April 29, 2011

Mr. Chris Hodgson, P.Eng.
City Project Manager
City of Waterloo
265 Lexington Court
Waterloo, Ontario
N2J 4A8

Dear Mr. Hodgson:

CITY OF WATERLOO TRANSPORTATION MASTER PLAN
FINAL REPORT

On behalf of the entire IBI Group / MMM Group team who participated in the development of the City of Waterloo’s first Transportation Master Plan (TMP), we are pleased to submit this Final Transportation Master Plan Report which was approved in principle by City Council on April 18, 2011. We thank the City’s Project Team and Steering Committee who provided direction and assistance in developing this TMP over the last three years.

All policies and plans recommended in the TMP are intended to support the City’s strategic vision of a “City that is truly accessible to all”. The TMP supports a healthy and sustainable City that includes a more balanced transportation network for walking, cycling, public transit, goods movement and auto travel. It does this with an overarching Complete Streets Policy where all streets in the City of Waterloo are to be planned, designed, operated and maintained to enable safe access for all users.

We also acknowledge the many members of the public who provided their ideas and insights into the development of this TMP. Our consulting team is proud to have been part of this innovative transportation planning process.

Yours truly

IBI GROUP

Don Drackley, MCIP, RPP, MITE
Project Manager

DD/baw
Encl.
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- Appendix A: Public Engagement Material
- Appendix B: Intersection LOS Forecasts
- Appendix C: Bikeway & Trails Priority Projects
- Appendix D: Traffic Calming Policy
- Appendix E: Draft Intersection Control Policy
- Appendix F: Business as Usual Implications
EXECUTIVE SUMMARY

The City of Waterloo Transportation Master Plan is a strategic planning document that provides direction for local transportation planning and decision-making. This is the first Transportation Master Plan (TMP) prepared for the City.

Transportation Master Plan Guiding Principles

The motivation of this Transportation Master Plan (TMP) is summarized using the four following guiding principles taken from the principles of the 2007-2010 City of Waterloo Strategic Plan:

1. ACCESSIBLE
2. CHOICE
3. SUSTAINABLE
4. FISCALLY RESPONSIBLE

The priorities, emphasis and ultimately, recommendations of this TMP have these four (4) principles embedded throughout.

Waterloo’s first TMP will support a healthy and sustainable city with a balance of social, cultural, environmental and economic successes through the implementation of a balanced transportation network. While it is recognizes the significance of the auto in both the existing and future system, the development of a multi-modal system of walking, cycling, and transit will provide the transportation balance this city needs. This plan also recognizes the movement of goods and freight which require, and will continue to require a reliable road network to remain economically competitive. The overarching direction for Waterloo’s future transportation system will be through a Complete Streets Policy.

In terms of transportation planning, the guiding principles of ‘Accessibility’ and ‘Choice’ are inextricably linked. A transportation system that provides choice in how people can travel around its community provides accessibility to the many services the City and surrounding area provides. Based on this approach, the community becomes ‘inclusive’ as opposed to ‘exclusive’ in a solely auto dominated society. Feedback from general public and stakeholders was a request for greater ‘Accessibility’ through travel ‘Choice’.

These two principles were fully integrated into the TMP within its primary vision statement:

“To develop a coordinated and integrated transportation system that provides realistic travel options to the auto, thereby creating a City that is truly accessible to all”.

All policies and plans recommended in this TMP are intended to support the vision of a “City that is truly accessible to all”. Further support of this strategic direction is through guidance by national, provincial and regional policies in support of sustainable communities and sustainable transportation planning that both provide for an economically viable and vibrant place to live, and with a complete transportation system that is walkable, bicycle friendly, age friendly, accessible and diverse.

Waterloo has changed dramatically over the years and will continue to change in the coming decades as it moves into an era of significant population and employment growth. With this change comes an opportunity to re-visit how the city is planned and developed to ensure the future vision for the city is met. Land use and transportation are without doubt the two biggest influencers of that planning strategy. The direction of a nodes and corridors planning approach through the 2003 Height and Density Policy study provided the platform for intensification along a completely different path than the urban sprawl of the past several decades. This intensification planning approach
compliments a transit oriented transportation system, one that provides choice in how people travel around and through Waterloo.

This TMP builds upon that planning approach through placing an emphasis on transit and active transportation. The result is a future transportation system not only less reliant on the auto, but one that supports the strategic initiatives Waterloo is planning for – a Healthy and Safe Community through provision of much needed active transportation. How we plan our communities has a direct relationship to the health of its population. Canada’s less than desirable recognition as having the world’s second worst obesity rate can be reduced in the future through developing communities that strive for the initiatives Waterloo is reaching for.

It must be recognized that there are implications to implementing a plan that shifts the decades focus on the auto to a focus on a multi-modal plan. This plan is setting the platform for a brighter future for the community where active transportation plays an integral part of its makeup. But as with all plans, they take time to develop. Many North American cities such as Vancouver, Ottawa, Seattle, Madison and Boulder have successfully made this shift, but their planning and decision-making for their vision started many decades before. A cultural shift is required to help people see and move towards alternative forms of transportation. This cannot occur over night. This TMP is a 20 year strategy that requires tough decision making, restructuring of some resources, reallocation of funding priorities and redistribution of funding already budgeted to name a few of the challenges ahead in bringing this plan to life.

In order to make this shift over time, the City will see manageable but acceptable delays at some locations within its road network as prioritization begins to be redistributed to the other modes of transportation.

The alternative scenario for Waterloo would be to continue down the same path as the past four to five decades, i.e. the Business as Usual (BAU) approach. Municipal road networks have peak hours during the day, where the majority of travel trips occur. For most of the day, roads and intersections operate at good levels of service. The BAU approach would continue to follow a road expansion strategy and widen roads and intersections to address future peak demand. This TMP analyzed this scenario with resulting impacts on the urban and natural environment, public health and safety, in addition to the high capital and operating costs needed to continue an accustomed level of service and are clearly not practical and do not align with any of the four key guiding principles of this plan, the principles of the 2007-2010 Strategic Plan or other city, region or provincial strategic planning documents.

“Building a sustainable city” is a key directive of the 2007-2010 Strategic Plan. The development of a transportation system that maximizes its carrying capacity through reallocating resources and funds to other, much needed areas and services of its transportation system is a more sustainable approach. In terms of the Environment, the plan helps in conserving energy, reducing resource consumption and improving air quality with less vehicle emissions by planning for a more efficient and multi-modal transportation system. It supports a Healthy and Safe Community by supporting calmed traffic, emergency responsiveness and Active Transportation opportunities (cycling and walking). The City’s Economic Vitality will also be supported by a transportation system that serves the movement of people and goods for growing businesses.

Traditionally, Transportation Master Plans were undertaken to determine the prioritization and costs of a road widening program for future years. The approach taken with Waterloo’s first TMP prioritizes funding on alternative forms of transportation as it recognizes the City’s infrastructure deficit and mitigates increasing this further through a preferred planning and cost effective approach, making this plan fiscally responsible.

Planning Coordination at Local, Regional and Provincial Levels

This City of Waterloo TMP has been prepared in association with, and with reference to a number of related local, regional and provincial planning policies including:
Existing Transportation System

Analysis of key corridors and intersections indicates that today's network handles around 70,000 (2006 survey data) morning (AM) peak period trips, the vast majority (around 83%) is by the auto but generally functions well apart from some localized movements at some intersections. The network of sidewalks is fairly comprehensive, however the cycling network is less so and is lacking connectivity between many existing on-road and off-road routes. Around 75% of all auto trips originating in Waterloo are between 2 and 8km in length, which, when considering Waterloo is around 7.5 km wide, are trips well within acceptable distances for cycling and transit.

The role and planning of transit service within the City of Waterloo is under the Region of Waterloo's jurisdiction. Generally, transit ridership in the Region has increased from 9.5 million rides in 1999 to 16.6 million rides in 2009, a 75% increase or 6% annual growth. In 2006, the transit mode share overall was 4.3% specifically in the city.

Future Transportation System

The planned growth for Waterloo identifies a further 30,000 additional trips in the AM peak hour and associated growth through the day show that the City is expected to experience deficiencies in roadway network capacity in some key areas of the City. By 2031 the forecasted capacity deficiencies in the roadway network suggest that eight (8) additional travel lanes per direction (16 lanes) will be required to serve expected growth in motorized traffic.

The City of Waterloo has identified future bikeway and trail projects to implement over the next 20 years. The implementation cost for this planned Bikeways and Trails Network is $105,000 in Year 1, $1.7M in years 2-5 and $5.7M between years 6 and 20.

The Regional Transportation Master Plan (RTMP) forecasts transit ridership to grow to 8.5% specifically in Waterloo. To accomplish this, the Region's transit network plan includes phased improvements to conventional transit service, and implementation of Rapid Transit service from Waterloo to downtown Cambridge.

Alternative Transportation Planning Strategies

Based on input gained from the community engagement conducted during the TMP preparation, three alternative transportation strategies were considered:

Capacity-Focused Strategy – continue to provide roadway network capacity where required in response to growing travel demand, i.e. Business as Usual. This approach is not considered sustainable or economically viable for the City.

Demand-Focused Strategy – addresses growing travel demands primarily by changing travel characteristics in the City i.e. Transportation Demand Management (TDM). For a demand-focused strategy to work, Waterloo would have to accept any associated supporting costs, plus the impacts of reduced roadway capacity and operations while behavioral shift develops.
Complete Transportation Strategy – A focus on providing more Complete Streets to serve all modes of transportation is viewed as a more desirable strategy that combines the provision of roadway capacity for all roadway users (walking, cycling, transit, auto), with changes in travel behaviour that will slow the growth in auto use and provide more viable alternative travel modes. This Complete Street strategy is preferred for Waterloo and is compatible with the RTMP.

Strategic Roadway Network Improvements

The RTMP recommends a staged enhancement of the roadway network over the next 20 years and more. City roads identified for enhancement are:

- University Avenue (Bridge Street to Lexington Road) – capacity enhancements (completed);
- Columbia Street West (Erbsville Road to Fischer-Hallman Road) – capacity enhancements;
- Columbia Street West (Fischer-Hallman Road to Albert Street) – transit priority;
- Bridge Street (Northfield Drive to King Street) – widening; and
- Laurelwood Drive (Fischer-Hallman Road to Westmount Road) – new road.

Intersection Capacity Enhancements

A total of 47 intersections were analyzed in Waterloo to determine future deficiencies resulting from traffic growth. Between five (5) and (8) experience some deficiencies today. This is expected to grow to fourteen (14) by year 2031.

Roadway Capacity Adjustment

A Complete Streets strategy provides opportunities to adjust road capacity to better accommodate other modes of transportation by reducing the number of travel lanes to provide roadway space for other means. These are termed ‘road diets’ and two (2) projects have been used effectively in Waterloo already – Davenport Road and Bearinger Road.

A Complete Streets Policy

Complete Streets are planned, designed, operated and maintained to enable safe access for all users. Pedestrians, cyclists, transit riders and motorists of all ages and abilities must be able to safely move along and across a complete street. A Complete Streets policy compliments the City’s Official Plan Update, Accessibility Plan, Pedestrian Charter, Recreation and Leisure Services Plan, Environmental Strategic Plan and plans for a network of linked trail greenways or open space corridors.

The Complete Streets policy is intended to shift Waterloo from the decades-long focus of providing streets to move cars, to providing streets where people can interact and move about whether they are on foot, on a bicycle, in a bus or in a car. Implementing a Complete Streets policy in Waterloo will enable all users of all ages and abilities – pedestrian, people with disabilities, cyclists, transit riders and motorists – to safely move along and across City streets. It is intended to be applied comprehensively across the City, but with flexibility to reflect local context.

The Complete Street policy is based in part on successful applications in cities of similar size to Waterloo. One of the best examples is Boulder, Colorado, a winter and university city of around 100,000 people with a strong shift away from single occupant vehicle (SOV) use. Through its investment in active transportation and public transit, in the 20 years between 1990 and 2010 Boulder has seen the use of SOV’s drop from 45% of all trips to 37% today, and the target is 25% by 2025. Less than 20% of the City’s intersections experience congestion, and Vehicle Miles Traveled in the City has remained constant since 1994 although Boulder itself has grown. Much of this is attributed to a Complete Streets strategy to systematically transform major streets to better accommodate all modes of transportation.
Other Recommended Transportation Policies

Traffic Calming – The City’s policy for traffic calming has been updated with a new process on initiating and conducting studies. The “toolbox” of measures has been expanded and each measure will be reviewed for appropriateness to the problem(s) identified. Consultation will be mandatory with Emergency Response providers to ensure emergency response times are not compromised.

Traffic Control – This new policy provides a mechanism to determine appropriate traffic control devices – i.e. roundabout, stop sign, yield sign and traffic signal. Consistent and appropriate application of traffic control devices helps all road users, therefore making roads safer to use for everyone.

Parking Management – The TMP addresses a number of issues associated with parking and recommends continuation of applying the guiding principles from the 2008 Uptown Parking Strategy, which in essence is to ensure that as a rule of thumb, the cost of monthly parking is generally more than the cost of a monthly transit pass.

To maximize the transportation and social use of streets, the TMP recommends that, subject to the 2012-2014 budget, the City modify its current full, year round restriction on overnight on-street parking so that such parking, where deemed appropriate is only restricted during winter months. This would not apply across the entire city but within specific areas that would be selected through a detailed and systematic review program developed by staff, and any modification would be subject to a trial period.

Transportation Demand Management – The RTMP identifies 52 initiatives to manage the demand for transportation in the Region through the use of TDM. Implementation of eleven (11) of these lie with the local municipalities and involves the integration of land use and transportation planning, provision of transportation supply and education and promotion of TDM and active transportation services.

Sidewalk Maintenance (Winter Control) – Current practice is for abutting property owners to clear sidewalks, although the City currently maintains around 95km of sidewalks and trails. From a Complete Streets perspective and developing a “City that is accessible to all”, there is a fundamental need to ensure that public sidewalks are accessible to all through timely and consistent removal of snow and ice. Winter maintenance has been an issue raised by the community under this TMP and the number one issue raised by the Grand River Accessibility Advisory Committee.

Expanding the City’s current sidewalk snow clearing program would promote and enhance safe and accessible pedestrian movement, encourage greater pedestrian and transit use and help make the shift to alternative modes of transportation. This would ultimately reduce the negative impacts and costs to widen more roads and intersections. A phased approach to implementing an expanded program would assist in the budgeting of this program, therefore the focus would be on higher pedestrian and transit routes. Recommendations of this TMP include reviewing current city practice to identify efficiencies in service, an increase in the existing sidewalk snow clearing program of $100,000 per year over the next five years, subject to the 2012-2014 budget process, and develop a mid to long term strategy to expand the program where necessary.

Implications of Business As Usual

If the benefits of the Complete Streets approach with more active transportation and transit use are not achieved in Waterloo over the next 20 years, and auto traffic continues to grow as forecast in relation to plan growth, the amount of congested lane kilometers on city roads will increase by between 20% and 30%. In addition, 16 key intersections are expected to become deficient. In order to maintain an adequate level of service, capacity improvements will be needed in the form of widening, extensions and intersection capacity improvements which will add to the City’s
infrastructure needs in terms of Capital and Operating dollars. As today’s existing road network needs across the City have reached $172.5 Million, adding further significant costs to this deficit is not a sustainable or fiscally responsible approach.

**Public and Stakeholder Consultation**

Consultation and communication has been an essential component of this TMP over the past 3 years. In addition to three (3) Public Open Houses, a dedicated project web site, one-on-one meetings with mayor and councilors and a stakeholder workshop, the direction of this TMP was guided by a focused steering committee made up of City staff from various departments as well as Region of Waterloo, University of Waterloo and the City’s Transportation and Trails Advisory Committee. In general, the objectives, outcomes and recommendations of this TMP are the result of community input.

**Using the Transportation Master Plan**

The primary purpose of the TMP is to guide the City’s transportation-related decision making, and provide the need and justification for transportation infrastructure projects that require approval under the Municipal Class Environmental Assessment process.

**Plan Reviews and Updates** – The TMP must be regularly reviewed to ensure it continues to meet the transportation needs of the City. The City’s 10 Year Capital Projects – Roads, should be updated to include the short-term projects recommended in the TMP. An annual staff report on the ‘State of the Transportation System’ should be prepared addressing local transportation conditions, behaviours, needs and trends. The TMP should also be fully updated as required every five (5) years in association with the mandatory Official Plan reviews.

**Funding Opportunities** - Local transportation system improvements may be eligible for provincial and federal funding programs as they are made available. Other sources include Development Charges for growth related roadway construction, development agreements, gas tax, user fee pay, cash in-lieu of parking and focused private sector advertising.

**Implementation Through the Development Approval Process** – The TMP can be implemented through integrated transportation/land use planning that provides incentives supporting Complete Streets and TDM. These could include minimum parking standards, provision of bicycle parking and preferred parking for hybrid type vehicles. Others include parking and trip reduction incentives in the workplace.

The TMP also recommends that in order to implement the multiple TDM and active transportation programs and infrastructure recommendations of this TMP, and develop the associated policies and programs, the City should add a full time staff person as the Active Transportation Program Manager, to oversee all aspects of TDM and active transportation within the City of Waterloo. Given active transportation covers many departments within the Corporation, it is recommended this centralized position resides in the Chief Administration’s Office.

**Conclusion**

In concluding, this TMP strategically aligns with local, regional, provincial and national transportation planning approaches, by investing in transit and active transportation in the development of Waterloo’s future. It recognizes the severity of the City’s deficit and makes recommendations to mitigate impacting this deficit further.
1. INTRODUCTION

1.1 Purpose of the Transportation Master Plan

A Master Plan is an all encompassing planning document that strategically directs all aspects of the program that it addresses. The Transportation Master Plan addresses all modes of transportation in the City of Waterloo that are under the jurisdiction of the City, namely road transportation, cycling facilities and pedestrian infrastructure. It must be aligned with and comply with the City’s Strategic Plan and Official Plan (see Section 3.1.6 and 3.1.7).

The purpose of the City of Waterloo Transportation Master Plan (TMP) is to provide an implementation strategy for the coordination and integration of the transportation system that will guide the decision-making process for the next 20 years to 2031. The transportation system recommended by the TMP integrates the transportation infrastructure requirements of existing and future land use, with the community planning vision and objectives of the City for growth management, public safety, affordability, economic vitality and quality of life developed through the City’s Official Plan.

1.2 Conformance to Municipal Class Environmental Assessment Process

The Municipal Engineers Association Municipal Class Environmental Assessment Process (2007) (Class EA) recognizes that it is sometimes advisable to plan municipal infrastructure as part of an overall system, rather than as specific projects such as a roadway improvement project. The planning provisions of the Class EA describe the scope of a master plan as being broad and comprehensive, usually including analysis of an entire system such as a municipal transportation system, in order to develop a framework for future works and developments. The master plan is not typically prepared to address site-specific problems such as traffic operations at individual intersections or in specific neighbourhoods.

The City of Waterloo TMP was prepared in conformance to the master planning process of the Class EA. This accepted master planning process applies to long range transportation plans that integrate municipal infrastructure including roads, public transit systems, bikeways, pedestrian systems and the parts of air, marine and rail systems that involve municipal responsibility. To help expedite these types of transportation projects, the Class EA provides alternative approaches for the preparation of master plans, each designed to address at least Phases 1 and 2 of the Municipal Class EA process.

The City of Waterloo TMP conforms to the Class EA description of a master plan using Approach #1 from the Class EA document. Following this approach, Phases 1 and 2 of the Municipal Class EA process were concluded by broadly establishing the problems and opportunities associated with the City’s transportation system over the next 20 years, and selecting a preferred transportation planning solution to address these needs and opportunities.

Once approved by the municipality, the TMP then provides the context for the implementation of specific minor (Schedule B) projects such as intersection improvements, and major (Schedule C) transportation infrastructure projects such as road widening and extensions. As such, the TMP satisfies Phases 1 and 2 of the Class EA process, once again by establishing the problem or opportunity that such projects address, and selecting the preferred transportation planning solution.
More detailed investigations will be required for specific Schedule C projects recommended in this TMP. Schedule B projects will require the filing of the project file for public review, while Schedule C projects will have to fulfill Phases 3 and 4 of the Class EA process prior to filing an Environmental Study Report (ESR) for public review. In both cases, the public review period includes a Part II Order appeal mechanism, where an individual can make a written request to the Minister of the Environment to extend the project to a higher level of EA investigation.

**Note:** A Part II Order request can only be made on a project-specific Schedule B or C EA, and not on a Transportation Master Plan on which such a project is based.

### 1.3 Project Direction

The technical direction for the preparation of this TMP was provided by a Project Team with the following members:

- Chris Hodgson, P. Eng., City Project Manager, Capital Projects & Services
- Phil Hewitson, P. Eng., Director, Transportation Services
- Sunda Siva, P. Eng., Director, Capital Projects & Services
- Don Drackley, MITE, MCIP, RPP, IBI Group, Project Management/Transportation Planning
- Norma Moores, P. Eng., IBI Group, Cycling System Planning
- Jay Cranstone, OALA, MMM Group, Trails Planning

Strategic direction was provided to the Project Team on development of the TMP from a Steering Committee with the following City, Region and community representatives:

- Chris Hodgson, P. Eng., Capital Projects & Services, Chair
- Phil Hewitson, P. Eng., Director, Transportation Services
- Sunda Siva, P. Eng., Director, Capital Projects & Services
- Christine Koehler, CET, Transportation Services
- Janice Mitchell, BES, MCIP, Development Services
- Karen Anderson, OALA, Community, Culture & Recreation Services
- Paula Sawicki, P. Eng./Geoff Keyworth, MCIP, RPP, Region of Waterloo
- Pauline Richards, Transportation & Trails Advisory Committee
- Larry Brassard, Waterloo Fire Rescue
- Clarence Woodsma, Phd., University of Waterloo
- Jeffery Casello, Phd., P. Eng., University of Waterloo

### 1.4 Best Practices in Sustainable Transportation Planning

A peer review of best practices in small city transportation planning was conducted specifically for the City of Waterloo Transportation Master Plan project as a summary review of master planning approaches used in a number of comparable municipalities similar in population to Waterloo.
Information in this peer review report was taken from Transport Canada’s *STRATEGIES FOR SUSTAINABLE TRANSPORTATION PLANNING: PRACTICES & OPTIONS*, September, 2005, IBI Group. The excerpts taken from that report focus on small Canadian cities comparable to the City of Waterloo. Some medium sized city references are also used since the City of Waterloo is part of a larger regional urban area of the Regional Municipality of Waterloo with a population in the medium city 150,000 – 750,000 range.

Additional information of this most recent peer review of transportation planning approaches in Canadian and other cities, reference should be made to the Transport Canada report which is available at [www.tc.gc.ca](http://www.tc.gc.ca).

The peer review found that despite positive changes in the overall understanding of sustainable transportation in Canada, there remains a wide variance in municipal approaches to incorporating sustainable transportation principles into municipal transportation and land use plans. For example, there is no widely accepted definition of sustainable transportation from a municipal planning perspective, nor are there any accepted measures for determining whether a transportation master plan will actually lead to a more sustainable transportation system. It seems that each municipality essentially starts from scratch when developing these plans.

Another major concern is that in those Canadian municipalities with master plans that promote more sustainable transportation, actual observed trends have been moving in the opposite direction. Perhaps most telling is the finding of TAC’s Urban Indicators Survey that gasoline fuel use per capita (a surrogate measure for many sustainability indicators) grew by more than 11% between 1991 and 2001 in major Canadian cities.

The 2005 Transport Canada report concluded that there is a significant need for improved resources to help municipalities efficiently and effectively prepare transportation plans that promote and help create more sustainable transportation systems. TAC’s Sustainable Transportation Standing Committee, with the assistance of Transport Canada, developed a set of guidelines for the benefit of municipalities of various sizes across Canada. These guidelines must be based on a sound understanding of current practices, opportunities and challenges, and they must also be sensitive to the jurisdictional, technical and cultural differences that exist among Canadian urban communities.

Exhibit 1.1 provides a high level overview of each plan review and where they were considered to be notable with respect to any of the twelve sustainable transportation principles. This provides a guide to those plans that have addressed a principle comprehensively, and with a view to promoting more sustainable transportation.
### Exhibit 1-1: Summary of Plans Reviewed and Notable Considerations

<table>
<thead>
<tr>
<th>Principles</th>
<th>Notable Canadian plans</th>
<th>Notable international plans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Victoria</td>
<td>Kamloops</td>
</tr>
<tr>
<td>1. Integration with land use planning</td>
<td>● ● ● ●</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>2. Environmental health</td>
<td>● ● ● ●</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>3. Economic development and social objectives</td>
<td>● ● ● ●</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>4. Modal sustainability</td>
<td>● ● ● ●</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>5. Transportation demand management</td>
<td>● ● ● ●</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>6. Transportation supply management</td>
<td>● ● ● ●</td>
<td>● ● ● ●</td>
</tr>
</tbody>
</table>

**SUSTAINABLE COMMUNITIES AND TRANSPORTATION SYSTEMS**

1. Integration with land use planning | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● |

**SUSTAINABLE AND EFFECTIVE TRANSPORTATION PLANNING**

1. Integration with land use planning | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● | ● ● ● ● |

**Notable consideration and discussed in text**

**●** Notable consideration, not discussed in text.
2. TRANSPORTATION VISION STATEMENT, PRINCIPLES & OBJECTIVES

2.1 Transportation Vision

The Vision Statement for the Transportation Master Plan (TMP) is taken from an excerpt of the City of Waterloo’s Strategic Plan 2007-2010 and the project’s Request For Proposal stating:

“to develop a coordinated and integrated transportation system that provides realistic alternative travel options to the auto thereby creating a City that is truly accessible to all.”

To meet this Vision, the TMP must provide a multi-modal strategy for the City of Waterloo, supported by the Region of Waterloo, with transportation capacity, infrastructure and services needed for the movement of people and goods within and through the City to the year 2031.

2.2 Transportation Principles

The City of Waterloo Strategic Plan 2007-2010 includes the following imperatives that have become fundamental principles for the TMP:

<table>
<thead>
<tr>
<th>Transportation Principle:</th>
<th>Role of TMP:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Our Living Environment</td>
<td>Minimize impact on natural resources</td>
</tr>
<tr>
<td>2. Build a sustainable city</td>
<td>Build a sustainable transportation system</td>
</tr>
<tr>
<td>3. Promote, enhance and demonstrate environmental stewardship</td>
<td>Provide alternative travel choices that contribute to environmental stewardship (i.e. air quality, natural heritage features)</td>
</tr>
<tr>
<td>2. Healthy and Safe Community</td>
<td>Include transportation as part of community building and identity</td>
</tr>
<tr>
<td>1. Create an inclusive sense of community</td>
<td>Provide policy direction that enhances transportation system safety for all users</td>
</tr>
<tr>
<td>2. Enhance community safety</td>
<td></td>
</tr>
<tr>
<td>3. Economic Vitality</td>
<td>Provide business with required transportation infrastructure</td>
</tr>
<tr>
<td>1. Become the location of choice for innovative and growing businesses</td>
<td>Provide the Employment Lands with required transportation infrastructure</td>
</tr>
<tr>
<td>2. Implement the Employment Lands Strategy</td>
<td></td>
</tr>
<tr>
<td>4. Partnerships and Collaboration</td>
<td>Address Class EA consultation requirements</td>
</tr>
<tr>
<td>1. Enhance public engagement processes</td>
<td>Include University of Waterloo and Wilfrid Laurier University</td>
</tr>
<tr>
<td>2. Leverage community assets</td>
<td>Involve the Region of Waterloo</td>
</tr>
<tr>
<td>3. Advocate for Waterloo</td>
<td></td>
</tr>
</tbody>
</table>
The direction of the TMP is guided not only by principles of the City of Waterloo, but also by a policy framework at the National, Provincial, and Regional level. The justification to undertake a TMP with the principle of creating a sustainable community is well-established and supported by all levels of government, as illustrated in Exhibit 2.1:

Exhibit 2-1: Policy Framework for Creating a Sustainable Community and Related Transportation System
2.3 Transportation Objectives

Based on the project Request For Proposal, the transportation objective of the TMP is to establish a policy that:

<table>
<thead>
<tr>
<th>Transportation Objective:</th>
<th>TMP Interpretation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encompasses a workable document …</td>
<td>A TMP document that is understandable and easy to use.</td>
</tr>
<tr>
<td>Incorporating a coordinated, integrated, multi-modal transportation system …</td>
<td>The City’s TMP is coordinated and integrated with its Strategic Plan and Official Plan, plus the Official Plan and TMP of the Region of Waterloo. A TMP for all modes of travel under City jurisdiction, with plans, policies and guidelines for City roads, cycling routes and facilities and pedestrian infrastructure, and with input into transit service provided by the Region of Waterloo.</td>
</tr>
<tr>
<td>That truly reflects the changing dynamic of a unique yet growing and developing city.</td>
<td>A city changing from a post-industrial economy to a new hi-tech human capital economy, with residential growth primarily to the west and employment growth in established nodes.</td>
</tr>
<tr>
<td>A city that is accessible to all.</td>
<td>With transportation infrastructure serving a complete range of users.</td>
</tr>
</tbody>
</table>
3. PLANNING COORDINATION

3.1 Transportation Planning Context

The City of Waterloo, as part of the “Plan it!” project to update the City’s Official Plan, produced a “Networks and Transportation System Final Report” dated June 26, 2009 that describes the provincial, regional and City of Waterloo planning policy context that is the basis of the new TMP. Also, the Region of Waterloo in their Regional Transportation Master Plan (RTMP) “Existing Transportation System Context Overview” paper dated April 20, 2009 also established the regional planning context for the City’s TMP which is further reported below. This planning context is summarized in Exhibit 3.1 and the following sub-sections.

Exhibit 3-1: Transportation Planning Context

3.1.1 PROVINCIAL POLICY STATEMENT

The Provincial Policy Statement (PPS) provides further detail and policy direction on matters of provincial interest related to land use planning and development such as managing growth and the protection of the environment. The Planning Act requires that all planning decisions “shall be consistent with” the PPS.

The PPS contains a section regarding “Infrastructure and Public Service Facilities”. The PPS policies in this section focus on municipalities:

- ensuring that the necessary infrastructure and public service facilities are available to meet current and future needs;
- optimizing existing infrastructure and public service facilities to avoid premature development of new infrastructure and public service facilities;
• locating infrastructure and public service facilities in a strategic manner, in order to meet the
  needs of emergency management services; and
• directing and accommodating growth in a manner that promotes the efficient use of
  municipal sewage services and municipal water services;

Further, the PPS also contains a series of policies with respect to Transportation. These policies
direct municipalities to:

• promote a land use pattern that minimizes the length and number of vehicle trips, and
  support the development of viable alternative transportation modes;
• integrating transportation and land use considerations through all stages of the planning
  process;
• using existing and planned infrastructure (including transportation infrastructure) efficiently;
  and
• providing a transportation system that is safe, energy efficient, facilitates goods and people
  movement, and has sufficient capacity for projected needs.

Finally, with respect to transportation and infrastructure corridors, the PPS directs municipalities to:
plan and protect corridors and rights-of-way for transportation, transit and infrastructure facilities to
meet current and projected needs;

• not permit development in planned corridors should it limit the planned corridor’s use; and
• consider the environmental impacts when planning for corridors and rights-of-way for
  significant transportation infrastructure facilities.

The plans and policies for the City of Waterloo’s transportation system reflect the direction set out in
the Provincial Policy Statement.

3.1.2 PLACES TO GROW ACT AND GROWTH PLAN FOR THE GREATER GOLDEN HORSESHOE
  (GROWTH PLAN)

The Growth Plan is a Provincial growth management plan that articulates a long-term strategic
vision and tools for how the Greater Golden Horseshoe and surrounding areas should grow over
the next 30 years. The Plan directs municipalities to optimize the use of existing and new
infrastructure to support growth, as well as coordinate infrastructure planning, land use planning
and infrastructure investment in order to implement the Growth Plan.

Many policies in the Growth Plan deal with planning for transportation infrastructure, with emphasis
on encouraging municipalities to plan for transportation systems that are adequate for the level of
anticipated growth, offer multi-modal access to destinations, provide safety for users, and are
interconnected and planned for in a coordinated manner. The Growth Plan also mirrors policies
found in the PPS with respect to transportation corridors.

The Growth Plan also focuses heavily on planning for transit service levels that support higher
density areas (such as the Uptown Waterloo Urban Growth Centre, Major Transit Station Areas),
and increasing the modal share of transit. Further, municipalities are directed to integrate
pedestrian and bicycle networks into transportation planning for both existing and new communities.
The Growth Plan contains a series of policies regarding community infrastructure. These policies provide direction for community infrastructure planning, land use planning and community infrastructure investment to be coordinated, to use such community infrastructure efficiently, and to plan for an appropriate range of community infrastructure to accommodate population changes.

The plans and policies for the City of Waterloo’s transportation system reflect the direction set out in the *Places to Grow Act* and the Growth Plan.

### 3.1.3 REGIONAL OFFICIAL PLAN

The new Regional Official Plan (ROP) approved in 2009 places a strong emphasis on balancing growth between new development in greenfield areas and intensification within the existing built-up area. Combined with Regional requirements for increased densities on greenfields lands, the ROP sets a vision for an enhanced link between land use and transportation planning.

The ROP also contains policies that require greenfield development to contribute to the creation of complete communities, and directs area municipalities to provide development patterns, densities and mix of land uses that support walking, cycling and use of transit.

The ROP is also heavily focused on ensuring that new development supports public transit, particularly on lands within the Built Boundary. To those ends, the planned community framework set out in the ROP, with Urban Growth Centres, Major Transit Station Areas (which are future Rapid Transit Stops), Reurbanization Corridors and Major Local Nodes, all promote a land use pattern that supports transit infrastructure and seeks to maximize the use of existing infrastructure.

The plans and policies for the City of Waterloo’s transportation system reflect the direction set out in the Regional Official Plan.

### 3.1.4 REGIONAL TRANSPORTATION MASTER PLAN - MOVING FORWARD 2031

In 2010 the Region of Waterloo approved a new Transportation Master Plan (RTMP), which includes a set of policies and priorities to guide how future transportation direction and investment decisions are made for all types of transportation (roads, rapid transit, transit, cycling and walking) used throughout Waterloo Region. It also includes recommendations on where to enhance arterial roadway capacity in the 0-5, 5-10, 10-20 and 20+ year planning horizons which will be reported in Section 8.2 of this TMP. This includes plans for new roads, road extensions and road widening within the City of Waterloo’s arterial roadway network, plus recommendations for transit priority features such as queue jump (transit bypass) lanes, transit priority traffic signals

The plans and policies for the City of Waterloo’s transportation system reflect the direction set out in the Regional Transportation Master Plan.

### 3.1.5 REGION OF WATERLOO RAPID TRANSIT INITIATIVE

The Region of Waterloo is seeking to develop a new rapid transit system within the primary urbanization area identified in its Regional Growth Management Strategy. This area links the major urban centres of Cambridge, Kitchener and Waterloo. This system is intended to form the backbone of the future transportation network as the Region grows from a population of approximately 508,000 today, to 729,000 over the next 25 years. A Rapid Transit Environmental Assessment was started in 2006, and Regional Council approved a Rapid Transit implementation plan in 2009 subject to satisfactory federal and Provincial funding.

During the fall of 2010, concerns were raised about the affordability of the rapid transit project, specifically in terms of the Region’s contribution. Regional staff prepared an objective review of
project implementation options for Council’s consideration on February 15, 2011 in order to identify a rapid transit project that is affordable to the Region and provides best value to the community. Following this, further public consultation was planned, leading to planned Regional Council approval of a preferred rapid transit system in June 2011.

3.1.6 CITY OF WATERLOO STRATEGIC PLAN 2007-2010

The strategic plan helps the City of Waterloo move successfully into the future by identifying the key areas of focus and outlining the activities that will help the City build strength in each of these areas. Through community forums, a community survey and presentations to Council, residents, community leaders, institutions and organizations were asked “What’s in Your Waterloo?”

The discussions, however, do not stop at the City boundaries, and the Strategic Plan recognizes that what Waterloo does as a City must fit within the broader context of neighbouring communities as well as the Waterloo Region.

Four of the key areas of the Strategic Plan have been fundamental to the preparation of the TMP:

1. Our Living Environment
   - Protect our Natural Resources
   - Building a sustainable city
   - Promote, enhance and demonstrate environmental stewardship
   - Focus on transportation of all forms

2. Healthy and Safe Community
   - Create an inclusive sense of community
   - Enhance community safety

3. Economic Vitality
   - Become the location of choice for innovative and growing businesses
   - Implement the Employment Lands Strategy

4. Partnerships and Collaboration
   - Enhance public engagement processes
   - Leverage community assets
   - Advocate for Waterloo

In 2011 the City of Waterloo initiated the development of a new 2011–2014 strategic plan built on the pillars of the 2007-2010 plan, including the four strategic areas (pillars) listed above that guided Waterloo’s success for the previous four years. This TMP will adhere to and support these new strategic areas.

3.1.7 CITY OF WATERLOO OFFICIAL PLAN

While the TMP was developed between 2008 and 2011, City staff were also involved with the review and update of the City’s Official Plan, which is the municipality’s primary strategic document for guiding land use and development. The Official Plan contains the goals and objectives of the community and establishes the policies that direct the form, extent, nature and rate of growth and change of the City. Official Plans are generally designed to guide community decisions for a set
The Draft Official Plan dated June 2010 provides important information for the TMP development in the following areas of future City growth and development, and transportation needs for the City as it grows:

- City Form;
- Networks & Transportation Systems;
- Arts, Culture, Heritage, Recreation and Leisure;
- Environment and Energy;
- Economy (including Knowledge and Technology);
- Land Use Designations;
- Land Use Policies; and
- Implementation of the Plan

### 3.1.8 OTHER CITY OF WATERLOO MASTER PLANS

Recreation and Leisure Master Plan - approved in 2008, highlights the importance that high quality recreation and leisure opportunities have in helping to foster a sense of community, contribute to social cohesion and add to knowledge-based communities into the future. To these ends, the policies within that master plan support an integrated parks, trails and open spaces network that is reflected in this TMP.

Environmental Strategic Plan - includes policies related to the parks, trails and open space network that support the continued creation and retention of open space areas for environmental benefits, naturalization of appropriate areas of parks, and designing and maintaining parks and trails in an energy efficient manner.

Fire Master Plan - the TMP supports the City’s Fire Master Plan by providing and maintaining a road network for Waterloo that supports public safety and emergency response.

The inter-relationship of planning documents for the City of Waterloo that form the local context for the TMP is summarized in Exhibit 3.2:

**Exhibit 3-2: Local City of Waterloo Master Planning Context**
4. EXISTING CITY-WIDE TRAVEL CHARACTERISTICS

The 2006 Transportation Tomorrow Survey data for the City by Waterloo provides the following information on travel characteristics within the city:

- Trips originating in travel zones in the City of Waterloo;
- Trips by purpose including Home-Based Work (HBW), Home-Based School (HBS), Home-Based Other (HBO) and Non-Home-Based (NHB);
- Travel mode including walking, cycling and public transit; and
- Distance of trip, with trips less than 2 km representing a distance that can be covered by walking, less than 8 km representing a distance that can be covered by cycling and over 8 km being trips that to most require motorized transportation (auto, transit).

Some of the City-wide trip-making characteristics are summarized below:

- In 2006 there were 36,800 households in the city with car ownership of 1.5 cars per household;
- 269,300 trips originated in the City of Waterloo;
- The purpose of the trips that originated in the City of Waterloo (see Exhibit 4.1) were:
  - 68,200 (25%) were Home-Based Work trips
  - 37,200 (14%) were Home-Based School trips
  - 108,700 (40%) were Home-Based Other trips
  - 55,200 (21%) were Non-Home-Based trips
- The mode of travel for the trips that originated in the City of Waterloo were:
  - 19,600 (7%) were by walking
  - 10,500 (4%) were by public transit
  - 3,200 (1%) were by cycling
  - The remainder (88%) were by motor vehicle

In examining the potential to shift trips by motor vehicle to walking or cycling, reasonable trip distances to walk of two kilometres and to bicycle of eight kilometres were selected. On a city-wide basis, the following characteristics were noted:

- 63,700 (24%) trips originating in the City of Waterloo were less than two kilometres in length;
- 135,900 (50%) trips originating in the City of Waterloo were greater than two kilometres but less than eight kilometres in length;
Of the trips less than two kilometres in length, 16,300 (26%) were made by walking and 1,200 (2%) were made by cycling; and

Of the trips greater than two kilometres and less than eight kilometres in length, 3,300 (2%) were made by walking and 2,000 (1%) were made by cycling

Exhibit 4-1: City of Waterloo Trip Purpose and Mode

No. of Trips Originating in City of Waterloo by Purpose

Source: 2006 Transportation Tomorrow Survey

Today, almost three-quarters of the trips made in the City of Waterloo are less than eight kilometres in length, but only one in ten of these trips are made by walking or cycling.

By comparison, European countries that have invested in walking and cycling policies, infrastructure and programs over the last 30 to 40 years see half of the trips under eight kilometres in length made by walking or cycling. If the City of Waterloo were to invest similarly, then it is estimated that the overall modal split for all trips originating in the City could shift from about 7% today by walking and cycling, up to 37% by walking and cycling by 2031.

The amount of cycling and walking in the City of Waterloo based on the 2006 Transportation Tomorrow Survey is shown by wards in Exhibit 4.2. The data shows that in the older mixed use and higher density Ward 7 with Uptown Waterloo, 80% of average daily trips are less than eight kilometres in length, and of these, 13% are by cycling and 2% by walking. The walking mode understandably increases to 16% in Ward 6 which includes the universities.

Conversely, the more suburban Ward 4 in northeast Waterloo with lower density and less mixed use development (i.e. close proximity between place of residence and place of work) shows that 63% of average daily trips are less than eight kilometres in length, with 3% by cycling and 1% by walking.
Exhibit 4-2: Current Levels of Cycling and Walking in Waterloo

Reasonable trip distances to walk are less than 2 km and to bicycle are less than 8 km in length.

- **Ward 1**: 77% Trips < 8km, 13% Walk, 2% Bike
- **Ward 2**: 70% Trips < 8km, 11% Walk, 1% Bike
- **Ward 3**: 69% Trips < 8km, 8% Walk, 2% Bike
- **Ward 4**: 63% Trips < 8km, 3% Walk, 1% Bike
- **Ward 5**: 79% Trips < 8km, 6% Walk, 1% Bike
- **Ward 6**: 79% Trips < 8km, 16% Walk, 2% Bike
- **Ward 7**: 80% Trips < 8km, 13% Walk, 2% Bike

Today, almost 75% of the trips that originate in the City of Waterloo are less than 8 km in length and one in ten of these trips are made by walking or cycling.

European countries that have invested in walking and cycling policies, infrastructure & programs over the last 30 to 40 years see half of the trips under 8 km in length made by walking or cycling!

If Waterloo were to invest similarly, then trips originating in City could shift from 8% by walking and cycling to 37%.

Today, almost 75% of the trips that originate in the City of Waterloo are less than 8 km in length and one in ten of these trips are made by walking or cycling.

Data from the 2006 Transportation for Tomorrow Survey from the Region of Waterloo
5. EXISTING CITY OF WATERLOO ROADWAY NETWORK

The vast majority of the movement of people and goods within the City of Waterloo takes place on the network of City and Regional roads. The road rights-of-way accommodate and serve the movement of motorized vehicles, cycling and walking, in association with the network of off-road cycling and trail routes within the City. This existing road network is described in terms of new roadway classifications developed as part of the TMP, roadway planning capacities and the existing Level-of-Service (LOS) at the main intersections within this network.

5.1 Roadway Classification

A new roadway classification system has been developed for the City of Waterloo based on a people movement rather than traffic movement focus. Using the transportation objectives developed for the City’s TMP in Section 2.3, the recommended road classification system includes the six following types of roads. This compares to the Region’s new road classifications used in their Context Sensitive Regional Transportation Corridor Design Guidelines (June 2010) listed in Exhibit 5.1:

- Provincial Highway (Ministry of Transportation responsibility);
- Regional Road (Region of Waterloo responsibility);
- City Arterial;
- Major Collector;
- Minor Collector;
- Local; and
- Laneway (not shown on Exhibit 5.2 due to exhibit scale).

Exhibit 5-1: Regional Road Classifications

<table>
<thead>
<tr>
<th>Urban Community Connector</th>
<th>Urban Residential Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Neighbourhood Connector (Avenue)</td>
<td>Rural Connector</td>
</tr>
<tr>
<td>Urban Neighbourhood Connector (Main Street)</td>
<td>Rural Main Street</td>
</tr>
</tbody>
</table>

The City’s road classifications are applied to the Waterloo road network in Exhibit 5.2 showing the recommended application. This road classification system is intended to be incorporated into the City’s updated Official Plan.

Exhibit 5.3 lists the various criteria that apply to each of the City’s road classifications, describing the role of each road class in the City’s overall roadway network.
### Exhibit 5-3: City of Waterloo Roadway Classification Criteria

#### City of Waterloo Transportation Master Plan

**ROAD CLASSIFICATION SYSTEM**

<table>
<thead>
<tr>
<th>KEY STRATEGIC AREA: STRATEGIC PLAN VISION</th>
<th>TRANSPORTATION MASTER PLAN CHARACTERISTICS</th>
<th>ROAD CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CITY ARTERIAL</td>
<td>MAJOR COLLECTOR</td>
<td>MINOR COLLECTOR</td>
</tr>
<tr>
<td>LOCAL</td>
<td>LANEWAYS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ROW Width</th>
<th>30 – 35 m</th>
<th>20 – 30 m</th>
<th>18 – 20 m</th>
<th>16 – 18 m</th>
<th>6m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement Width</td>
<td>11 – 18 m</td>
<td>11 – 15 m</td>
<td>8 – 11 m</td>
<td>8 – 9 m</td>
<td>6m</td>
</tr>
<tr>
<td>Innovation Potential</td>
<td>Opportunities for innovation to enhance person-carrying capacity and transit efficiency</td>
<td>Opportunities for innovation to accommodate non-motorized travel and reduce impacts of vehicular modes</td>
<td>Opportunities for innovation to accommodate non-motorized travel and reduce impacts of vehicular modes</td>
<td>Opportunities for innovation to develop safe and pedestrian-friendly streets</td>
<td>Opportunities for innovations in the street orientation of buildings and to remove residential on-street parking</td>
</tr>
<tr>
<td>Streetscape Features</td>
<td>Opportunities for Basic and Enhanced Streetscape Features Involving Furniture, Lighting, Trees &amp; Landscaping</td>
<td>Opportunities for Basic and Enhanced Streetscape Features Involving Furniture, Lighting, Trees &amp; Landscaping</td>
<td>Opportunities for Basic and Enhanced Streetscape Features Involving Boulevard Landscaping &amp; Sidewalks</td>
<td>Opportunities for Primarily Basic Streetscape Features Involving Boulevard Landscaping &amp; Sidewalks</td>
<td>Limited to streetlighting and drainage opportunities in Laneways</td>
</tr>
</tbody>
</table>

---

1 Based on City of Waterloo Urban Design Manual and Development Manual
# City of Waterloo Transportation Master Plan

## ROAD CLASSIFICATION SYSTEM

<table>
<thead>
<tr>
<th>KEY STRATEGIC AREA: STRATEGIC PLAN 2007-10</th>
<th>TRANSPORTATION MASTER PLAN VISION</th>
<th>ROAD CLASSIFICATION CHARACTERISTICS</th>
<th>ROAD CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CITY ARTERIAL</td>
<td>MAJOR COLLECTOR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MINOR COLLECTOR</td>
<td>LOCAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LANEWAYS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LIVEABILITY &amp; PROSPERITY</td>
<td>Existing/Planned Adjacent Land Use</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium/High Density Mixed use</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Development &amp; Major Traffic</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attractions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mixed Land Uses in Range of Low/Medium Density</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primarily Low/Medium Density</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Development in Residential Neighbourhoods &amp; Employment Areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primarily Low Density Residential Neighbourhood &amp; Employment Areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low Density Residential Neighbourhood with Frontages on Public Street</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>User Volume (Typical Motorized Traffic AADT)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12,000 – 30,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 12,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 5,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 2,000</td>
<td>Local Access Only</td>
</tr>
<tr>
<td></td>
<td></td>
<td>User Volume (Pedestrian)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Local Access Only with No Sidewalks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design Speed</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>70 km/h Maximum</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 km/h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 km/h</td>
<td>30 km/h Maximum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40 – 50 km/h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 30 km/h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average Running Speed</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 – 80 km/h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 km/h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 km/h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Permitted One or Both Sides</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Permitted One or Both Sides</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parking Generally Restricted on a Laneway</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>On-Street Parking Provisions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Generally Restricted</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Generally Restricted</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Permitted One or Both Sides</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Permitted One or Both Sides</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parking Generally Restricted on a Laneway</td>
<td></td>
</tr>
<tr>
<td>KEY STRATEGIC AREA: STRATEGIC PLAN VISION 2007-10</td>
<td>TRANSPORTATION MASTER PLAN CHARACTERISTICS</td>
<td>ROAD CLASSIFICATION SYSTEM</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-------------------------------------------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>CITY ARTERIAL</td>
<td>MAJOR COLLECTOR</td>
<td>MINOR COLLECTOR</td>
<td>LOCAL</td>
</tr>
<tr>
<td><strong>Land Service / Access</strong></td>
<td>Primary Function is People and Goods Movement with Access Controls</td>
<td>Primary Function is People and Goods Movement of Equal Importance</td>
<td>Property Access and People and Goods Movement of Equal Importance</td>
</tr>
<tr>
<td><strong>Transit Service</strong></td>
<td>Supports all Conventional &amp; Rapid Transit Service</td>
<td>Conventional Transit Allowed</td>
<td>Conventional Transit Allowed</td>
</tr>
<tr>
<td><strong>Pedestrian Facilities</strong></td>
<td>Sidewalks Both Sides</td>
<td>Sidewalks Both Sides</td>
<td>Sidewalks Both Sides</td>
</tr>
<tr>
<td><strong>Cyclists Facilities</strong></td>
<td>Dedicated On-Road Facilities and Off-Road Facilities Where Appropriate</td>
<td>Generally Dedicated On-Road Facilities and Off-Road Facilities Where Appropriate</td>
<td>Accommodate Safely Within Road Right-Of-Way</td>
</tr>
<tr>
<td><strong>Commercial Vehicle Access</strong></td>
<td>Generally Allowed – May Be Subject to Time Restrictions</td>
<td>Permitted in Employment Areas or as Specified in Truck Route Bylaw</td>
<td>Permitted in Employment Areas or as Specified in Truck Route Bylaw</td>
</tr>
<tr>
<td><strong>Max. Intersection Separation</strong></td>
<td>400 m</td>
<td>200 m</td>
<td>60 m</td>
</tr>
<tr>
<td><strong>Max. Intersection Pedestrian Crossing</strong></td>
<td>400 m</td>
<td>200 m</td>
<td>60 m</td>
</tr>
<tr>
<td><strong>Max. Driveway Spacing</strong></td>
<td>Generally Restricted</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Region’s guidelines for context-sensitive regional transportation corridors are compatible with the City’s road classification system based on the following equivalencies in Exhibit 5.4:

### Exhibit 5-4: City/Region Roadway Classification Equivalences

<table>
<thead>
<tr>
<th>City Classification</th>
<th>Equivalent to Region Classification</th>
<th>City Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Arterial</td>
<td>Urban Community Connector</td>
<td>Columbia Street \ University Avenue East</td>
</tr>
<tr>
<td>Major Collector</td>
<td>Urban Neighbourhood Connector (Avenue)</td>
<td>Albert Street \ Lincoln Road \ Keats Way</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>Urban Neighbourhood Connector (Main Street)</td>
<td>Regina Street \ Father David Bauer Drive</td>
</tr>
<tr>
<td>Local</td>
<td>Urban Residential Connector</td>
<td>Numerous examples</td>
</tr>
</tbody>
</table>

### 5.2 Existing Intersection Level-of-Service

The *Highway Capacity Manual* provides measurements of signalized intersection operation levels based on a qualitative measure of traffic flow at an intersection. The resulting intersection Level-of-Service (LOS) is dependent on vehicle delay and vehicle queue lengths at the approaches to a signalized intersection. It is calculated as the ratio between traffic volumes and approach capacities, and is described by the following LOS ratings. The objective in most small to medium-sized cities is to avoid LOS E/F:

- **A**= Free flow
- **B**=Reasonably free flow
- **C**=Stable flow
- **D**=Approaching unstable flow
- **E**=Unstable flow
- **F**=Forced or breakdown flow

More specifically, the conditions that exhibit these LOS ratings are:

<table>
<thead>
<tr>
<th>LOS</th>
<th>Description</th>
<th>V/C Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No Traffic signal phase is fully utilizes, with the intersection approach appearing open and turning movements made easily.</td>
<td>0 – 0.59</td>
</tr>
<tr>
<td>B</td>
<td>Occasional signal phase is fully utilized and many phases approach full use. Many drivers begin to feel somewhat restricted with platoons of vehicles approaching the intersection.</td>
<td>0.60 – 0.69</td>
</tr>
<tr>
<td>C</td>
<td>Operation is stable though with more frequent fully utilized signal phases, meaning some drivers may have to wait one red signal phase and longer queues develop behind turning vehicles. This condition is generally considered normal and acceptable in most urban intersection design.</td>
<td>0.70 – 0.79</td>
</tr>
</tbody>
</table>
Motorists experience restriction and instability of traffic flow, with delays to short delays to approaching vehicles in the peak periods. There is still enough signal cycles with lower demand to permit occasional clearance of developing queues to prevent excessive backups.

<table>
<thead>
<tr>
<th>LOSE</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Intersection capacity is reached. There are long queues upstream of the intersection, and delays to vehicles may extend to several signal cycles.</td>
<td>0.90 – 0.99</td>
</tr>
<tr>
<td>F</td>
<td>Saturation (gridlock) occurs, with vehicle demand exceeding the available capacity.</td>
<td>1.00 or greater</td>
</tr>
</tbody>
</table>

In June of 2008, turning movement and signal timing data was collected and analysed for 40 main signalized intersections, five main unsignalized intersections and two roundabouts in the City of Waterloo. These included major and minor nodes as identified in the City’s Nodes and Corridors Study, plus additional strategic major intersections. The intent of this exercise was to broadly identify overall traffic LOS across the whole city’s roadway network.

Using Synchro™ Version 6, the existing LOS at these intersections in the weekday AM Peak Hour and PM Peak Hour was calculated to identify any existing capacity or operational deficiencies at these key signalized intersections. The existing LOS results are presented on Exhibit 5.5 for the morning AM Peak Hour and Exhibit 5.6 for the PM Peak Hour.

The afternoon PM Peak Hour experiences the highest traffic volumes owing to more discretionary trips being made (work to home with shopping, recreation, social, etc). Exhibit 5.7 shows that today, intersection operation deficiencies in this busier PM Peak Hour are being experienced in the following nine intersection movements. Less critical intersections deficiencies today are also listed in the AM Peak Hour portion of Exhibit 5.7 for seven movements owing to a slight decrease (average 10-15%) in overall traffic volume in the morning due to less discretionary trip making:

**Exhibit 5.75 – Existing Weekday Deficient Level-Of-Service E/F**

**Afternoon PM Peak Hour (see Exhibit 5.6)**

<table>
<thead>
<tr>
<th>LOS</th>
<th>Movement</th>
<th>Intersection</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>EBLT</td>
<td>Northfield Drive @ Westmount Road</td>
</tr>
<tr>
<td>E</td>
<td>NBThro</td>
<td>Albert Street @ Columbia Street</td>
</tr>
<tr>
<td>E</td>
<td>EBThro</td>
<td>University Avenue @ King Street</td>
</tr>
<tr>
<td>E</td>
<td>EBThro</td>
<td>University Avenue @ Weber Street</td>
</tr>
<tr>
<td>F</td>
<td>NBLT</td>
<td>Marsland Drive @ Columbia Street</td>
</tr>
<tr>
<td>F</td>
<td>NBRT</td>
<td>Marsland Drive @ Columbia Street</td>
</tr>
<tr>
<td>E</td>
<td>WBLT</td>
<td>University Avenue @ Lincoln Road</td>
</tr>
<tr>
<td>E</td>
<td>NBLT</td>
<td>Weber Street @ King Street</td>
</tr>
<tr>
<td>E</td>
<td>WBLT</td>
<td>Northfield Drive @ King Street</td>
</tr>
</tbody>
</table>
Morning AM Peak Hour (see Exhibit 5.5)

<table>
<thead>
<tr>
<th>LOS</th>
<th>Movement</th>
<th>Intersection</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>EBThro</td>
<td>Columbia Street @ Fischer-Hallman Road</td>
</tr>
<tr>
<td>E</td>
<td>EBThro</td>
<td>University Avenue @ King Street</td>
</tr>
<tr>
<td>F</td>
<td>NBLT</td>
<td>Marsland Drive @ Columbia Street</td>
</tr>
<tr>
<td>F</td>
<td>NBRT</td>
<td>Marsland Drive @ Columbia Street</td>
</tr>
<tr>
<td>E</td>
<td>EBThro</td>
<td>Columbia Street @ Erbsville Road</td>
</tr>
<tr>
<td>E</td>
<td>EBLT</td>
<td>University Avenue @ Bridge Street</td>
</tr>
<tr>
<td>E</td>
<td>WBLT</td>
<td>Columbia Street @ Fischer-Hallman Road</td>
</tr>
</tbody>
</table>

During this network analysis of existing conditions, adjustments to signal timings were made within given boundaries in order to improve overall LOS for the intersections and/or improve LOS for individual legs within intersections. In most cases, the above-noted LOS deficiencies were reduced or eliminated entirely. These intersection capacity optimization measures that can be used to optimize intersection capacity today are:

- For intersections with Actuated Left Turn Arrows, minimum and maximum times can be given in the signal timing data provided by the Region. If the Left Turn Movement volume was low and LOS was acceptable, Protected Left Turn green time may be adjusted to minimum time or a level between the minimum and maximum. Other movements (NB, SB, EB, WB) may then be increased for intersection cycle time to remain the same as given.

- For intersections with Cross street or Side street vehicle phase callable and extendable, similar adjustments may be made when necessary. If the LOS is acceptable, the green time can be adjusted to a level between the maximum and minimum. The timings for the other intersection movements may then be increased for the intersection cycle time to remain the same as given.

- For intersections with Protected Left Turn Phases, Synchro can be set to allow Right Turn Movement at the same time as the Protected Left Turn Phase. For example, if the intersection had a NB Left Turn Protected Phase, EB Right Turn Movement may be allowed at the same time.
Exhibit 5-5: Existing Intersection Level-of-Service Weekday AM

Legend

- Overall LOS
- Critical Movements

'A-B'
'C-D'
'E'
'F'
Unsignalized
Roundabout
Exhibit 5-6: Existing Intersection Level-of-Service, Weekday PM

Legend

Overall LOS
‘A-B’
‘C-D’
‘E’
‘F’
Unsignalized
Roundabout

Critical Movements

B

Page 25
6. **ACTIVE TRANSPORTATION: CYCLING & TRAILS**

The City of Waterloo’s 2000 *Community Trails and Bikeways Master Plan Study and Implementation Plan* has been updated for integration into this new TMP. An inventory of existing bikeways and off-road trails in the City was conducted in the spring of 2008 and presented to the public for review and discussion at the three Public Information Centres (PICs) held as part of this master planning process (see Section 7: Public Engagement). Based on public input provided at these PICs, the cycling and trails mapping has been refined and finalized as the Active Transportation system for this TMP.

6.1 **Approach to Bikeway/Trails Planning**

The bikeway and trails network was developed through mapping and overlaying opportunities and constraints, examination of digital aerial photography and field assessment. The following factors were considered in planning the City’s bikeway and trails network, and shown on Exhibit 5.1:

- Existing Regional and City on-road bikeways and off-road multi-use trails;
- Planned bikeways and trails that have been approved in the 2000 master plan or other plans and studies;
- Origins and destinations that are important for residents and visitors to Waterloo to access;
- Physical barriers such as freeways, waterways and railways;
- Opportunities to retrofit on-road bike lanes on existing roadways and in road reconstruction projects, and bikeways and trails in new development areas; and
- Candidate routes based on ideas from the Project Team, Steering Committee, stakeholders and members of the public.

![Exhibit 6-1: Bikeway/Trails Planning Approach](image-url)
6.2 General Objectives and Goal of Active Transportation

General objectives that direct the City to focus on increasing cycling and walking as an Active Transportation Master Plan are as follows:

The City’s transportation system will:

- Be multi-modal, meaning that users have choice in the type of transportation within the City;
- Move away from a dependency on non-renewable energy;
- Encourage healthy lifestyles and environmental sustainability;
- Support a reduced demand for car use in favour of alternative modes of travel;
- Increase the capacity of the transportation system by increasing the opportunities for, and removing the disincentives to walking, cycling and transit; and
- Integrate the trail network as an integral part of the transportation system for utilitarian transportation, as well as recreational and leisure opportunity.

Therefore, the goal of the Active Transportation component of this TMP is to:

*Establish a cycling and trails network that connects people and places throughout Waterloo for people of varying experience via a network of convenient, safe, well-designed, efficient and comfortable on-road bikeways and multi-use trails.*

6.3 Network Planning Guiding Principles

Guiding principles aid in defining the general character of the cycling and trail network in the City of Waterloo. The principles guide the development of the network during the master plan study when candidate routes, links and corridors are identified, during design and implementation of sections of the network, and when changes to the network are being considered.

Principles for updating the Cycling and Trails Network based on the draft *Plan it! Waterloo Objectives* are as follows:

<table>
<thead>
<tr>
<th>Draft Plan it! Waterloo Objectives</th>
<th>Proposed Network Guiding Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Develop an urban form that provides for a high level of connectivity, facilitating the safe and efficient movement of people and goods between destinations within and around the community</td>
<td>• Connected and comprehensive—within and between neighbourhoods; throughout all areas of the City; to adjacent municipalities and external destinations; within, to and around Uptown; and to transit in neighbourhoods</td>
</tr>
<tr>
<td>• Ensure the provision and maintenance of the physical infrastructure needed to support the community, where infrastructure includes a connected, efficient, multi-modal system for the safe and efficient movement of people and goods</td>
<td>• Destination-oriented</td>
</tr>
<tr>
<td>• Movement within and between neighbourhoods should be safe, convenient and accessible to all by various means of travel</td>
<td>• Safe and well-designed</td>
</tr>
<tr>
<td></td>
<td>• Efficient and convenient</td>
</tr>
<tr>
<td></td>
<td>• Comfortable and accommodates</td>
</tr>
</tbody>
</table>
### Draft Plan it! Waterloo Objectives

<table>
<thead>
<tr>
<th>Proposed Network Guiding Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>various users</td>
</tr>
<tr>
<td>Encourage opportunities for appropriate multi-purpose uses on land used for utility corridors</td>
</tr>
<tr>
<td>Plan for a well-designed, comprehensive, safe and accessible trail system that is connected throughout the City and to adjacent municipalities</td>
</tr>
<tr>
<td>Ensure that movement within, to, and around Uptown accommodates all forms of movement and users of varying degrees of mobility</td>
</tr>
<tr>
<td>Plan for the safe and convenient movement of goods and people with varying degrees of mobility within and to/from Waterloo</td>
</tr>
<tr>
<td>The transportation system will support and encourage connectivity between various modes of transportation, enabling users to choose multiple modes for a single trip</td>
</tr>
<tr>
<td>The local neighbourhood transportation system will be safely and adequately connected to the higher-order network throughout the City</td>
</tr>
<tr>
<td>Waterloo will be accessible and well connected to external destinations in order to support the commuting labour force</td>
</tr>
<tr>
<td>Plan for a pedestrian and bicycle facility network that is safe, convenient, comfortable, and accessible to cyclists and pedestrians with varying degrees of mobility</td>
</tr>
<tr>
<td>The pedestrian and bicycle facility network will provide connectivity between all areas of the City and to adjacent municipalities</td>
</tr>
<tr>
<td>Neighbourhoods will be designed to facilitate transit and enable it to be well connected with other modes of travel, making it a desirable travel option</td>
</tr>
<tr>
<td>Plan for a road network with differentiated speeds and vehicular capacities to suit individual areas and include traffic calming design elements</td>
</tr>
<tr>
<td>With respect to arts, culture, heritage, recreation and leisure opportunities, plan for a comprehensive and connected trail system that is integral part of the transportation system as well as recreational and leisure opportunity</td>
</tr>
</tbody>
</table>

### 6.4 Policies, Practices and Programs

A bicycle-friendly and walkable city not only has a network of facilities for walking and cycling, but also has a set of policies that direct community and infrastructure planning and practices to:
• operate and maintain facilities and infrastructure; and

• programs that support residents and visitors cycling and walking.

Policies, practices and programs that support more cycling and walking based on the Plan it! Waterloo: Final Objectives are as follows:

<table>
<thead>
<tr>
<th>Draft Plan it! Waterloo Objectives</th>
<th>Proposed Policies, Practices and Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creating a bicycle-friendly and walkable community</strong></td>
<td></td>
</tr>
<tr>
<td>• Develop an urban form that provides for an appropriate mix of land uses in close proximity to one another, increasing the opportunity for people to live close to where they work, shop, learn and play</td>
<td>• Plan for bicycle-friendly and walkable communities</td>
</tr>
<tr>
<td>• Develop an urban form that provides for compact urban development to facilitate reduced reliance on the automobile while supporting opportunities for other forms of movement</td>
<td>• Create bicycle-friendly and walkable multi-family residential, commercial/retail, office, institutional, cultural/recreation, industrial and mixed-use sites</td>
</tr>
<tr>
<td>• Develop an urban form that reflects that accessibility considerations are part of City decisions respecting planning, growth, development and operations</td>
<td>• Support the provision of end-of-trip facilities within community plans and on development sites</td>
</tr>
<tr>
<td>• Promote sustainable design and development, where decisions on growth strike a balance between the needs of today’s population with the needs of future generations</td>
<td>• Implement a “complete streets” approach for roadway planning and design associated with community plans and development sites</td>
</tr>
<tr>
<td>• Ensure the provision and maintenance of the physical infrastructure needed to support the community, where infrastructure includes a connected, efficient, multi-modal system for the safe and efficient movement of people and goods</td>
<td>• Develop design guidelines to support the development of bicycle-friendly and walkable communities and development sites such as multi-use trails, accessible sidewalks and street crossings, and end-of-trip facilities</td>
</tr>
<tr>
<td>• Neighbourhoods should be planned and designed to provide for direct and convenient access to transit and to destinations such as commercial, institutional, recreational, cultural and employment uses</td>
<td></td>
</tr>
<tr>
<td>• Neighbourhoods should be planned and managed to place a priority on safe and convenient pedestrian movement and other alternatives to automobile dependency</td>
<td></td>
</tr>
<tr>
<td>• Plan for a well-designed, comprehensive, safe and accessible trail system that is connected throughout the City and to adjacent municipalities</td>
<td></td>
</tr>
<tr>
<td>• In the Uptown Area, plan for transit-supportive land uses while maintaining pedestrian-friendly scale in built form</td>
<td></td>
</tr>
<tr>
<td>• Ensure that movement within, to, and around Uptown accommodates all forms of movement and users of varying degrees of mobility</td>
<td></td>
</tr>
<tr>
<td>• In the Uptown Area, plan for appropriate, well-designed parking opportunities, balancing the desire</td>
<td></td>
</tr>
<tr>
<td><strong>Draft Plan it! Waterloo Objectives</strong></td>
<td><strong>Proposed Policies, Practices and Programs</strong></td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>for convenience with the desire to reduce reliance on the automobile</td>
<td></td>
</tr>
<tr>
<td>• Require urban design that emphasizes connectivity and interaction by enhancing connectivity between different land uses and destinations; placing a priority on pedestrians and other alternatives modes of travel, including transit; promoting safety and accessibility for all users; fostering built form and spaces that facilitate interaction and human scale of development</td>
<td></td>
</tr>
<tr>
<td>• Require urban design that encourages innovation and creativity by promoting sustainable design; creating interesting streetscapes</td>
<td></td>
</tr>
<tr>
<td>• The transportation system will be designed to facilitate the achievement of a compact mixed-use urban form and in particular, support intensification in nodes and corridors</td>
<td></td>
</tr>
<tr>
<td>• Beginning and end-of-route features will be integrated into the urban form</td>
<td></td>
</tr>
<tr>
<td>• Neighbourhoods will be designed to facilitate transit and enable it to be well connected with other modes of travel, making it a desirable travel option</td>
<td></td>
</tr>
<tr>
<td>• Plan for a road network with differentiated speeds and vehicular capacities to suit individual areas and include traffic calming design elements</td>
<td></td>
</tr>
<tr>
<td>• Plan for the provision of an appropriate amount of automobile and bicycle parking to accommodate the intended use</td>
<td></td>
</tr>
<tr>
<td>• Plan for automobile and bicycle parking areas that are attractive and well designed, including consideration of safe and convenient access for pedestrians</td>
<td></td>
</tr>
</tbody>
</table>
### Operating and Maintaining Cycling and Walking Infrastructure and Facilities

| Ensure the provision and maintenance of the physical infrastructure needed to support the community, where infrastructure includes a connected, efficient, multi-modal system for the safe and efficient movement of people and goods | Implement the trails and cycling network |
| Neighbourhoods should be planned and managed to place a priority on safe and convenient pedestrian movement and other alternatives to automobile dependency | Monitor, evaluate and update the trails and cycling network |
| Increase the capacity of the transportation system by increasing the opportunities for, and removing the disincentives to, walking, cycling and transit | Develop a sidewalk retrofit prioritization program |
| Beginning and end-of-route features will be integrated into the urban form | Implement neighbourhood pedestrian improvement plans |
| Plan for the provision of an appropriate amount of automobile and bicycle parking to accommodate the intended use | Consider sidewalk, trail and bikeway maintenance required in spring, summer, fall and winter and through construction zones |
| Plan for automobile and bicycle parking areas that are attractive and well designed, including consideration of safe and convenient access for pedestrians | Develop a signage program to integrate the trail and bikeway systems, and communicate their connectedness, convenience and efficiency |
| | Incorporate pedestrian and cyclists incident data into safety analyses |
| | Institute a report and response program or routine audit of the trails and bikeway system to address hazards and deficient design |
| | Routinely consider the needs of cyclists and pedestrians in neighbourhood traffic studies |
| | Routinely consider the needs of cyclists and pedestrians in all transportation projects, a "complete streets" approach, including lane width allocation in resurfacing projects, and reconstruction and new construction projects |
| | Integrate the collection of data regarding cycling and walking into programs to gain an understanding of demand, capacity and opportunities |
| | Support the provision of end-of-trip facilities at existing developments |
| | Develop design guidelines to support the development of well-designed and located end-of-trip facilities |
Supporting residents and visitors in cycling and walking

<table>
<thead>
<tr>
<th>Supporting residents and visitors in cycling and walking</th>
<th>Supporting residents and visitors in cycling and walking</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Promote awareness of trail location and educate users as to the functions they are intended to fulfill</td>
<td>• Support updating and distributing cycling and trail maps</td>
</tr>
<tr>
<td>• Increase the capacity of the transportation system by increasing the opportunities for, and removing the disincentives to, walking, cycling and transit</td>
<td>• Develop an informational portal on walking and cycling in the City</td>
</tr>
<tr>
<td>• Promote awareness of arts, culture, heritage, recreation and leisure facilities through communication, marketing and education initiatives</td>
<td>• Develop employee benefits for those who walk or bicycle to or for work</td>
</tr>
<tr>
<td>• Support lifelong learning</td>
<td>• Support TDM (Transportation Demand Management) programs</td>
</tr>
<tr>
<td></td>
<td>• Support enforcement, safety and education campaigns on walking and cycling</td>
</tr>
<tr>
<td></td>
<td>• Support cycling and walking skill development for school children, youth, adults and seniors</td>
</tr>
</tbody>
</table>

6.5 Supporting Active Transportation

A cornerstone of the Transportation Master Plan is the proposed Complete Streets Policy described in Section 11 to plan, design, operate and maintain streets to enable all users of all ages and abilities – pedestrians, cyclists, transit riders and motorists – to safely move along and across City streets. A Complete Streets policy is complemented by and integrates with the concept of a network of Linked Greenways or Open Space Corridors that focus on the development of trails in corridors other than those defined by streets. Such a network of trails primarily used by humans for non-motorized travel provides a variety of environmental, social and economic benefits, similar to street networks that also accommodate Active Transportation. As a result, Active Transportation becomes an integral part of the municipal transportation system.

6.5.1 RECREATION AND LEISURE SERVICES MASTER PLAN RECOMMENDATIONS

The Recreation and Leisure Services Master Plan indicates that trends in leisure and recreation opportunities support increased investments in trails. Trails provide opportunities that are low cost, can be available at all times of the day and year if maintained year-round, provide opportunities for various skill levels and support diverse users in non-programmed activities. Trails also support active transportation options between home, school, work and recreation destinations and healthier communities where children, families and individuals have opportunities to improve their fitness and physical well-being.

Specific recommendations approved by Council on November 17, 2008 with respect to investments in and expansion of the Community Trail System include:

• Continue to expand the trail system through Plan of Subdivision approvals and community planning processes in green field developments within the City;

• Integrate trails and access roads around stormwater management facilities into the Community Trails System;

• Investigate opportunities to create a minimum of two safe dedicated Community Trail linkages across the Conestoga Parkway from central Waterloo to the east;
• Expand the trail signage program, providing consistent directional supports, such as on street crossing names, to various connected venues across the City, at trail heads and other locations;

• Create trail map kiosks at strategic locations to provide directions for trail users;

• Improve trail use safety at busy intersections, and offer suitable alternatives where trails end at major roads; and

• Investigate the enhanced winter maintenance of trails to support year-round use and to facilitate trail use twenty-four hours per day where feasible and with community support;

The recommendations include sustaining current annual capital investments in the development of the Community Trails System based on a Recreation and Leisure Service Master Plan and its regular updating focusing on the following priorities:

• Trail extension into new areas;

• Overcoming trail linkage gaps and safety challenges;

• Replacing existing trails where appropriate and upgrading surfaces to facilitate accessibility and multiple uses; and

• Preparing, updating and distributing Community Trail and Bicycle Route Maps both electronically and via printed materials.

6.5.2 LINKED GREENWAYS CONCEPT

In terms of latent demand, if there are no safe, direct ways to make a non-motorized trip, the creation of a corridor for active transportation may induce some people to shift modes. In the case of trails, however, the attendant impacts of the new facilities and their use are both public and private and are more positive in nature than the same trip made by motor vehicle. Trails have the ability to attract people out of their cars for trip-making because such trails can often provide a very direct route, a pleasant travel experience, a way to get exercise while making a trip, allow social exchanges, and personal cost savings.

As is true of other transportation systems, both the extent and coverage of a trail system as opposed to a single trail route are important. Certain synergies emerge as a system grows from one route to two or many interconnected routes, increasing the connectivity between a growing number of origins and destinations. Therefore the development of trails as linked greenways within parkland, natural areas, woodlands, river and creek corridors, stormwater management facilities, utility corridors, transit and rail corridors, etc. results in an interconnected trail system that can have a significant impact on the City of Waterloo’s non-motorized transportation system in addition to the benefits of greenway corridor protection and enhancement.

The trail system for active transportation users is further enhanced when consideration is given to how the trail system connects with sidewalks, on-road bikeways and transit systems. Integrating the concept of Linked Greenways and Complete Streets in a meaningful way with attention to the functionality and quality of the travel experience will significantly affect induced travel demand and system extent and coverage for active transportation.

Principles and policies that further support Linked Greenways including corridor protection and enhancement can be explored through updates to the Recreation and Leisure Service Master Plan.
7. **PUBLIC ENGAGEMENT**

The following mandatory public consultation was conducted as part of the TMP development, in response to the master planning requirements of the Municipal Class EA Process, along with a number of optional “outreach” contacts with local groups with interests in transportation.

**Mandatory Consultation:**

1. Notice of Study Commencement, April, 2008
2. Public Information Centre #1, June 19, 2008 (summary report in Appendix A)
3. Public Information Centre #2, December 3, 2008 (summary report in Appendix A)

**Optional Outreach Consultation:**

1. Website Initiated, March, 2008
2. Transportation & Trails Advisory Committee, June 25, 2008, April 28, 2010 and February 8, 2011
4. Mayor and Councillor interviews, November 10, 12, 21 2008
5. City Staff Lunch & Learn sessions, November 20, 21 2008
6. Emergency Response Providers meeting, January 12, 2009
7. Laurelwood Neighbourhood Association, January 14, 2009
8. Region of Waterloo TDM meeting, January 14, 2009
10. Posters in U of Waterloo and Wilfrid Laurier University, April 2009
11. Uptown Visioning Committee, June 12, 2009
12. Waterloo Citizens Environmental Advisory Committee meeting, September 9, 2008
13. Stakeholders Workshop, September 30, 2009 (notes in Appendix A)
14. Economic Development Advisory Committee meeting
15. City of Waterloo Corporate Management Team, November 20, 2009 and March 30, 2011

This public engagement has provided mainly focused responses on subjects such as active transportation and the future of public transit in the City, including rapid transit. This input has been valuable in confirming some of the City’s transportation issues and expectations, especially from the stakeholders and City advisory committees who have provided input.

More generalized contacts with the public were provided through the study notices, Public Information Centre advertisements and a project poster, shown in Exhibit 7-1, that was displayed at City of Waterloo venues, the University of Waterloo and Wilfrid Laurier University. The level of response to this general project information was limited, with most public input being generated on more specific transportation issues such as cycling, trails and public transit.
Exhibit 7-1: General Public Information Poster

OBJECTIVE - Develop a coordinated and integrated transportation system that provides realistic alternative travel options to the auto to create a City that is truly accessible to all.

For more information, visit www.waterloo.on.ca

If you have ideas or suggestions on how to achieve this Transportation Objective for the City of Waterloo, please contact chodgson@city.waterloo.on.ca or Chris Hodgson at 519-886-2310 x 304

7.1 Public Information Centre #1

This informal drop-in Public Information Centre held on June 19, 2008 provided the public with an introduction to the TMP project. Information presented to the public included general transportation conditions for motorists, transit users, cyclists and pedestrians throughout the City, and alternative strategies to manage the City’s existing and future transportation challenges that are becoming increasingly important to all residents, including:

- Rising cost of gas;
- Growing concerns about travel delays, traffic congestion and public safety;
- The ability of transportation to support the City’s economic growth and vitality;
- Demands placed on the transportation system by City and Region growth; and
- The impacts of all of this on our air quality, neighbourhoods and natural areas.

Information on alternative ways that the City can address these and other transportation challenges was also provided. These strategic directions included:
7.2 Public Information Centre #2

Eleven residents attend this second PIC Held on December 3, 2008 after being advertised in the Waterloo Region Record and Waterloo Chronicle newspapers, and on the project web site. Invitations were also mailed to 53 agencies, 35 stakeholder groups and 42 members of the public who registered for project information. The following information was presented (see Appendix A), and five public responses were received mostly addressing specific locational traffic and pedestrian issues.

| 2. Bike Friendly Community             | 7. Current Levels of Walking and Cycling in the City of Waterloo |
| 3. Walkable Community                  | 8. Proposed Complete Streets Policy           |
| 4. Consultation Subjects Discussed to Date | 9. Traffic Calming Update                  |

7.3 Stakeholder Workshop

A special workshop was held on September 30, 2009 to discuss the following transportation master planning themes and questions amongst groups of local stakeholders. These participants ranged from staff of the City of Waterloo, City of Kitchener and Region of Waterloo through the City’s Transportation and Trails Advisory Committee members, representatives from other city advisory committees and members of transportation-related stakeholder groups. Their input on the following themes and questions is summarized in Appendix A.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievability</td>
<td>1. How will the public respond to new transportation challenges and policies in the City of Waterloo? For example:</td>
</tr>
<tr>
<td></td>
<td>• Will Complete Streets Work in Waterloo?</td>
</tr>
<tr>
<td></td>
<td>• Will Transportation Demand Management Work in Waterloo?</td>
</tr>
<tr>
<td></td>
<td>• More Traffic Calming – Residents vs. Public?</td>
</tr>
<tr>
<td></td>
<td>• More Bike Lanes &amp; Trails – Cost?</td>
</tr>
<tr>
<td></td>
<td>• Will there be Public Support?</td>
</tr>
<tr>
<td>Implementation</td>
<td>2. How should the City implement the Plan? What advice would you give City Council on:</td>
</tr>
</tbody>
</table>
Change

3. Prioritize long term transportation issues in the City of Waterloo. What is most important and why? What is least important and why?

i.e. Rapid Transit
i.e. Land Use Intensification
i.e. Changing Travel Behaviour (how, when, where)

7.4 Public Information Centre #3

Twenty two individuals signed the attendance register at this May 27, 2010. Display panels were organized in a manner which effectively presented information on the Waterloo TMP, and two presentations were made on particular aspects of the Plan. Comment forms were made available and members of the public were encouraged submit completed forms to the project team as included in Appendix A. Comments were incorporated into the project record where specific concerns were addressed by the project team. The following PIC exhibits are provided in Appendix A:

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. TMP and Other Plans</td>
<td>8. Complete Streets</td>
</tr>
<tr>
<td>3. Types of Streets</td>
<td>9. Recommended Bikeway and Trails Network</td>
</tr>
<tr>
<td>4. Existing Traffic Conditions</td>
<td>10. Region of Waterloo Light Rail Transit Proposal</td>
</tr>
<tr>
<td>5. Future Needs to 2031</td>
<td>11. Strategic Transportation Policy Directions</td>
</tr>
<tr>
<td>6. Future Road / Transit Improvements</td>
<td>12. Next Steps</td>
</tr>
</tbody>
</table>

7.5 Project Website

A project web site was maintained by the City of Waterloo from project inception through to completion. Web site contents include PIC notices and presentations, reports to Council and other project information for public use.

In general, the public and stakeholder response to the TMP project has been very positive to the shift towards a more sustainable approach to transportation planning and the emphasis on active transportation. Some of the outcomes of the consultation process clearly show a desire for:

- An integrated network that allows people to walk, cycle and take transit;
- Ensuring walking and cycling routes connect to other routes in the network;
- Reduced traffic congestion on some key roadways and intersections in the City; and
7.6 Consultation Messages

Those members of the public, stakeholders and agency representative who provided input into the development of this TMP through the PCCs, the stakeholder workshop, the project web site or by contacting Project Team representatives offered the following main messages for master transportation planning in the City of Waterloo:

- Make public transit a more viable alternative for more people;
- Remove the limitations to cycling throughout the City;
- Provide a quicker response to specific transportation issues and needs in the City;
- Provide a comprehensive transportation system plan for the West Side development area;
- Address the availability of funding to implement the TMP;
- Manage the negative and positive impacts of peak period traffic congestion;
- Recognize the impacts of traffic congestion on neighbourhoods and the environment;
- Financing increased Uptown Waterloo parking supply;
- Plan for and address the impacts of Rapid Transit in the City;
- Find ways to reduce motorist speeds in the City;
- Find ways to maximize the people carrying capacity of the City’s roadway network without road widening;
- Preserve major arterial road corridors for the efficient movement of vehicles;
- Integrate public transit into subdivision planning and urban design; and
- Incorporate transportation demand management incentives into the development application and approval process.
8. FUTURE TRANSPORTATION CHALLENGES AND OPPORTUNITIES

One important component of a TMP is to clearly define the challenges and opportunities facing the city in the provision of transportation infrastructure and services. When combined with the vision and objectives established for the TMP, the result should be a clear description of the direction the community wants to move towards in its future transportation planning and associated implementation decision-making.

8.1 Roadway Network Level-of-Service

The planning capacity of the City’s existing roadway network is one of the factors used in the travel demand forecasting model developed by the Region for their RTMP update, and modified for use in the City’s TMP. Road capacity has been addressed at both the macro city network level as reported in Section 8.3 of this TMP, and at specific strategic intersections in Section 10.2.

The macro road network capacities used in the Region’s model are provided below in Exhibit 8.1, measured as vehicles per lane per hour, are as follows. The model does not measure people movement, just vehicle movement but average vehicle occupancy and transit, cycling and walking mode shares can be used to roughly estimate people movement, although this is not recommended for macro-level master planning purposes:

<table>
<thead>
<tr>
<th>Road Classification in Model</th>
<th>Vehicles/Lane/Hour</th>
<th>City Road Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Arterial</td>
<td>900</td>
<td>City Arterial</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>750</td>
<td>Major Collector</td>
</tr>
<tr>
<td>Major Collector</td>
<td>650</td>
<td>Minor Collector</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>550</td>
<td>Local</td>
</tr>
<tr>
<td>Local</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: It is important to note that although the measurement of roadway capacity is a central concept in roadway design and traffic control, the estimation of roadway planning capacities is not considered a exact science because it is often difficult to define the capacity of a road in an unambiguous manner. Although established planning capacities such as those used in the Region to Waterloo are based on studies of road section operations, these capacities are also influenced by related factors including transit headways\textsuperscript{1}, intersections and driveways, abutting land use and traffic volumes, speed and density. For example, the 900 vehicles/lane/hour of a major arterial road in a built up and urbanized part of a city may potentially grow to twice that amount if located in an undeveloped fringe location with few intersecting street and little land use to generate traffic. Furthermore, in some North American cities, major arterial roads are operating well with up to 1,500 vehicles/lane/hour (of an Average Annual Daily Traffic or AADT of 30,000 vehicles).

With this in mind, the Region’s calibration of the forecasting model to 2006 AM conditions, and modified by IBI Group for use in the City’s TMP, confirms existing (2006) roadway capacity deficiencies measured as volume/capacity (v/c) ratios. This showed that based on the existing roadway capacity, traffic volumes, mode splits and distribution of population and employment growth used in the Regional model, the only roadway corridor in the City of Waterloo that currently

\textsuperscript{1} Headway is a measurement of the distance/time between vehicles in a transit system
operate with deficient capacity in the AM Peak Hour is the east-west corridor crossing the rail corridor (Screenline #10) on Erb Street, William Street and Union Street.

Similar to the Level-of-Service (LOS) measurement used for intersections previously described in Section 5.2, roadway network LOS is a recognized way of quantifying the way roadways operate in terms of the efficiency of traffic flow. At its most basic level, roadway LOS is based on the number of vehicles traveling on the road (Volume) compared to the estimated capacity of the road (Capacity) as listed above. Roadway LOS uses the following roadway LOS measurement system shown in Exhibit 8.2. In most small cities such as the City of Waterloo, the practice is to monitor, plan and implement roadway capacity improvements so that LOS does not exceed D/E because LOS F represents severe congestion or gridlock.

### Exhibit 8-2: Roadway LOS Descriptions

<table>
<thead>
<tr>
<th>V/C Ratio</th>
<th>Roadway LOS Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.8</td>
<td><strong>(A) Free Flow Traffic.</strong> Individual users are practically unaffected by the presence of other vehicles on a road section. The choice of speed and the manoeuvrability are free. The level of comfort is excellent, as the driver needs minimal attention.</td>
</tr>
<tr>
<td>&lt; 0.8</td>
<td><strong>(B) Steady Traffic.</strong> The presence of other vehicles on the section begins to affect the behaviour of individual drivers. The choice of the speed is free, but the manoeuvrability has somewhat decreased. The comfort is excellent, as the driver simply needs to keep an eye on nearby vehicles.</td>
</tr>
<tr>
<td>&lt; 0.8</td>
<td><strong>(C) Steady Traffic but Limited.</strong> The presence of other vehicles affects drivers. The choice of the speed is affected and manoeuvring requires vigilance. The level of comfort decreases quickly at this level, because the driver has a growing impression of being caught between other vehicles.</td>
</tr>
<tr>
<td>0.8 – 0.9</td>
<td><strong>(D) Steady Traffic at High Density.</strong> The speed and the manoeuvrability are severely reduced. Low level of comfort for the driver, as he must constantly avoid collisions with other vehicles. A slight increase of the traffic risks causing some operational problems and saturating the network.</td>
</tr>
<tr>
<td>0.9 - 1.0</td>
<td><strong>(E) Traffic at Saturation.</strong> Low but uniform speed. Manoeuvrability is possible only under constraint for another vehicle. The user is frustrated.</td>
</tr>
<tr>
<td>&gt; 1.0</td>
<td><strong>(F) Congestion.</strong> Unstable speed with the formation of waiting lines at several points. Cycles of stop and departure with no apparent logic because created by the behaviour of drivers. High level of vigilance is required for the user with practically no comfort.</td>
</tr>
</tbody>
</table>

### 8.2 The Region of Waterloo Travel Demand Forecasting Model

The Region’s travel demand forecasting model is a 4-phase TransCAD model intended to forecast trip-making by mode and trip purpose across screenlines located at strategic locations in the Region’s transportation network. It is a “macro” model intended for use in region-wide master planning, meaning it is not designed or intended to forecast traffic volumes and operations along specific routes or at specific intersections. That can be done by using the macro trip-making forecasts from roads crossing the screenlines and applying this data to specific routes or intersections of interest using a “micro” intersection operations model such as Synchro/Sim-Traffic or VISSM.
In general, the Regional Model inputs consist of:

- land use data allocated according to a set of traffic zones; and
- network data that describe all the physical characteristics of the road links and transit routes that connect these zones.

The model outputs include estimates of travel volumes and travel times for:

- all origin/destination pairs by mode; and
- each link on the road and transit network.

The Regional Model is comprised of three main components:

1. a traffic zone system and associated land use data;
2. a base network (auto and transit); and
3. a four-stage transportation modelling procedure

The 4-phase modeling process is listed below from the Waterloo Regional Transportation Model Users Manual, October 2005, Tsi Consultants.

- **Trip Production and Attraction**: estimate the number of person trips in each traffic zone for each trip purpose, based upon the population and employment demographics;
- **Trip Distribution**: estimate the trip interchanges, of the number of person trips between zones, based upon trip impedance;
- **Mode Split**: estimates the mode of choice for a trip for each origin/destination pair (e.g. walk/bike, transit or auto); and
- **Traffic and Transit Assignment**: based upon the final trip matrices from the mode split stage, this step estimates route choice on the road and transit networks.

### 8.3 Travel Demand Forecasting

The Regional Model traffic zone system is comprised of 597 traffic zones (576 internal zones and 21 external zones) across the entire Region. Each zone contains detailed demographics, which are used to determine the amount of travel generated. The traffic zones are represented in the model by a centroid node, which loads trips onto the network. Zones vary in size according to population and employment densities, and attempt to adhere to census tracts and municipal boundaries.

As high-density areas produce and attract more trips, it is important to have smaller zones so that the loading of trips onto the network is uniform. The external zones represent entry points to the region. Inbound and outbound vehicle counts are stored in the model for the external locations.

The traffic zones in the Model that cover the City of Waterloo are shown on Exhibit 8.3, where each has been loaded by the Region with population and employment data for 2006, 2016 and 2031. A complex trip matrix is then created by the model based on trip generation and assignment for all 597 traffic zones.
Forecasting future travel demands in the two Regional model planning horizons with a medium term 2016 and long term 2031 horizon is based first on the amount and distribution of population and employment growth assigned to the traffic zones. As shown on Exhibit 8.4, population growth is focused on the west side of the City with some 8,000 new residents by 2031. Additional population growth is forecast in the NW quadrant, the NE quadrant (Rural East Development) and in the uptown.

Employment growth is expected mainly in the University of Waterloo area between University Avenue and Bearinger Road, and in the northeast business park area of the City as shown on Exhibit 8.5, as well as in the Conestoga Parkway/Northfield Drive business area.
Exhibit 8-4: Population Growth Distribution 2031

Exhibit 8-5: Employment Growth Distribution
The Model calculates the Level-of-Service forecast on major roadways crossing six screenlines in the City by comparing the forecasted volume of vehicular traffic in the AM Peak Hour on each major road with the planning capacity of the road (see Exhibit 8.1). The resulting V/C Ratio is then assigned one of six LOS ratings as follows, with LOS A being best and LOS F being the worst condition as summarized in Exhibit 8.2.

Forecasting of future roadway network deficiencies requires that travel demand and system performance be understood at strategic locations around the City. One way to do this is through the use of screenlines, which are imaginary lines drawn across major transportation facilities in a corridor. Screenlines typically follow a natural barrier to travel, such as a river or freeway, that has limited crossing opportunities. Many screenlines are significant barriers to walking and cycling, and are not very useful tools for examining travel by these modes. As a result, screenline crossing measurements and forecasts are typically for motorized vehicle travel. Since most urban travel is by motorized vehicles, screenline crossing measurements are very helpful to understand existing and future travel patterns at a strategic level.

The V/C Ratios forecast on the City of Waterloo roadway network in 2016 and 2031 are listed on Exhibit 8.6, showing potential traffic capacity deficiencies (LOS E/F) on the following arterial road sections across screenlines by 2031 in the AM peak period:

**Across Screenline 9A: West of Highway 85**
- Bridgeport Rd. Max LOS 1.0

**Across Screenline 10: West of Rail Corridor**
- Erb St. Max LOS 1.02
- William St. Max LOS 1.03
- Union St. Max LOS 1.33

**Across Screenline 13: South of University Ave.**
- Weber St. Max LOS 1.06
- Lincoln Rd. Max LOS 1.08

**Across Screenline 21: West of Fischer-Hallman Rd. N**
- Laurelwood Dr. 1.14

**Across Screenline 22: South of Northfield Dr. W and Conservation Dr.**
- Parkside Dr. 1.03
- King St. 1.14

**Across Screenline 23: West of Bridge St.**
- University Ave. 1.17
### Exhibit 8-6: V/C Ratios Across City of Waterloo Screenlines

<table>
<thead>
<tr>
<th>Screenline ID</th>
<th>Description</th>
<th>Road</th>
<th>2006 V/C Ratios (AM Peak)</th>
<th>2016 V/C Ratios (AM Peak)</th>
<th>2031 V/C Ratios (AM Peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9A</td>
<td>West of Highway 85</td>
<td>Northfield Dr. WO Hwy. 85</td>
<td>0.67 0.39 0.67</td>
<td>0.86 0.60 0.86</td>
<td>0.97 0.76 0.97</td>
</tr>
<tr>
<td></td>
<td></td>
<td>King St. WO Hwy. 85</td>
<td>0.71 0.69 0.71</td>
<td>0.69 0.74 0.74</td>
<td>0.76 0.77 0.77</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Columbia St. E. WO Hwy. 85</td>
<td>0.10 0.53 0.53</td>
<td>0.16 0.62 0.62</td>
<td>0.17 0.58 0.58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Ave. WO Hwy. 85</td>
<td>0.41 0.61 0.61</td>
<td>0.44 0.62 0.62</td>
<td>0.48 0.65 0.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bridgeport Rd. WO Hwy. 85</td>
<td>0.53 0.71 0.71</td>
<td>0.62 0.92 0.92</td>
<td>0.62 1.00 1.00</td>
</tr>
<tr>
<td>10</td>
<td>North of CN Rail and West of Rail Corridor</td>
<td>Weber St. N/S CN Rail</td>
<td>0.29 0.23 0.29</td>
<td>0.31 0.41 0.41</td>
<td>0.28 0.60 0.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bearinger St. N/S CN Rail</td>
<td>0.77 0.12 0.77</td>
<td>1.03 0.36 1.03</td>
<td>0.94 0.54 0.94</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Columbus St. N/S CN Rail</td>
<td>0.41 0.49 0.49</td>
<td>0.45 0.61 0.61</td>
<td>0.42 0.65 0.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Erb St. N/S CN Rail</td>
<td>1.34 0.41 1.34</td>
<td>0.98 0.60 0.98</td>
<td>1.02 0.73 1.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>William St. N/S CN Rail</td>
<td>1.14 0.55 1.14</td>
<td>1.00 0.27 1.00</td>
<td>1.03 0.34 1.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>John St. N/S CN Rail</td>
<td>0.86 0.16 0.86</td>
<td>0.62 0.17 0.62</td>
<td>0.65 0.18 0.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Union St. N/S CN Rail</td>
<td>1.03 0.67 1.03</td>
<td>1.27 0.51 1.27</td>
<td>1.33 0.49 1.33</td>
</tr>
<tr>
<td>13</td>
<td>South of University Ave.</td>
<td>Westmount Rd. SO University Ave.</td>
<td>0.71 0.43 0.71</td>
<td>0.78 0.54 0.78</td>
<td>0.93 0.56 0.93</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Albert St. SO University Ave.</td>
<td>0.67 0.70 0.70</td>
<td>0.68 0.84 0.84</td>
<td>0.72 0.81 0.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>King St. SO University Ave.</td>
<td>0.38 0.48 0.48</td>
<td>0.47 0.39 0.47</td>
<td>0.63 0.39 0.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regina St. SO University Ave.</td>
<td>0.11 0.53 0.53</td>
<td>0.32 0.50 0.50</td>
<td>0.42 0.53 0.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weber St. SO University Ave.</td>
<td>0.64 0.50 0.64</td>
<td>0.98 0.54 0.98</td>
<td>1.06 0.57 1.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lincoln Rd. SO University Ave.</td>
<td>0.90 0.81 0.90</td>
<td>0.99 0.78 0.99</td>
<td>1.08 0.79 1.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Highway 85 SO University Ave.</td>
<td>0.68 0.57 0.68</td>
<td>0.75 0.51 0.75</td>
<td>0.88 0.57 0.88</td>
</tr>
<tr>
<td>NEW: 21</td>
<td>West of Fischer-Hallman Rd N</td>
<td>Laurelwood Dr</td>
<td>0.86 0.48 0.86</td>
<td>1.10 0.55 1.10</td>
<td>1.14 0.60 1.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Columbia St</td>
<td>0.83 0.34 0.83</td>
<td>0.78 0.20 0.78</td>
<td>0.86 0.19 0.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Keats Way</td>
<td>0.31 0.14 0.31</td>
<td>0.44 0.12 0.44</td>
<td>0.73 0.40 0.73</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Erb St</td>
<td>0.80 0.33 0.80</td>
<td>0.92 0.28 0.92</td>
<td>0.94 0.30 0.94</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Ave W</td>
<td>0.29 0.11 0.29</td>
<td>0.40 0.21 0.40</td>
<td>0.38 0.19 0.38</td>
</tr>
<tr>
<td>22</td>
<td>South of Northfield Dr W &amp; Conservation Dr</td>
<td>Erbsville Rd</td>
<td>0.09 0.13 0.13</td>
<td>0.26 0.23 0.26</td>
<td>0.25 0.42 0.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beaver Creek Rd</td>
<td>0.08 0.02 0.08</td>
<td>0.26 0.16 0.26</td>
<td>0.53 0.32 0.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Westmount Rd N</td>
<td>0.26 0.24 0.26</td>
<td>0.50 0.27 0.50</td>
<td>0.69 0.31 0.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weber St</td>
<td>0.13 0.25 0.25</td>
<td>0.23 0.33 0.33</td>
<td>0.45 0.45 0.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parkside Dr</td>
<td>0.49 0.76 0.76</td>
<td>0.60 0.89 0.89</td>
<td>0.53 1.03 1.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kitchener - Waterloo Expressway</td>
<td>0.58 0.62 0.62</td>
<td>0.60 0.64 0.64</td>
<td>0.62 0.75 0.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>King St N</td>
<td>0.40 0.40 0.40</td>
<td>1.04 0.73 1.04</td>
<td>1.14 0.85 1.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Davenport Rd</td>
<td>0.07 0.02 0.07</td>
<td>0.23 0.07 0.23</td>
<td>0.31 0.14 0.31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bridge St</td>
<td>0.48 0.24 0.48</td>
<td>0.74 0.19 0.74</td>
<td>0.86 0.26 0.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Ave</td>
<td>0.28 0.01 0.28</td>
<td>0.10 0.12 0.12</td>
<td>0.10 0.17 0.17</td>
</tr>
<tr>
<td>23</td>
<td>West of Bridge St</td>
<td>Northfield Dr</td>
<td>0.45 0.72 0.72</td>
<td>0.87 1.01 1.01</td>
<td>0.63 0.78 0.78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lexington Rd</td>
<td>0.34 0.75 0.75</td>
<td>0.44 0.96 0.96</td>
<td>0.42 0.93 0.93</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Ave</td>
<td>0.61 1.12 1.12</td>
<td>0.86 1.27 1.27</td>
<td>0.81 1.17 1.17</td>
</tr>
</tbody>
</table>
Transportation planning strategies described in Section 9 of this TMP include the City of Waterloo not attempting to “build itself out” of growing roadway network deficiencies. In most cases the deficiencies are forecast on Regional Road, meaning it will be Regional transportation planning and decision-making that will decide how to address such deficiencies. For City of Waterloo roads, the City can first focus on the strategic identification of capacity enhancement techniques at strategic locations that will optimize the road network capacity while also encouraging changes in travel behaviour through Transportation Demand Management (TDM). This requires that traffic growth must be monitored on the above-noted critical screenline roads to ensure that appropriate actions are taken when required to ensure adequate LOS. These actions may include capacity optimization and enhancement, traffic operations management and/or TDM to address growing travel demands and associated network capacity and operational deficiencies.

These results of the travel demand forecasting are based only on the relationship between existing roadway capacity measured by the number of travel lanes, and roadway traffic volume forecast in 2016 and 2031. This volume/capacity or V/C ratio is equated to link Level-of-Service (LOS) to identify potential roadway link deficiencies. The V/C methodology measures vehicle travel only, and does not directly include the role of walking, cycling and transit use in generating roadway traffic. This is done in the Region’s forecasting model by incorporating mode shares and average vehicle occupancy in forecasting the 2016 and 2031 traffic volumes. The mode shares in the Model for the City of Waterloo are shown on Exhibit 8.7.

### Exhibit 8-7: Regional Model Mode Shares

<table>
<thead>
<tr>
<th>AM Peak Hour - Trips Within City of Waterloo</th>
<th>Year 2016</th>
<th>2031</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Trips</td>
<td>Mode Share</td>
<td>Number of Trips</td>
</tr>
<tr>
<td>Auto Driver</td>
<td>47,223</td>
<td>67.6%</td>
</tr>
<tr>
<td>Auto Passenger</td>
<td>10,564</td>
<td>15.1%</td>
</tr>
<tr>
<td>Transit</td>
<td>2,998</td>
<td>4.3%</td>
</tr>
<tr>
<td>Bike</td>
<td>1,266</td>
<td>1.8%</td>
</tr>
<tr>
<td>Walk</td>
<td>7,786</td>
<td>11.1%</td>
</tr>
<tr>
<td>Total Internal Trips</td>
<td>69,837</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

The following table in Exhibit 8.8 and map on Exhibit 8.9 provides a summary of the results show the number of additional travel lanes that have been forecast across the City’s road network screenlines to move people and goods efficiently by 2031:

### Exhibit 8-8: Additional Travel Lane Forecast 2031

<table>
<thead>
<tr>
<th>Model Screenline</th>
<th>Description</th>
<th>Capacity Enhancement</th>
</tr>
</thead>
<tbody>
<tr>
<td>9A</td>
<td>West of Highway 85</td>
<td>1 additional lane crossing screenline per direction</td>
</tr>
<tr>
<td>13</td>
<td>South of University Ave.</td>
<td>2 additional lanes required per direction crossing screenline serving</td>
</tr>
</tbody>
</table>
The additional two lanes per direction across the University Avenue screenline is a result of growth plans at the University of Waterloo and in the Northwest Campus. The transportation planning strategy recommended for the City of Waterloo in Section 9 of this TMP, and the strategic roadway capacity enhancements recommended in Section 10 are intended to address roadway capacity deficiencies in the City that will impact all users of roadways. Those actions that require significant construction will be the subject of further project-specific Environmental Assessments to confirm designs, impacts and mitigation measures where required. Alternatives, the City and Region can decide to apply capacity management measures where feasible.

8.4 Challenges Forecast

The City of Waterloo, in association with the Region, will need to address the following transportation challenges and associated impacts of any transportation system capacity or
operational deficiencies that evolve over the next 20 years as a result of growing traffic volumes and limited system capacity:

1. Consumption and purchase of land for transportation infrastructure;
2. Impact of traffic growth and condition (i.e. congestion) on City air quality;
3. Impact of transportation on personal transportation affordability (i.e. distances travelled, fuel consumption);
4. Impacts of transportation on public health and wellness (i.e. physical activity);
5. Degree of transportation mode choice in Waterloo;
6. Changes in transportation operations and related public safety (i.e. intersection pedestrian safety, frustration caused by congestion-related travel delay);
7. Ability to contribute to Uptown Waterloo vitality by attracting travel to this area;
8. Ability to contribute to and serve City-wide economic development by facilitating convenient movement of goods to, from and through the City;
9. Cost to the City of maintaining adequate level of transportation service; and
10. Compatibility with Provincial, Regional and City policies.

8.5 Opportunities Forecast

TMP recommendations for the City’s transportation system to 2031 also provide opportunities to improve important aspects of the City, including:

1. Accessibility and mobility for all (in response to the TMP Vision);
2. Travel convenience and safety within the City;
3. Streetscape and urban design improvements within and adjacent to the road right-of-way;
4. Maximize the protection of areas of natural and socio-cultural importance; and
5. Provide the public with more travel choices and reduced reliance on the private automobile, including integration with planned Light Rail Transit service.
9. ALTERNATIVE TRANSPORTATION PLANNING STRATEGIES

Based on input gained from community engagement to date during the TDM preparation, and the approach taken in the Regional TMP to identify long-term transportation strategies, three alternative transportation strategies have been identified for the City of Waterloo.

9.1 Capacity-Focused Strategy

A long term transportation strategy for the City of Waterloo that continues to provide roadway network capacity in response to growing traffic demands could be considered a “business as usual” approach. This is because the capacity focus would continue to add vehicle travel lanes and extend roads to primarily accommodate motorized traffic, often at the expense of the expansion and improvement to the City’s active transportation infrastructure and services. It would also perpetuate auto use and compete successfully against transit ridership growth. A capacity-focused strategy is not considered to be sustainable for the City for the following reasons:

- Capital costs to construct and maintain an expanded local roadway network would be very expensive for the City given its current infrastructure deficit;
- Social impacts would result from growing neighbourhood traffic intrusion;
- Natural and cultural heritage resources may be impacted by road widening and extension;
- Discouraging increased active transportation would impact on community health and wellness; and
- Extending the City’s road network into suburban growth areas may provide added capacity in support of further suburban sprawl beyond the City’s urban boundary and would not help to encourage urban intensification.

9.2 Demand-Focused Strategy

A long term transportation strategy that is demand-focused would concentrate on changing travel characteristics in the movement of people and goods within and through the City. At its extreme, a demand-focused strategy could strategically withhold roadway capacity enhancements to create the functional incentives needed to shift travel demands towards transit and active transportation.

For example, this could mean encouraging more transit use by limiting any increase in the auto carrying capacity of the City’s roadway network, and enhancing transit capacity with rapid transit service and/or High Occupancy Vehicles (HOV) lanes in the City. A combination of Transportation Demand Management (TDM) incentives would be required to change travel modes, times and other demand characteristics including the following examples:

<table>
<thead>
<tr>
<th>Demand-Focused TDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost-Based</td>
</tr>
<tr>
<td>i.e. user pay (tolls), parking pricing</td>
</tr>
<tr>
<td>Behaviour-Based</td>
</tr>
<tr>
<td>i.e. transit, telecommuting, ride-sharing, peak hour shifts</td>
</tr>
<tr>
<td>Land Use-Based</td>
</tr>
<tr>
<td>i.e. density intensification, mixed land use</td>
</tr>
</tbody>
</table>
9.3 A Complete Transportation Strategy

In the Regional TMP update, the Region of Waterloo is planning a transit-oriented approach with strategic road improvements for the delivery of transportation infrastructure and services over the next 20 years. If current trends in auto use continue in the Region, the regional road network will have to expand by 35 percent to maintain an adequate LOS in the future. The Region has calculated that this would equate to the addition of at least 100 new travel lanes to the regional road network by 2031. The conclusion is that this is not a practical or desirable prediction for Waterloo Region and its local municipalities.

The transit ridership targets set by the Region for their new long term transportation strategy, and with the planned rapid transit spine from north Waterloo to south Cambridge would require about 34 additional travel lanes in the urban area compared to the 100 new lanes in the “business as usual” scenario. This would encourage growth in active transportation by increasing the transportation mode share of cycling and walking. In a complete transportation strategy for the City of Waterloo, these regional strategies would be supported at the local level to reduce the growth in private auto use and increase the use of alternative modes specifically in the City, thereby reducing the amount of roadway capacity enhancements (widenings, extensions).

In the City of Waterloo, a complete transportation strategy would not eliminate the need for City roadway improvements and capacity enhancements at strategic location. Private auto use would still be the predominant mode of transportation in the City, but a complete strategy would have the following primary and practical benefits:

1. Reduce the amount of road construction needed to serve future travel demands, with a corresponding reduction in City costs and the negative impacts of roadway capacity enhancement;

2. Provide added incentives for the City to optimize the carrying capacity of its roadway network through transportation operations management (i.e. intersection controls); and

3. Provide new opportunities for the City to strategically convert or adjust the auto carrying capacity of selected City streets towards alternative transportation and/or streetscape uses, for example through road “diets” and closures where appropriate.
10. STRATEGIC ROADWAY NETWORK MASTER PLAN

A number of new and updated transportation policies have been developed for the City of Waterloo as part of the TMP to implement a Complete Transportation Strategy to the year 2031. Part of this Strategy in the implementation of roadway capacity and intersection capacity enhancements to address future travel demands efficiently and with accessibility for all users of the City’s transportation system.

10.1 Roadway Capacity Enhancement

Enhancing the capacity of a road typically involves adding travel lanes and/or bike lanes, installing transit improvements such as transit priority signals or queue jump lanes, restricting cross-street and/or driveway access and optimizing traffic controls. It can also involve structural roadway extensions and additions to enhance overall road network capacity.

As a capacity enhancement example, one additional lane of road capacity can be provided across the Fischer-Hallman Road screenline with the extension of Laurelwood Drive from Bearinger Road to Westmount Road. This would require a Municipal Class EA or Plan of Subdivision to assess the impacts and mitigation measures associated with this extension, especially involving the Laurel Creek area and crossing. In that case, the EA Phase 1 problem/opportunity statement and Phase 2 identification of alternative solutions would be provided by the TMP.

The new Regional TMP recommends a number of roadway capacity and transit improvements projects within the City of Waterloo to 2031 and beyond. These recommendations are shown on Exhibit 10.1 and listed as follows on Exhibit 10.2. The cost of these planned roadway capacity enhancements including transit infrastructure enhancements within the City of Waterloo to 2031 total $103 M in 2009 dollars. Of this, approximately $17 M is attributed to City of Waterloo roadway projects, not including the University Avenue East widening completed in late 2010 and the Columbia Street West transit priority improvements which are expected to be cost-shared with the Region. The remaining $86 M of planned roadway improvements in the City are on Region of Waterloo roadways.

The three specific roadway capacity enhancement projects recommended on City roadways with a total estimated capital cost of approximately $17 M in 2009 dollars are:

- Columbia Street West improvements from Fischer-Hallman Road to Erbsville Road (5-10 years) with estimated capital cost of $6 M excluding Clair Creek drainage improvements;
- Extension of Laurelwood Road from Fischer-Hallman Road/Bearerger Road to Westmount Road, with the cost included in the Servicing Agreement. A further extension to Wes Graham Way with transit priority in the 20 year + period is planned as a bus and active transportation route as part of planned University of Waterloo expansion; and
- Widen or construct a new Bridge Street at the north limit of the City connecting King Street North and Northfield Drive estimated to cost $11 M.
City of Waterloo Transportation Master Plan
Exhibit 10.1 - Recommended Road Network Capacity Enhancements
Exhibit 10-2: Road Improvement Recommendations in the City of Waterloo Regional
Transportation Master Plan, January 2011

<table>
<thead>
<tr>
<th>NAME</th>
<th>SECTION</th>
<th>ROAD WORK</th>
<th>COST $Million</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>$2009</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Road Improvements Priority Listing 0-5 Years</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>* University Avenue East</td>
<td>Bridge St. to Lexington Rd.</td>
<td>Widen (completed)</td>
<td>$3.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Road Improvements Priority Listing 5-10 Years</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Erb Street West (RR# 9)</td>
<td>Erbsville Court To Beechwood Dr.</td>
<td>Widen to 4 lanes</td>
<td>$2.56</td>
</tr>
<tr>
<td>Northfield Drive (RR# 22)</td>
<td>Davenport Rd. to University Ave. E</td>
<td>Widen</td>
<td>$4.10</td>
</tr>
<tr>
<td>University Avenue W (RR# 57)</td>
<td>Fischer- Hallman Rd. to Erb St. W</td>
<td>Transit Priority</td>
<td>$7.42</td>
</tr>
<tr>
<td>University Avenue W (RR# 57)</td>
<td>Erb St. to Keats Way</td>
<td>Widen</td>
<td>$3.30</td>
</tr>
<tr>
<td>* Columbia Street W</td>
<td>Erbsville Rd. to Fischer Hallman Rd.</td>
<td>Widen</td>
<td>$6.07 City</td>
</tr>
<tr>
<td>* Columbia Street W</td>
<td>Fischer- Hallman Rd. to Albert St.</td>
<td>Transit Priority</td>
<td>$3.00 City/Region</td>
</tr>
<tr>
<td>Ira Needles Blvd (RR# 70)</td>
<td>City Boundary to Erb St. W.</td>
<td>Widen</td>
<td>$6.10</td>
</tr>
<tr>
<td>* Laurelwood Drive</td>
<td>Fischer-Hallman Road to Westmount Rd.</td>
<td>New Road</td>
<td>Included in Servicing Agreement</td>
</tr>
<tr>
<td>Sub-Total 5-10 Years ($M)</td>
<td></td>
<td></td>
<td>$32.55</td>
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<table>
<thead>
<tr>
<th>Road Improvements Priority Listing 10-20 Years</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Northfield Drive (RR# 59)</td>
<td>Westmount Rd. to Davenport Rd.</td>
<td>Transit Improvements</td>
<td>$8.50</td>
</tr>
<tr>
<td>Bridge Street (RR# 52)</td>
<td>University Ave. E to Northfield Dr. E</td>
<td>Transit Priority</td>
<td>$8.86</td>
</tr>
<tr>
<td>University Avenue W (RR# 57)</td>
<td>Ira Needles Blvd. to Fischer Hallman Rd.</td>
<td>Widen</td>
<td>$7.50</td>
</tr>
<tr>
<td>Fischer Hallman Road (RR# 58)</td>
<td>Highway 7/8 to Columbia St. W</td>
<td>Transit Lanes</td>
<td>$17.50</td>
</tr>
<tr>
<td>Fischer Hallman Road (RR# 58)</td>
<td>Columbia St. W to Westmount Rd.</td>
<td>Widen</td>
<td>$8.94</td>
</tr>
<tr>
<td>Erbsville Road (RR# 70)</td>
<td>Erb St. W to Columbia St. W</td>
<td>Widen</td>
<td>$4.79</td>
</tr>
<tr>
<td>Highway 85</td>
<td>City Boundary to King St. N</td>
<td>Widen to 6 lanes</td>
<td>MTO</td>
</tr>
<tr>
<td>* Bridge Street West</td>
<td>King Street N to Northfield Dr.</td>
<td>Widening or New Road</td>
<td>$11.00</td>
</tr>
<tr>
<td>Sub-Total 10-20 Years ($M)</td>
<td></td>
<td></td>
<td>$67.09</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Road Improvements Priority Listing 20+ Years</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Erbsville Road (RR# 70)</td>
<td>Columbia St. W to Wideman Rd.</td>
<td>Widen</td>
<td>N/A</td>
</tr>
<tr>
<td>Laurelwood Road</td>
<td>Westmount Rd. to Wes Graham Way</td>
<td>Transit Priority Private Road</td>
<td>N/A</td>
</tr>
<tr>
<td>King Street N / RR #15</td>
<td>Northland Rd. to City Boundary</td>
<td>Widen</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* City of Waterloo Project
N/A – Not Applicable, Beyond 20 Year Planning Timeframe
All Subject to Regional Council or City Council Approval and Budget Approval
10.2 Intersection Capacity Enhancement

Current turning movement volumes at 47 strategic intersections (40 signalized) in the City of Waterloo (see Exhibits 5.5, 5.6 and 5.7) have been analysed using existing traffic counts to identify any Level-of-Service (LOS) deficiencies. Such deficiencies, defined as the inability of an intersection to accommodate traffic flow and turning movements, represent LOS problems in the roadway network that affects all users. Fortunately, the existing condition analysis identified only a few such deficiencies in the current network, although some other localized problems were perceived by the public at Public Information Centres from conditions such as line-of-sight limitations and perceived needs for traffic signals.

Following this, intersection operations were forecast to 2016 and 2031 using the Regional Model to project traffic volumes to these two planning horizons. Growth factors were developed on all approaches to the 47 intersections using the model flows. An interpolation was made to adjust the growth factors to represent 2008 to 2016 growth, and 2008 to 2031 growth factors, as the majority of the traffic counts available were collected in 2008. The growth factors were then applied to the traffic counts on an intersection approach basis. This method is generally superior to using model turning movements directly, which can be unreliable due to the macroscopic nature of the model and the local influences on turning volumes at intersections.

As the City continues to grow as planned by the new City and Regional Official Plans, traffic forecasts in most locations show an increase in traffic volumes at most intersection locations, first for 2016 and again for 2031, with a resulting decrease in overall intersection operations to LOS E/F at the following major intersections (see Section 5.2 for a definition of intersection LOS). The City is expected to experience manageable but acceptable vehicular traffic delays at some locations within its road network as prioritization begins to be redistributed to the other modes of transportation.

A complete tabulation of intersection LOS in 2009, 2016 and 2031 by movement is included in Appendix B, along with potential intersection capacity enhancement measures summarized as follows:

Exhibit 10-3: Forecasted Overall Intersection LOS Deficiencies

<table>
<thead>
<tr>
<th>Street 1</th>
<th>Street 2</th>
<th>2016 LOS – Period</th>
<th>2031 LOS – Period</th>
<th>Potential Improvement Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge Street</td>
<td>University Avenue</td>
<td>E – AM</td>
<td>F – PM Overall</td>
<td>To Be Determined (TBD)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EBL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>F – PM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Overall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Columbia Street</td>
<td>Westmount Road</td>
<td>E – PM</td>
<td>F – AM</td>
<td>Right Turn Bays</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E – PM</td>
<td>Double Westbound Left Lanes</td>
</tr>
<tr>
<td>Erbsville Road</td>
<td>Keats Way</td>
<td>E – AM</td>
<td>F – AM</td>
<td>TBD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E – PM</td>
<td>Potential Roundabout</td>
</tr>
<tr>
<td>Fischer-Hallman Road</td>
<td>Columbia Street W</td>
<td></td>
<td>F – AM</td>
<td>Widen to 2 EB Thro Lanes</td>
</tr>
<tr>
<td>Fischer-Hallman Road</td>
<td>Keats Way</td>
<td></td>
<td></td>
<td>TBD</td>
</tr>
<tr>
<td>Fischer-Hallman Road</td>
<td>Laurelwood Drive</td>
<td></td>
<td>F – AM</td>
<td>TBD</td>
</tr>
<tr>
<td>King Street N</td>
<td>Northfield Drive</td>
<td></td>
<td>F – AM</td>
<td>Eastbound Turn Bay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Double Westbound Turn Lanes</td>
</tr>
</tbody>
</table>
### 10.3 Roadway Capacity Adjustment

In addition to enhancing roadway capacity in appropriate corridors and at deficient intersections, a Complete Transportation Strategy also includes opportunities to adjust road capacity to better accommodate all transportation modes and improve the streetscape environment. In some cases this can be done by reducing the number of motorized vehicle travel lanes on a road section, called a “road diet”, in order to accommodate features such as bike lanes, widen sidewalks, centre turn lanes, boulevard treatments, medians for traffic calming and other streetscape features.

Road diets are not appropriate for all streets. A consistent process should be followed to determine the appropriateness of road diet conversions in the city. Using established industry sources such as the *Road Diet Handbook: Setting Trends for Livable Streets*[^2],

**ROAD DIET FEASIBILITY FACTORS:**

1. Road Function and Environment;
2. Overall Traffic Volumes and Level of Service;
3. Turning Volumes and Patterns;
4. Frequent-Stop and Slow-Moving Vehicles;
5. Weaving, Speed and Queues;
6. Cash Types and Patterns;
7. Pedestrian and Bicycle Activity;
8. Right-of-Way Availability, Cost and Acquisition Impacts;


---

<table>
<thead>
<tr>
<th>Street 1</th>
<th>Street 2</th>
<th>AM</th>
<th>PM</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>King Street N</td>
<td>Weber Street</td>
<td>F – PM</td>
<td>F – PM</td>
<td>Eastbound Right Turn Bay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Double Westbound Left Lanes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Westbound Right Turn Bay</td>
</tr>
<tr>
<td>Northfield Drive</td>
<td>Davenport Road</td>
<td>F – PM</td>
<td></td>
<td>Double Northbound Left Lanes</td>
</tr>
<tr>
<td>University Avenue</td>
<td>King Street</td>
<td>E – PM</td>
<td></td>
<td>Eastbound Right Turn Bay</td>
</tr>
<tr>
<td>University Avenue</td>
<td>Lexington Road</td>
<td>F – PM</td>
<td></td>
<td>Westbound Right Turn Bay</td>
</tr>
<tr>
<td>University Avenue</td>
<td>Westmount Road</td>
<td>F – PM</td>
<td>E – PM</td>
<td>TBD</td>
</tr>
<tr>
<td>Conservation Drive</td>
<td>Westmount Road</td>
<td>F – PM</td>
<td>F – AM/PM</td>
<td>Traffic Signal Warrant</td>
</tr>
<tr>
<td>Weber Street</td>
<td>Northfield Drive</td>
<td>E – AM</td>
<td></td>
<td>Add SB Thro</td>
</tr>
<tr>
<td>Westmount Road</td>
<td>Bearinger Road</td>
<td>F – AM</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Woolwich Street (near New Bedford Drive)</td>
<td>University Avenue</td>
<td>F – PM</td>
<td>F – AM</td>
<td>Traffic Signal Warrant</td>
</tr>
<tr>
<td>Marsland Drive</td>
<td>Columbia Street E</td>
<td>Existing LOS F NBLR</td>
<td>LOS B/C with signals</td>
<td>LOS improvement possible with introduction of signals with 80 cycle length. Requires warrant and design study.</td>
</tr>
</tbody>
</table>
9. Presence of Parallel Routes; and

10. Other Contextual Considerations.

The two current examples of road diets implemented to date in the City of Waterloo are on
Davenport Road between Lexington Road and near Old Abbey Road, and on Bearinger Road from
Westmount Road to Glen Forrest Blvd. The TMP recommends that further consideration of
roadway capacity adjustment continue to rely on the assessment of the preceding feasibility factors,
with area traffic analysis and impact assessment which includes:

- Existing traffic conditions on the subject roadway and associated roads within the traffic
  analysis area;

- Forecasted future traffic volumes and conditions with the analysis area using the Region's
  TransCAD Model;

- Short (2016) and long (2031) transportation impact analysis using Synchro or similar micro
  forecasting and intersection analysis model;

- Consultation with area residents and stakeholders; and

- Reporting of conclusions and recommendations to the public.
11. COMPLETE STREETS POLICY

“Complete Streets” are designed, operated and maintained to enable safe access for all users. Pedestrians, cyclists, transit riders and motorists of all ages and abilities must be able to safely move along and across a complete street. For the City of Waterloo, a Complete Streets policy can assist the City in implementing the vision for the TMP to:

“Develop a coordinated and integrated transportation system that provides realistic alternative travel options to the auto thereby creating a City that is truly accessible to all.”

11.1 Complementary City Policies

In addition to implementing the TMP vision, a Complete Streets policy is complementary to following City policies and master plans:

- Official Plan (Plan It!)
- Accessibility Plan
- Recreation & Leisure Plan
- Land-use Zoning & Urban Design Guidelines
- Environmental Strategic Plan
- Fire Master Plan

A Complete Streets policy can enable those responsible for the provision of conventional transportation infrastructure and services within the City to effectively integrate transportation into the overall vision and fabric of the City.

A Complete Streets policy is also complementary to the Pedestrian Charter approved by City Council in 2008 to create an urban environment in all parts of the City that encourages and supports walking.

As noted in the Recreation and Leisure Services Plan, the City of Waterloo trails extend through Uptown Waterloo, parkland, natural areas, woodlands and creek corridors. Started over fifteen years ago, the network of trails has grown to over 120 km in length. There are multi-use trails for hiking, jogging, cycling and roller blading; low-impact trails for foot traffic only. The importance of trail corridors and networks in supporting active transportation is discussed in Section 6 of this TMP. A Complete Streets policy is complemented by and integrates with a network of Linked Trail Greenways or Open Space Corridors that focus on the development of trails in corridors other than those defined by streets.

11.2 Importance of Complete Streets

The importance of Complete Streets lies in the function of streets and roadways within the community fabric. Access to adjacent lands, whether they are residential, employment, commercial, institutional or recreational is oriented to the streets. Streets are meeting places for social and business interaction through access and mobility. Unlike corridors that solely serve rail, air, water, utilities, recreation, or natural areas, streets integrate many elements of our society and therefore need to provide access to the broad range of citizens within that society.

A Complete Streets policy is intended to shift the City of Waterloo from the decades-long focus of providing streets to move cars, to providing streets where people can interact and move about
whether they are on foot, on a bicycle, on a new or alternative form of transportation, in a bus or in a car. Every street needs to accommodate pedestrians at a basic level with the provision of sidewalks, walkways or “safe space”.

There is even a need for safe crossings of freeways to be provided for pedestrians. The needs of pedestrians with cognitive, mobility or visual impairments must be incorporated into the design of those pedestrian facilities.

As the volume of motor vehicles, their speed and size increase, cyclists need separate space or alternative corridors. An efficient transit system will focus on a network of compatible streets and land-uses. Efficient truck routes are also required to ensure goods movement to and within the City. And our car-dominated culture necessitates the provision of streets for motorists. All of those users needs must be provided for within the context of localized culture and physical form.

A Complete Streets policy can empower and direct citizens, elected officials, government agencies, employers, businesses, developers, bureaucrats, planners, architects and engineers. It requires a change in policies and practices to ensure that the entire right-of-way is routinely planned, designed, constructed, operated, and maintained to enable safe access for all users that are appropriate for local context and needs.

11.3 Recommended Complete Streets Policy Foundation

In creating a coordinated and integrated transportation system that provides realistic alternative travel options to the auto, and in recognizing the benefits of walking and cycling to our health, community and environment, it is recommended that the City of Waterloo adopt a Complete Streets policy to plan, design, operate and maintain streets to enable all users of all ages and abilities – pedestrians, cyclists, transit riders and motorists – to safely move along and across City streets. The principle of Complete Streets supports compact, sustainable development. It is intended to be applied comprehensively but with flexibility to reflect local context. The Complete Streets policy:

- Incorporates the principle of Complete Streets into all transportation projects except where cyclists and pedestrians are prohibited by law, or there is a demonstrated absence of need. Safe crossings of facilities that prohibit use by pedestrians and cyclists are still required. All exceptions must be justified and approved at a senior staff level, i.e. City Engineer, Director of Transportation or their delegate.

- Integrate Complete Streets with a complementary Linked Greenways or Trail Corridors policy that supports active transportation in a variety of non-street corridors such as parkland, natural areas, woodlands, river and creek corridors, stormwater management facilities, utility corridors, transit and rail corridors, etc.

- Incorporates the principle of Complete Streets into all aspects of the City’s responsibilities for streets including:

  **Planning and Design:**

  o Planning of streets and street networks City-wide, in secondary plans and plans of subdivision;

  o Design of street networks, corridors, intersections, site-specific improvements and traffic calming;

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2 In Ontario, the following types of new and alternative forms of transportation are allowed to operate on streets; Limited Speed Motorcycle, Motor-Assisted Bicycle (moped), Motor Tricycle, Bicycle, Electric Bicycle (e-bike), Personal Mobility Device (motorized wheelchair, medical scooter preferably on sidewalks), Low-Speed Vehicle and Seagway Human Transporter/Personal Transporter.
Design of new construction, reconstruction, retrofit and resurfacing roadway projects.

Maintenance and Operations:

- Construction within or adjacent street rights-of-way including maintaining pedestrian and cyclist access and mobility through construction zones and in traffic management plans. Operation of streets and intersections, including signage, pavement markings, traffic control and illumination;
- Maintenance of streets and alternatives for pedestrians and cyclists, i.e. trails, including seasonal and repair work. Seasonal includes maintaining the surface free of disabling debris, water, snow, and ice. Repair includes attention to spot repairs, hazards and overall wear or deterioration.

Communications:

- Public consultation and communications;
- Advisory committee responsibilities and function;
- Review of roadways within the City under the jurisdiction of the Ministry of Transportation, Ontario (MTO), or the Regional Municipality of Waterloo (RMOW);
- Collaboration with the RMOW on travel demand management (TDM) initiatives.

Asset Management:

- Audits of streets and alternatives for pedestrians and cyclists, i.e. trails;
- Annual reviews of the development and implementation of the sidewalk, trails and bikeway network;
- Establishment of performance standards that reflect the safety, convenience and needs of all users;
- Data collection procedures and analysis that benchmark and track how well streets are serving all users.

- Implement the Complete Streets principle including:
  - Restructure City procedures associated with the above responsibilities, where required, including budgetary and funding models;
  - Rewrite any City standards and guidelines, and refer to design standards, guidelines and practices that encompass all users, drawing on the latest demonstrated, beneficial initiatives;
  - Retrain staff including planners, architects, landscape architects and engineers to understand and incorporate the needs of all users in their daily work; and
  - Create a working group of staff lead by a senior staff member to oversee the implementation, restructuring and retraining.
11.4 Complementary Policies

There are a number of needs, concerns, issues and deficiencies related to the Complete Streets principle, in particular with respect to pedestrians and cyclists. The following complementary policy themes are recommended to be examined in detail and considered for implementation within the short-term, including:

- On-road bikeway and trail implementation process that recognizes the importance of the network in meeting the principles of the TMP if opposition arises. Any route that does not proceed would require justification of why not, mitigation considered and alternative routes approved at a senior staff level, i.e. City Engineer, Director of Transportation or delegate;
- Bicycle and pedestrian-friendly sites;
- End-of-trip facilities (bicycle parking by-law and showers / change facilities);
- Trail and sidewalk maintenance in winter (see Section 17);
- Active and Safes Route to School collaboration;
- Hazard reporting for all users;
- Advisory Committee (technical committee or subcommittee to TTAC);
- RMOW trail, bike and walking portal collaboration;
- Sidewalk retrofit prioritization program;
- Collaborate with RMOW and adjacent municipalities on a signage strategy for bikeways and trails;
- Walking, cycling and trail audit programs to identify and program upgrades so that the active transportation infrastructure is fully integrated and maintained;
- Collaborate with the Region of Waterloo on implementing Transportation Demand Management policies and programs (see Section 16);
- Intersection and traffic control policy that considers the needs of all street users to cross intersections and designated crosswalks (see Section 14); and
- Parking policies and practices that support all road users.

The Complete Streets policy framework developed specifically for the City of Waterloo is illustrated on Exhibit 11.1.

Walking, Cycling and Trail audits—sample checklist:
- Signage—regulatory, warning and information
- Pavement markings
- Sidewalk present, material, width, slope, grade, driveways treatments, etc.
- Trail width, slope, grade, curves, sight distance, materials, etc.
- Accessibility features—ramps (location, orientation, grade, landing), detectable warnings, audible signals, protruding objects, etc.
- Surface condition, potholes, cracks, tripping hazards, etc.
- Vegetation / plantings—maintenance required
- Sidewalk clutter
- Street crossing present, type of traffic control, traffic volume / speed / gaps, physical features
- Drainage issues—erosion, ponding, debris, culvert required / damaged, etc.
- Lighting
- Security issues
- Bicycle parking—rack type / condition, location, spacing, lighting, shelter
Exhibit 11-1: Complete Streets Policy Framework

A Proposed Policy Framework

Plan It!
Waterloo Official Plan

Transportation Master Plan (TMP)
Accessibility Plan

Environmental Strategic Plan

Land Use Plan
Urban Design Guidelines

PROPOSED
Create a network of trails that support active transportation in a variety of non-urban corridors, as appropriate, such as parkland, natural areas, woodlands, river and creek corridors, streets, water management facilities, utility corridors, transit and rail corridors, etc.

APPROVED
Develop a comprehensive and integrated transportation system that provides cycling, alternative transit options to the park or train station, a city that is bike accessible to all.

Create an urban environment in all parts of the city that encourages and supports walking.

PROPOSED
Plan, design, engineer and maintain streets to enable all users of all ages and abilities — pedestrians, cyclists, transit riders and motorists — to safely move along and across city streets.

Cyclists
Transit Riders
Goods Movement

Pedestrians
Motorists
11.5 Complete Street Case Studies

To illustrate the potential for success of a Complete Street policy in achieving the City of Waterloo’s “accessible for all” goal, reference can be made to the impacts of similar policies in similar cities. Some case studies, such as those on Montreal, Vancouver or Chicago show Complete Streets success in large metropolitan areas. More relevant to the City of Waterloo are the Complete Street impacts in Boulder, Colorado summarized as follows:

**CASE STUDY: GO Boulder, Colorado, USA**
Population: 101,000; Platinum Bicycle-friendly City since 2004

The City’s 1989 original Transportation Master Plan called for shifting away from single occupant vehicle (SOV) trips, reconciling two conflicting goals of “safe and convenient mobility and access” and “minimizing auto congestion, air pollution and noise” that make Boulder a great place to live. The 1996 update set an objective of “no long term growth in vehicle traffic”, committing to enhance the City’s ten major arterials to make them work for buses, bikes and pedestrians. The 2003 update focused on four policy areas: regional connections, expanded transportation demand management (TDM), multi-modal corridors, and funding necessary to achieve the plan’s goals. The 2008 update recommended the Complete Streets Investment Program that identifies a strategic set of the highest priority investments for the community through 2025.

**How is Boulder doing?**

*SOV Mode Share*—From 1990 to 2010, decreased from ~45% to ~37% for all trips; however the rate of decrease needs to double from 0.4% to 0.8% per year to meet the 2025 target of 25%

*Change in mode share*—Since 1990, transit and bicycling have increased while walking remains stable.

*Vehicle miles travelled*—As of 2009, the VMT has levels are holding at 1994 levels

*Congestion*—In 2009, less than 20% of the City’s intersection were heavily congested (level of service E or F)

**Evolution of Transit:** Most transit services in Boulder are operated by the RTD (region’s transit agency); however, the City partnered with a non-profit to create a Community Transit Network (HOP, SKIP, JUMP, BOUND, DASH, STAMPEDE and BOLT) and introduced the Eco Pass in early 1990s to make transit more convenient and attractive. The Eco Pass targets audiences such as employees, students and neighbourhoods, offering a discounted pass if purchased in groups, and a taxi Guaranteed Ride Home for employees.

**Human Powered Action:** Boulder has a robust bicycle network—83 km of paved multi-use pathways with 76 underpasses, 59 km of roads with bike lanes, 14 km of paved shoulders, 69 km of roads with designated bike routes, and 16 km of soft surface trails. About 85% of Boulder’s arterial streets accommodate cyclists, and all local and regional buses are equipped with bike racks. The City has almost 500 km of roads and almost 250 km of bicycle facilities! Two bike corrals installed in the downtown have resulted in a 58% increase in bicycles parked in the area from 2007 to 2010. Programs include Walk & Bike Month, Winter Bike to Work Day, personal bike routing on the internet, and a public bike system. Two maintenance crews are mobilized at the same time when the snow falls: one for roads and one for the pathway system. It takes about 8 hours to clear the entire pathway system with two trucks and a special plow.

Major streets are barriers to pedestrians. The City has a goal of providing safe pedestrian crossings of major streets every 200 m. A sidewalk repair program has been in place since 1993. A sidewalk missing links program is funded $75,000 annually.

Since 1993, the City and the school board have funded a transportation co-ordinator working on Safe Routes to School efforts. Infrastructure and programming for this has received $1.56 M in federal funds since 2005.

**Completing the Streets:** Out of the 2003 TMP update came the strategy of systematically transforming the major streets...
to better accommodate all modes and integrate adjacent land uses. Corridor transformation ranges from larger-scale transit improvements to smaller details such as wider sidewalks and innovative signage.

Complete Streets also focuses on individualized travel planning, and increased Eco Pass pick-up and the Driven to Drive Less campaigns. There are 450 volunteer employee transportation co-ordinators at 230 businesses representing 25,000 employees. New developments with significant traffic impacts are required to develop and implement a TDM plan. Only 1/3rd of employees in the downtown arrive by car.

**Partnering for the Bigger Picture:** Boulder has a growth boundary articulated in the land-use plan, with growth occurring through redevelopment and increasing density. This has allowed infrastructure funds to focus on enhancing rather than expanding the transportation system.

**Transportation Revenue:** A 0.6% local sales tax dedicated to transportation was approved by voters in 1967. Federal funding tied to larger infrastructure programs is the next largest source.

**Will Boulder think creatively about its future transportation?** The City is already reconsidering the use of transportation space. A potential future “repurposing” of streets, i.e. low-cost approaches to convert traditional auto space for other modes to support vibrant community life in these public spaces, is being thought about with community input and partners.

12. BIKEWAYS AND TRAILS MASTER PLAN

The TMP has identified 143 future bikeway and trail projects shown in Appendix C, with the Year 1 and Year 2-5 project properties listed below on Exhibit 12.1. In Appendix C they are prioritized as either being in the City’s current 10 year capital program, or as new projects. Recommendations for the implementation of these projects and supporting policies, programs and guidelines are provided in this section.

Exhibit 12-1: Year 1-5 Priority Bikeway & Trail Projects

<table>
<thead>
<tr>
<th>STREET FROM TO</th>
<th>FUNDED</th>
<th>FACILITY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexington Road University Avenue Davenport Road</td>
<td>Yes</td>
<td>Bike Lanes</td>
</tr>
<tr>
<td>Lake Louise Boulevard Westmount Road Conservation Drive</td>
<td>Yes</td>
<td>Bike Lanes</td>
</tr>
<tr>
<td>Parkside Drive Weber Street Northfield Drive</td>
<td>Yes</td>
<td>Bike Lanes</td>
</tr>
<tr>
<td>Westside Trails (east of ESPA 19) North east of ESPA 19</td>
<td>Yes</td>
<td>Trails</td>
</tr>
<tr>
<td>Wideman Road Erbsville Road Wilmot Line</td>
<td>No</td>
<td>Signed Route</td>
</tr>
<tr>
<td>Toll Gate Boulevard Glen Forrest Boulevard Bearinger Road</td>
<td>No</td>
<td>Signed Route</td>
</tr>
<tr>
<td>Craigleith Drive Fischer-Hallman Road Faraday Court</td>
<td>No</td>
<td>Signed Route</td>
</tr>
</tbody>
</table>

YEAR 2-5*

<table>
<thead>
<tr>
<th>STREET FROM TO</th>
<th>FUNDED</th>
<th>FACILITY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexington Road/Columbia Street Davenport Road King Street</td>
<td>No</td>
<td>Bike Lanes</td>
</tr>
<tr>
<td>Columbia Street West Fischer-Hallman Road Erbsville Road</td>
<td>Yes</td>
<td>Bike Lanes</td>
</tr>
<tr>
<td>Park Street Allen Street City of Kitchener Boundary</td>
<td>Yes</td>
<td>Bike Lanes</td>
</tr>
<tr>
<td>Albert Street Weber Street Columbia Street</td>
<td>No</td>
<td>Bike Lanes</td>
</tr>
<tr>
<td>Regina Street Columbia Street William Street</td>
<td>No</td>
<td>Signed Route</td>
</tr>
<tr>
<td>Phillip Street Albert Street University Avenue</td>
<td>No</td>
<td>Bike Lanes</td>
</tr>
<tr>
<td>Marsland Drive Lexington Road University Avenue</td>
<td>No</td>
<td>Bike Lanes</td>
</tr>
<tr>
<td>Conservation Drive Beaver Creek Road Westmount Road</td>
<td>No</td>
<td>Bike Lanes</td>
</tr>
</tbody>
</table>

* Sample of priority Year 2-5 projects. For a complete list of Year 2-5 and 5+ Year projects refer to Appendix C

The new trails and bikeway network is intended to build upon the networks recommended in the City of Waterloo Community Trails and Bikeways Master Plan (2001) and the Region of Waterloo Cycling Master Plan (2004). The recommended network and implementation plan also include a number of revisions based on City and Regional initiatives that have taken place since the 2001 and 2004 studies were completed, changes based on recent information gathered by the study team through consultation with staff, key stakeholders such as the Transportation and Trails Advisory Committee (TTAC) and the public, and finally changes that are recommended based on the most recent research and trends in the evolution of bikeway and trail design.

The recommended network and implementation plan should be adopted by City Council as the long-term strategy to guide decision making related to cycling network and trail development for the City. It is important to recognize that priorities change over time and opportunities may also arise that were not known at the time this plan was prepared. The network and implementation plan should be assumed to be flexible so that the City and its partners can adapt to changes,
constraints, available budget resources and opportunities as they arise. The ultimate facility type, timing and details related to implementation should evolve through detailed technical studies and additional community consultation where deemed necessary. While making adjustments to meet changing priorities and opportunities, it is also important that the intent and direction established through the development of the recommended network and implementation plan are respected when changes are being contemplated. With this in mind, it is important that:

- The validity of each route is confirmed when it is being considered for implementation. Where it is determined that a particular route is no longer valid, or is impossible to achieve, a parallel route performing the same network function should be selected;
- Network routes are considered during the Environmental Assessment process for municipal infrastructure projects;
- Input is solicited from various City departments and it partners, particularly the Region of Waterloo through a coordinated communication process to ensure that all needs are being considered and balanced among one another; and
- The performance of the facilities are being regularly monitored throughout their lifecycle so that improvements in routing, design and maintenance can evolve as new information becomes available.

12.1 Network Development Process and the Recommended Network

The recommended network was developed through an iterative process which included the following general steps:

1. **Inventory of Existing Conditions**: using the City’s Geographic Information System (GIS) database this included a compilation of digital mapping for existing or previously planned cycling routes and trails within the City;

2. **Consultation** with the Project Steering Committee, key stakeholder groups such as TTAC and interested members of the public to receive feedback on the network vision, guiding principles, existing and potential routes took place during the early stages of the development of the Transportation Master Plan;

3. **Develop the Candidate Route Network**, which includes the existing and previously approved routes plus new suggestions for routes that required further examination in the context of the city –wide network;

4. **Network Analysis** which involved studying the City’s high resolution aerial imagery, the use of other resources such as Google Earth and scoped field investigation of potential routes;

5. **Develop the Recommended Network**, based on the results of the network analysis;

6. **Recommend Facility Types** for each of the on and off-road route segments that together form the comprehensive network;

7. **Develop the Phasing Plan** for the staged implementation of the trail network; and

8. **Finalize the Network, Facility Types and Phasing**, a final step that will be based on feedback from the Steering Committee.
The recommended bikeway and trails network is illustrated in Exhibit 12.2. It includes consideration of the following:

- Existing routes that have been implemented by the City and Region. Facility types include bike lanes, shared-use lanes, paved shoulders, signed routes and multi-use trails;

- Routes previously approved, but not yet constructed from:
  - The Community Trails and Bikeways Master Plan (2001);
  - The Region of Waterloo Cycling Master Plan (2004);
  - Various City of Waterloo neighbourhood traffic studies; and
  - Projects scheduled in Regional and City Capital Works Plans.

- Planned street crossings that have been studied and approved by the City of Waterloo;

- Multi-use trails that are either existing or previously approved and are being recommended as “Primary” or priority trails. These trails are considered key links in a city-wide cycling network and as such should have a high design standard and level of maintenance;

- Locations for crossing improvements that are being recommended as part of this current study and that require further study and approval; and

- Hydro corridors that may have potential for development of a trail.

The Recommended Bikeway and Trails Network as illustrated in Exhibits 12.2 to 12.5 should be used as the guide to the development of the comprehensive cycling and trail network throughout the City of Waterloo. It should also be updated as part of future updates to the City of Waterloo Transportation Master Plan.

12.2 Recommended Facility Types

Exhibit 12.6 illustrates facility types for the Recommended Network. Facility types include dedicated and shared space for cyclists on city and regional roads, and multi-use trails in boulevards and city parks and open space. Bikeway design should be based on the application of current bikeway planning and design guidelines and engineering judgement regarding context. Context includes such elements as available right-of-way and pavement width, horizontal and vertical alignment (curves and hills), sight lines, traffic volumes, commercial vehicle volumes, transit provisions, traffic control, side street spacing, driveway types and spacing.

The following guidelines were used in preparing the recommended facility types:


Exhibit 12.3
Existing On-Road Network
16 March 2011
Notes:
1. Required crossings are not yet approved and require further study. The City of Waterloo will coordinate with relevant authorities where applicable.

Notes:
1. Recommended Primary Multi-use Trails include existing and previously approved Multi-use Trails. As Primary Off Road Multi-use Trails, these trails would have a higher design standard.
2. Proposed Multi-use Trail
3. Proposed Paved Shoulder

Legend
- Community Facilities
  - Parks
  - Forests
  - Lakes and Rivers
  - Hydro Easement
- On Road Network
  - Proposed Signed Route
  - Proposed Paved Shoulder
  - Proposed Bike Lane
  - Proposed Bikeway Boulevard
- Off Road Network
  - Proposed Multi-use Trail
  - Recommended Primary Multi-use Trail

Exhibit 12.6
Recommended Facility Types
16 March 2011
The following provides a brief description of facility types that make up the Recommended Network.

12.2.1 ON-ROAD FACILITIES – DEDICATED SPACE

**Bike Lane**

Bike lanes are typically located on high volume, high speed urban cross-section roads (with curb and gutter) to create a dedicated space for cyclists. The recommended minimum width for the bike lane is 1.5m to the face of the curb including the gutter where one is present. Where posted speeds are greater than 60km/hr and/or where commercial vehicle percentages are greater than 10-12% of the total traffic volume the minimum recommended bike lane width is 1.8m. Where space is constrained and the inability to meet the recommended minimum has been carefully examined and documented, a width of 1.2m to the face of the curb may be acceptable.

In areas where on-street parking is permitted, the continuation of the bike lane is preferred and the recommended width is 1.8m. Where roadway widths are limited and narrowing or removing traffic lanes is not feasible, and/or where the relocation or removal of parking is not an option, the bike lane must be properly terminated and signed. In these locations the Shared-use Arrow or “Sharrow” may also be considered.

In the City of Waterloo, many kilometres of bike lanes have already been implemented on Regional Roads as well as City arterial roads and collectors. Bike lanes should continue to be added to higher order Regional and City roads as recommended in Exhibit 12.1 through 12.6. Exhibit 12.7 below outlines a number of different approaches to implementing bike lanes on streets in the City of Waterloo regardless of jurisdiction.

**Exhibit 12-7: Potential Approaches for Adding Bike lanes on Different Types of Streets**

<table>
<thead>
<tr>
<th></th>
<th>2 lane Roads</th>
<th>Multi-lane Roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Options</td>
<td><strong>Approach A.</strong> Repaint to add bike lanes where current road width permits when pavement markings are renewed or the road is resurfaced.</td>
<td><strong>Approach E.</strong> Repaint to add bike lanes when pavement markings are renewed or the road is resurfaced by narrowing the inner travel lanes and creating sufficient space in the curb lane for bike lanes.</td>
</tr>
<tr>
<td></td>
<td><strong>Approach B.</strong> Repaint to add bike lanes by restricting on-street parking to one side of the road when pavement markings are renewed or the road is resurfaced.</td>
<td><strong>Approach F.</strong> Reduce the number of travel lanes when pavement markings are renewed or the road is resurfaced (also known as a “road diet”). For</td>
</tr>
</tbody>
</table>
resurfaced. example change the cross section from 4 vehicle travel lanes to 2 bike lanes, 2 travel vehicle lanes and a continuous centre left-turn lane.

<table>
<thead>
<tr>
<th>Approach C</th>
<th>Approach G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repaint to add bike lanes by removing on-street parking when pavement markings are renewed or the road is resurfaced.</td>
<td>Add bike lanes by widening the road at the time it is scheduled for reconstruction.</td>
</tr>
</tbody>
</table>

Approach A and E - Repaint to Add Bike Lanes with no Impact to On-Street Parking
- Conestoga Rd W from Bauer Pl. to Northfield Dr.
- Conservation Dr. from Westmount Rd. N. to Roy Schmidt Rd.
- Marsland Dr. from University Ave. E. to Columbia St. E.

Approach B and C - Repaint to Add Bike Lanes with Impacts to On-Street Parking
Several of these streets have had traffic studies completed and have been previously approved for the addition of traffic calming measures.
- Lake Louise Blvd.
- Beechwood Dr.
- Parkside Dr. from Northfield Dr. W to Weber St. N.
- Northlake Dr.
- Thorndale Dr.
- Westvale Dr.
- Willow Wood Dr.
- Union St E. and W.
- Skylark Rd.
- Swallow St.
- Westvale Gate
- Park St. from Fullerton St. to John St.
- Highpoint Ave. from Northfield Dr to Northlake Dr.
- Glen Forrest Blvd. from Bearinger Rd. to Northgate Ave.
- Gatestone Blvd. from Columbia St. W to Fischer-Hallman Rd.
- Brentcliffe Dr. from Gatestone Blvd. to Beaver Creek Rd.
- Beaver Creek Rd. from Brentcliffe Dr. to Laurelwood Dr.
- Lexington Rd. from University Ave E. to Davenport Rd.
Approach D and G – Add Bike Lanes as Part of Road Reconstruction and Widening

This approach applies primarily to Regional Roads where bike lanes have not yet been implemented such as sections of Northfield Dr., University Ave., Weber St., Erb St., and Bridgeport Rd., except:
- Columbia St. E from King St. to Marsland Dr. (City Arterial)

Approach F - Reducing the Number of Lanes to Add Bike Lanes (“Road Diet”)
- Albert St. from Columbia St. W. to Weber St.
- Lexington Rd. from Marsland Dr. to Davenport Rd.

Paved Shoulders

Paved shoulders provide a space for cyclists on roads with shoulders and no curbs and gutters. They are typically recommended on rural cross section roads where traffic volumes and speeds are high, sight lines are limited and the percentage of commercial vehicles exceeds 12-15% of the total traffic volume. Research indicates that paved shoulders can also reduce shoulder erosion and long-term road maintenance costs, extend pavement life, and reduce the potential for single vehicle run-off-the-road accidents. Some Ontario jurisdictions such as the Region of Niagara and City of Ottawa have recently approved a policy to pave rural road shoulders on all rural roads when they are resurfaced or reconstructed. In the City of Waterloo the number of rural cross section roads that form part of the recommended cycling network is limited. Paved shoulders have already been implemented on several roads such as Erbsville Rd. and a few are recommended in the future on Benjamin Rd., Conservation Dr. west of Snowcrest Pl. and Wideman Rd.

Cycle Tracks

One of the challenges with standard bike lanes in urban areas, especially where on-street parking is provided, is that cyclists must use the space between parked cars and moving motor vehicles. The opportunity for conflict is higher in this condition as motor vehicles cross the bike lane to park or exit parking. Cyclists are also at increased risk from motorists in parked or stopped vehicles who open the vehicle door into the bike lane at the same time a cyclist is approaching (known as “dooring”). Cyclists also complain that delivery vehicles, buses and taxis illegally stopped in the bike lane force them to divert into the adjacent travel lane or wait for the illegally parked vehicle to move on.

An alternative to standard on-road bike lanes now being considered by a number of jurisdictions across North America is the separated bicycle lane or Cycle Track. A few jurisdictions have implemented Cycle Tracks as pilot projects and several others are currently evaluating the feasibility to implement them. The Cycle Track concept is based on a model that has become popular in some European countries such as the Netherlands. The Cycle Track is located on the road surface and separated from traveling motor vehicles or raised slightly above the road surface using a rolled curb. They may be unidirectional on each side of the street or bidirectional on
one side of the street. Separation from moving vehicles can be created with the use of a painted buffer space or a physical separator such as a flexible bollard, curb or landscaped median.

Although Cycle Tracks can provide a greater degree of separation between bicycles and moving vehicles, increase the perception of comfort and safety for cyclists, and may help to reduce the risk of conflict with parked vehicles, there are a number of potential concerns with this type of facility and further investigation/testing is required before they can be implemented on a broad scale. Some of these concerns include:

- Intersections may require special treatments such as separate traffic control and/or traffic calming;
- In busy commercial areas pedestrians may use the separated bikeway as an extension of the sidewalk;
- When on-street parking is present a motorist’s ability to see cyclists approaching on the passenger side of the vehicle may be compromised; and
- The cost to implement and maintain the facility, especially snow clearing and snow storage during winter months.

The City of Waterloo should continue to monitor and research the potential application of Cycle Tracks, with a view towards undertaking a pilot project on a selected route.

12.2.2 ON-ROAD FACILITIES – SHARED SPACE

Signed Route

Signed routes are typically found along roads where traffic volumes and vehicle speeds are low. They are typically located on:

- Quieter residential streets (low volume and low speed);
- Core urban/downtown areas (higher volume and low speed); and
- Lower order rural roads (low volume and moderate speed).

In these situations there is usually no need to create a designated road space, and cyclists are able to share the space road with motor vehicles. To assist users with wayfinding, bike route signs are typically located at intersections and mid-block areas for long blocks. Where signed routes are located on narrow streets, “Share the Road” signs can also be erected to encourage cooperative behaviour between cyclists and motorists.

On multi-lane roads where vehicle speeds and volumes do not exceed critical thresholds, the wide shared-use lane, sometimes also referred to as a wide curb lane can be implemented. Adjusting
the pavement markings to reduce the width of the interior travel lanes creates additional space in the curb lane, allowing cyclists and motorists to share the space.

**Shared Use Lane Marking (Bicycle with Chevron)**

Shared use lane markings, also called “sharrows” include the bicycle symbol and chevron. The Shared-use arrow or “Sharrow” symbol can be selectively applied to signed routes and wide curb lane/shared-use lanes in a number of circumstances. The symbol has several valuable functions:

- It indicates to cyclists the appropriate location in the road where they should ride;
- It indicates to motorists where cyclists might be expected to be riding; and
- It provides a visible indicator of the bicycle route network within the roadway corridor.

A few locations where Sharrows might be applied include:

- Uptown/core areas where traffic volume is high, vehicles are moving slowly and there is on-street parking, such as Regina St., a strategically important alternative route to/from Uptown Waterloo running parallel to two high-volume arterial roads;
- Through complex intersections to indicate where cyclists should be traveling; and
- On bridges, overpasses and underpasses where additional space for cyclists is limited.

The Transportation Association of Canada’s (TAC) Guidelines for the Design and Application of Bikeway Pavement Markings provides guidance on the application of shared use lane markings and includes the following recommendations:

- Symbols should be placed immediately after an intersection and 10 m before the end of a block;
- In mid-block locations symbols should be spaced longitudinally at 75m intervals. This spacing may be increased or decreased as needed so they can be evenly spaced within a block;
- The marking may be used on roadways with posted speeds of 60km/hr or less where lanes are wide enough for side-by-side bicycle and vehicle operation but not wide enough for a standard bicycle lane;
- On roadways without on-street parking the symbols should be placed so that the centre of the marking is a minimum of 0.75 m from the edge of pavement or edge of curb; and
- The use of this marking should be considered primarily on routes with high cyclist volumes and/or with less than average sight lines because of road grades. Bicycle route
In the City of Waterloo, a number of streets should be considered for the implementation of Bikeway Boulevards. The majority of these streets have had traffic studies completed and have been previously approved for the addition of traffic calming measures. Candidate streets are:

- Auburn Dr.
- Beechwood Dr.
- Bridle Trail
- Chesapeake Dr.
- Meadowvale Pl.
- New Bedford Dr.
- Eastbridge Blvd.
- Margaret Ave N. from Lincoln Rd to Erb St E.
- Regina St.

Bikeway Boulevard/Bicycle Priority Street

In some areas, particularly urban residential neighbourhoods, traffic calming techniques such as through travel restrictions for cars, traffic circles and reduction in the number of stops can be used to create “Bikeway Boulevard or Bicycle Priority Streets” to allow the cyclist to travel more efficiently by not having to break momentum and stop at frequently placed four way stops.

Sample application of design elements for and Bikeway Boulevard
(Source: Fundamentals of Bikeway Boulevard Planning and Design, 2009)

12.2.3 ADDITIONAL CONSIDERATIONS FOR ON-ROAD BIKEWAYS

There are a number of other important considerations when evaluating potential on-road routes and determining appropriate phasing for the facility implementation. These include:
If pavement width is adequate and implementation is related to adding pavement markings, co-ordinate implementation with the City’s pavement marking program and consider fast tracking those roads that are identified in the Bikeway Network;

Where road platform width is sufficient but existing pavement width is inadequate, schedule implementation at the same time road resurfacing occurs;

Where platform width is not sufficient to accommodate the recommended facility type and where implementing a signed route as an interim solution is not recommended because of roadway characteristics (i.e. traffic volume, mix or speed), the route should be considered as a medium or longer-term priority tied to roadway reconstruction. This provides significant cost savings as compared to constructing the bikeway as a stand-alone project; and

Acquiring additional lands to expand the right-of-way for the sole purpose of implementing a recommended bikeway is not necessarily the best and most efficient use of public funds, however, this may be the only long-term option, if no alternative emerges.

12.2.4 OFF ROAD FACILITIES

Multi-use Trails

Over the years the City has developed an extensive off-road system and has planned for additional future routes that will be constructed when timing and funding is appropriate. The off-road network consists of a hierarchy of trail types from wider, hard surface trails along heavily used main routes through parks and public open space, hard surface and granular surface multi-use trails in boulevards along some arterial roads to soft surface mulched trails, natural earth surfaced trails and boardwalks in natural areas. The intent of the hierarchy is to match user types with the environment in which the trail is located and provide a variety of user experiences.

As illustrated in Exhibit 12.1, a portion of the City’s multi-use trail network has been identified as a “Priority” component of the Bikeway Network. These selected off-road routes form critical links in the city-wide cycling network. The majority of priority trails identified are already in existence and a few are planned for future implementation, namely.

- In the east side of the city these routes include key trails in Forwell Park, Hillside Park, Bechtel Park, and a portion of Anndale Park. A critical primary link in this part of the city is the connection below Highway 85/Conestoga Parkway between Hillside Park and Bechtel Park. The importance and potential of this link has been discussed for a number of years, and given that the on-road link over the Conestoga Parkway on University Ave. is expected to be a long term project, the city should undertake a detailed feasibility analysis of the off road link below the Parkway within the 2 to 5 year time period if not sooner.

- In the west side of the city these include trails in Regency Park, McCrae Park, Trillium Valley Park, a north-south spine trail on the east side of ESPA 19 which continues south towards Kitchener along the hydro corridor.

All “Priority” multi-use trails should be reviewed on a site-by-site basis to determine the appropriate upgrades needed to ensure that these routes conform to minimum acceptable guidelines for two-way bicycle traffic. These guidelines are generally based on a design speed of 30 km/hr for trails with a gradient of less than 4%, and 40-50 km/hr for trails with a gradient greater than 4%. With these design speeds in mind, some key pathway design characteristics to be examined include:

- Pathway width (a minimum of 3.0 m is recommended);
- Pathway surface (asphalt or concrete is recommended to facilitate snow clearing during winter months);
• Horizontal and vertical pathway alignment to allow for adequate sight lines around corners and over hills;
• Clear zones beside the trail bed that are kept free of obstructions such as tree branches, rocks, signposts and signboards etc.; and
• Trail signage positioned in such a manner to provide cyclists with adequate advance warning of upcoming changes to the trail system (e.g. trail junctions, road crossings, trail narrowings, bridges, sharp curves, steep gradients etc.).

Other Trail Types

In addition to multi-use trails, the City of Waterloo develops and maintains a network of trails in buffers, woodlands and environmental lands. These trails are typically 1.5 m wide with a woodchip surface and are not maintained in winter. Although these trails can serve a transportation function, they are primarily developed to control potential encroachment and protect environmental lands, support nature appreciation and active recreational activities. Unauthorized trails through these types of lands will be closed by the City.

In-Boulevard Multi-use Trails

Boulevards vary dramatically from one location to the next depending on width, utilities, adjacent land uses and traffic volumes along the road, and the number of potential conflict points at residential and commercial driveways. The use of the in-boulevard multi-use trail should be considered on a site-by-site basis and the following are some general situations where the application of a boulevard trail may be considered appropriate:

• Urban arterial or collector roads where there is ample right of way between the edge of the road (i.e. back of the curb for urban cross section roads and edge of the shoulder for rural cross section roads) and the limit of the right-of-way to allow for an adequate offset between the road and the trail. A suggested minimum offset is 2.0 m;
• Boulevard segments providing a link between routes entirely or predominantly off-road;
• Route segments along arterial roads where a higher proportion of anticipated users are less experienced cyclists. For example routes that provides a connection to schools or community centres are good candidates;
• Boulevards where there are clear sight lines and where the number of obstacles are relatively few, and these obstacles can be easily relocated or the trail can be routed around them with relative ease; and
• Route segments along corridors with a limited number of commercial or residential driveway entrances (i.e. with driveways or entrances greater than 300 m apart).

Trail Crossings

A significant challenge in integrating an off-road network is how to safely accommodate trail users at road crossings. A number of pedestrian crossing controls used in North America include:

• Mid-Block Pedestrian Crossings
• Intersection Pedestrian Signals (IPS)
• Pedestrian Crossovers (PXOs)

Historically, warrants for pedestrian control and pedestrian crosswalks have generally been based on vehicular and crossing pedestrian volumes in the area. The City of Waterloo Draft Traffic
Control Policy provides a detailed review of the existing warrant system and explains where and when pavement markings, signs and signals can be used. It recommends that the City’s existing warrants be maintained and supported and that the City should not pursue the development of formal warrants beyond those that are currently in place. Refer to the Section 14 Traffic Control Recommendations for more information on warranting.

Generally, the current City of Waterloo practice for mid-block trail crossing includes the following:

- Create and maintain an open sight triangle on each side of the road at the crossing point;
- Signing along the trail to alert trail users of the upcoming roadway crossing;
- Alignment of the crossing point to achieve as close to possible a perpendicular crossing of the roadway in order to minimize the time that trail users are in the traveled portion of the roadway; and
- Curb ramps on both sides of the road.

In addition to these elements, the following may be considered on a site-by-site basis:

- Advance warning signs along the road to alert motorists to the trail crossing provided that the addition of these signs does not result in excessive visual clutter/distraction;
- Dotted white lines defining the limits of the crossover area (no other pavement markings are permitted);
- Trail access barriers (depending on location);
- Realignment of the trail in advance of the crossing to alert users that there is an upcoming change in the character of the trail; and
- Change the streetscape to provide a cue and traffic calming effect for vehicles, provided this does not result in excessive visual clutter or is determined to be a distraction to drivers.

The Intersection Pedestrian Signal (IPS) cannot be used unless warranted by traffic (vehicle and pedestrian) conditions (See Section 14).

The Recommended Bikeway Types as illustrated in Exhibit 12.6 should be used to guide decision-making regarding appropriate types of on and off-road bikeways throughout the city. Final decisions regarding the type of facility will be based on more detailed analysis of individual network routes and consultation with agencies, stakeholders and the public where deemed necessary.

### 12.3 Recommended Phasing / Implementation Strategy

The proposed Implementation Plan as illustrated in Exhibit 12.8 consists of three phases:

- Year 1;
- Years 2-5; and
- Years 5+. 
Community Facilities
- Sports or Recreation Facility
- Arts or Cultural Facility
- Community Centre
- Shopping Centre
- Places of Worship
- Schools

Planned Trail Crossing Improvements
- Existing Trail / Bikeway Crossing
- Planned Trail / Bikeway
- Crossing Improvement
- Required Trail / Bikeway
- Crossing Improvement
- Roundabout
- Traffic Signal

Legend
- Sports or Recreation Facility
- Arts or Cultural Facility
- Community Centre
- Shopping Centre
- Places of Worship
- Schools

Notes:
1. City routes with approved funding include routes previously identified in Capital Works or routes with other dedicated funding.
2. City routes with required funding include all other routes without dedicated funding.
3. Planned crossings have been studied and approved by the City of Waterloo.
4. Required crossings are not yet approved and require further study.

The City of Waterloo will coordinate with relevant authorities where applicable.

Exhibit 12.8
Bikeway and Trails Implementation
16 March 2011
12.3.1 ESTABLISHING PRIORITIES

Priorities were established using a variety of inputs which include:

- The approved City of Waterloo Capital Program;
- The approved Region of Waterloo Transportation Capital Base Program (2008 program and 2009 update);
- On-road routes that are scheduled to receive some form of traffic calming, as approved through various neighbourhood traffic studies;
- On and off-road routes outside of capital programs that were identified by City staff as high priority; and
- Previously approved routes (from the Community Trails and Bikeways Master Plan-2001 and the Region of Waterloo Cycling Master Plan Update-2004).

In addition to these inputs, the Consultant Team used insight and strategies employed on other cycling and trail network master plans developed for other jurisdictions across the country to further define the priorities. These strategies should continue to be considered as City staff work towards implementing the network in the years ahead. Some of these strategies for the on and off-road network include:

- Constructing routes in areas of new development at the time initial construction of these areas takes place rather than retrofitting routes at a later date;
- Closing short gaps in the existing network with a focus on those short gaps that, when completed result in long and continuous routes;
- Focus on creating an even distribution of spine routes in both north-south and east-west directions;
- Focus on areas where current cycling volumes are highest, and where the highest demand is anticipated;
- Focus on routes that facilitate access to key destinations, especially those that have the potential to attract large numbers of “would-be” or potential cyclists, such as those who might be travelling to schools, community centres, and places of employment (especially places with large numbers of employees); and
- Focus on routes that provide direct linkages to transit hubs.

12.3.2 NETWORK IMPLEMENTATION COSTS

A schedule of unit costs used to calculate network implementation costs is provided in Exhibit 12.9. Estimated unit costs for the construction of on and off-road bikeways are based on averages obtained from recent construction projects within Waterloo Region, as well as other municipalities across Ontario. They should be used as a guideline for establishing the costs for implementation of bikeway segments. The unit costs assume typical conditions for construction. These unit costs (in 2010 dollars) are based on the following assumptions:

- Estimates for on-road bikeways assume bi-directional facilities (i.e. one way on both sides of the street);
- Estimates do not include the cost of property acquisitions or utility relocations;
- Costs associated with major site-specific projects such as bridges, railway crossings, retaining walls and stairways are not included in the estimate;
- Annual inflation, which includes increased cost of labour, materials, fuel etc., is not factored into these costs; and
- Professional services and/or staff time for detailed design and all applicable taxes are not factored into these costs.

### Exhibit 12-9: Unit Costs for Various Types of Bikeways

<table>
<thead>
<tr>
<th>Route Type</th>
<th>Cost per kilometre</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On-Road Routes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Add 1.5m Bike Lane as part of the construction of a new road</td>
<td>$200,000</td>
<td>Cost of additional asphalt and markings only. Assumes road project pays for curbs, catch basin leads, road pavement structure</td>
</tr>
<tr>
<td>Add 1.5m Paved Shoulder when an existing road is scheduled for resurfacing</td>
<td>$55,000</td>
<td>Cost of asphalt and edgeline marking. Assumes adequate base already exists in granular shoulder (i.e. no additional width or depth required)</td>
</tr>
<tr>
<td>Retrofit existing two lane road with wide-shared use lane (on typical road with 1 lane in each direction)</td>
<td>$7,000</td>
<td>Repainting only (includes removal of existing lines, repainting of lane markings, addition of sharrow symbol every 75m (durable paint), addition of share the road signage)</td>
</tr>
<tr>
<td>Retrofit an existing road with wide-shared use lane (on typical road with 2 lanes in each direction)</td>
<td>$13,000</td>
<td>Repainting only (includes removal of existing lines, repainting of lane markings, addition of sharrow symbol every 75m, addition of share the road signage)</td>
</tr>
<tr>
<td>Retrofit an existing two lane road to include bikeway avenue features</td>
<td>$80,000</td>
<td>Blended price based on different types of bikeway avenue features and a typical/average spacing of these features</td>
</tr>
<tr>
<td>Retro-fit an existing road with bike lanes (line painting and signage)</td>
<td>$13,0000</td>
<td>Repainting only (includes removal of existing lines, repainting of lane markings, addition of bike lane symbol every 200m, addition of bike lane road signage)</td>
</tr>
<tr>
<td>Add on-road signed route along an urban street</td>
<td>$2,000</td>
<td>Assumes five &quot;bike route&quot; signs each side per kilometre in urban areas (10 signs total), assumes cost to supply and install each sign. Does not include allowance for other route signing systems (i.e. street blade signing, route map/orientation signing)</td>
</tr>
<tr>
<td><strong>Off-Road Routes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construct new 3.0m wide multi-use trail</td>
<td>$140,000</td>
<td>Assumes normal site conditions</td>
</tr>
<tr>
<td>Upgrade existing 3.0m wide multi-use trail to an asphalt surface</td>
<td>$50,000</td>
<td>Assumes normal site conditions</td>
</tr>
</tbody>
</table>

**Notes:**
1. Cost for on-road routes are for facilities on both sides of the road.
Exhibit 12.10 provides a summary of length and estimated implementation costs by facility type and implementation phase. As each route segment becomes a priority for construction, a more detailed assessment as part of the design process will be required to determine site-specific conditions and design details. Detailed cost estimates can then be developed from this work.

**Exhibit 12-10: Bikeway / Trails Network Statistics in City of Waterloo**

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Length (km)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXISTING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bike Lane</td>
<td>21.6</td>
<td>N/A</td>
</tr>
<tr>
<td>Paved Shoulder</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Bikeway Boulevard</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Signed Route</td>
<td>9.7</td>
<td>N/A</td>
</tr>
<tr>
<td>Multi-use Trail</td>
<td>127.2</td>
<td>N/A</td>
</tr>
<tr>
<td>Priority Multi-use Trail</td>
<td>1.6</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Subtotal Existing</strong></td>
<td>160.1</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>PROPOSED YEAR 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bike Lane</td>
<td>4.8</td>
<td>$45,770</td>
</tr>
<tr>
<td>Paved Shoulder</td>
<td>0</td>
<td>$0</td>
</tr>
<tr>
<td>Bikeway Boulevard</td>
<td>0</td>
<td>$0</td>
</tr>
<tr>
<td>Signed Route</td>
<td>2.3</td>
<td>$4,500</td>
</tr>
<tr>
<td>Multi-use Trail</td>
<td>1.3</td>
<td>$0</td>
</tr>
<tr>
<td>Priority Multi-use Trail</td>
<td>0.4</td>
<td>$54,070</td>
</tr>
<tr>
<td><strong>Subtotal Year 1</strong></td>
<td>8.8</td>
<td>$104,340</td>
</tr>
<tr>
<td><strong>PROPOSED YEARS 2-5</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bike Lane</td>
<td>15.2</td>
<td>$670,410</td>
</tr>
<tr>
<td>Paved Shoulder</td>
<td>1.6</td>
<td>$87,230</td>
</tr>
<tr>
<td>Bikeway Boulevard</td>
<td>4.8</td>
<td>$384,105</td>
</tr>
<tr>
<td>Signed Route</td>
<td>15.0</td>
<td>$30,350</td>
</tr>
<tr>
<td>Multi-use Trail</td>
<td>9.4</td>
<td>$258,875</td>
</tr>
<tr>
<td>Priority Multi-use Trail</td>
<td>3.8</td>
<td>$238,280</td>
</tr>
<tr>
<td><strong>Subtotal Years 2-5</strong></td>
<td>49.8</td>
<td>$1,669,250</td>
</tr>
<tr>
<td><strong>PROPOSED YEARS 5+</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bike Lane</td>
<td>18.9</td>
<td>$501,650</td>
</tr>
<tr>
<td>Paved Shoulder</td>
<td>0</td>
<td>$0</td>
</tr>
<tr>
<td>Bikeway Boulevard</td>
<td>4.1</td>
<td>$331,820</td>
</tr>
<tr>
<td>Signed Route</td>
<td>22.0</td>
<td>$43,760</td>
</tr>
<tr>
<td>Multi-use Trail</td>
<td>50.1</td>
<td>$4,053,445</td>
</tr>
<tr>
<td>Priority Multi-use Trail</td>
<td>12.4</td>
<td>$804,850</td>
</tr>
<tr>
<td><strong>Subtotal Years 5+</strong></td>
<td>107.5</td>
<td>$5,735,515</td>
</tr>
<tr>
<td><strong>Grand Totals</strong></td>
<td>326.2</td>
<td>$7,509,109</td>
</tr>
</tbody>
</table>
The implementation of the City-owned portion of the network can be funded in a number of different ways:

- Cycling facilities on new roads within new development areas should be built and funded by development, through development agreements with the City;
- On-road facilities on existing arterial and collector roads in growth areas, that are to be widened to accommodate growth, may be funded wholly or in part through Development Charges;
- On-road facilities on existing roads in established areas of the City will be funded through City tax revenues;
- Developers of new residential and commercial subdivisions should be required as part of the planning and approval process to construct new off-road pathways and connections to the network recommended in the Waterloo Transportation Master Plan; and
- Partnership and grant programs through various provincial and federal government programs such as the ‘Gas Tax’ and the current economic stimulus program.

12.3.3 IMPLEMENTATION RECOMMENDATIONS

As implementation of the network moves forward and continues to evolve it is recommended that the City should:

- Use the Implementation Plan as illustrated in Exhibit 12.8 as the guide to the installation and upgrading of network facilities over time;
- Use the strategies and inputs that were used to shape the Recommended Network and Implementation Plan to continue to refine the network and priorities over time;
- Continue to engage the Ministry of Transportation regarding the completion of critical network links across the Conestoga Parkway;
- In order to implement the active transportation infrastructure recommendations, and develop the associated policies and programs of this master plan, review the need for a staff person to oversee all aspects of active transportation within the City of Waterloo. This “Active Transportation Program Manager” should be funded from the City's parking budget as the function of this position is to reduce reliance on the auto through the provision of alternative, sustainable forms of transportation, and therefore, reduce the overall need for auto parking across the City.
- Given that Active Transportation in general involves many City departments, it is further recommended that an “Active Transportation / TDM Manager” position be centralized within the Chief Administrator's Office.
- Share the Recommended Network and implementation plan with its municipal neighbours to ensure that routes linking Waterloo with the surrounding municipalities is completed in a timely and cooperative manner;
- Share the Recommended Network and implementation plan and continue to work in close partnership with the Region of Waterloo and the Regional Cycling Advisory Committee with regard to routes on Regional roads throughout the city;
- Ensure that appropriate resources are allocated for the expansion of the network; and
- Ensure that appropriate resources are allocated for the maintenance of the network, and that this allocation expands in concert with expansion of the network over time.
13. TRAFFIC CALMING

An updated traffic calming policy was developed by the City of Waterloo and IBI Group dated February 4, 2009 as is included in Appendix D of this TMP.

The aim of the new Traffic Calming policy is to provide rationale and recommendations on implementing traffic calming that builds upon the strengths of the previous policy, and establishes a methodology for traffic calming measures and procedures tailored to the City of Waterloo. The new traffic calming methodology aims to create a balance between the conflicting needs of the service providers by recognizing a shift in transportation and urban design principles.

This Traffic Calming policy incorporates a number of key principles, including the following:

- Vision statement of the City of Waterloo TMP,
- Reflect the shift away from an auto dominated society,
- Support and encourage healthy lifestyles and safe communities,
- Support the shift towards an intensified urban form,
- Reflect the way the City is being planned for the next 20 years by promoting and encouraging a sustainable transportation approach,
- Support the vision of the Regional TMP for a transit oriented transportation system,
- Consider the cumulative impacts of traffic calming on emergency response times;
- Encourage and support walking and cycling of all ages and levels of ability,
- Support Walking School Bus and Active and Safe Routes to School practices, and
- Provide a mechanism to review and select any traffic calming measures that best serves the issues identified.

13.1 Traffic Calming Methodology and Measures

13.1.1 TRAFFIC CALMING METHODOLOGY

Traffic calming has traditionally only been considered for lower order streets as seen in neighbourhoods, sub-divisions and around schools. However, there has been a significant shift in how the higher order roads such as Arterial and Major Collectors are now being planned and designed. They are being seen as multi-modal transportation corridors where all modes of transportation are equally planned and designed for within the municipal right-of-way. This new ‘Complete Streets’ concept includes traffic calming incorporated within the streetscape design.

The Region of Waterloo has recently prepared new “Implementation Guidelines for the Design of Context-Sensitive Regional Transportation Corridors”. These guidelines revise the way Regional Road corridors will be planned and designed, and support the City’s approach to Complete Streets. Cities that place an emphasis on walking, cycling, connectivity to transit systems and overall intelligent land use strategies to promote wider travel choice are more likely to become an accessible place and therefore, sustainable place.

13.1.2 TRAFFIC CALMING MEASURES

There are a number of different traffic calming measures that can be used to achieve the street design concept of Complete Streets. Traffic Calming studies should consider a wide range of
measures that can be implemented. An update to the traffic calming “toolbox” for the City of Waterloo should include:

<table>
<thead>
<tr>
<th>Active Traffic Calming</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vertical Deflections</strong></td>
</tr>
<tr>
<td>• Speed humps, speed cushions and speed tables</td>
</tr>
<tr>
<td>• Raised Crosswalks</td>
</tr>
<tr>
<td>• Raised Intersections</td>
</tr>
<tr>
<td>• Textured Pavement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passive Traffic Calming</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Neighbourhood and Location-Specific Signage (NOTE: does not include Stop Signs)</td>
</tr>
<tr>
<td>• Vehicle-Activated Traffic Calming Signs (VATCS), i.e. Radar Speed Signs</td>
</tr>
<tr>
<td>• Pavement Colourization</td>
</tr>
<tr>
<td>• Pavement Warning Markings and Reflective Pavement Markers</td>
</tr>
</tbody>
</table>

It should also be noted that the use of Stop Signs should not be included as a traffic calming measure. Stop signs are addressed in the Traffic Control Recommendations in Section 14 of this TMP as they are not intended as traffic calming devices.

**13.1.3 CONTEXT SENSITIVE IMPACTS AND TRADE-OFFS**

Any potential installation of traffic calming measures must consider and balance the pros and cons of the installation using criteria that includes, at a minimum, traffic operations and effectiveness, public safety, measure-specific or cumulative impacts on emergency response times, impacts on transit operations (where applicable), property impacts, aesthetics and capital and life cycle cost.

For example, vertical measures, particularly speed humps and speed cushions are relatively low cost items compared to most other physical forms of traffic calming and are proven to have the most impact upon speeding traffic. However, they create some real and perceived impacts to transit, winter maintenance operations and especially emergency response. Alternatively, horizontal deflecting measures (i.e. bump-outs, chicanes, roundabouts at intersections), deflect vehicle paths laterally. They have minimal impacts upon services and operations but in general, also have less impact upon speeding traffic.

Increased cumulative use of certain types of traffic calming devices will negatively impact emergency (fire) vehicle response times, and may result in the need for additional fire stations and staff to maintain Council-approved response times.
13.2 Policy Recommendations

This new recommended policy involve a number of changes to the City of Waterloo’s Traffic Calming Policy. The updates to the decision making process for traffic calming better reflect the City’s key principles. They are outlined in four stages (Initiation, Review, Study and Approval) and are summarized in the following sections.

13.2.1 METHOD OF INITIATION

An initial request to consider the use of traffic calming anywhere in the City of Waterloo can be made by an interested resident or residents, a ward Councillor, an established community organization including a Neighbourhood Association, School Council or Business Association and/or a municipal department of the City of Waterloo.

It is also important that emergency service providers become involved in any consideration of traffic calming at the initial consideration stage. In Waterloo this includes:

- Waterloo Fire Rescue
- Waterloo Regional Police Services
- Regional Emergency Medical Services (EMS).

Grand River Transit should also be consulted when the area for traffic calming consideration involves GRT routes.

13.2.2 METHOD OF REVIEW

When an initiation request is made, City staff should undertake a two-part screening investigation using the following warranting criteria taken from Appendix 1 of the existing policy with further modifications:

Exhibit 13-1: Proposed Technical Traffic Calming Warrants

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>MEASUREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phase 1</strong></td>
<td></td>
</tr>
<tr>
<td>Operating Speed (85th percentile)</td>
<td>Recorded &gt; than 10 km/hr over posted limit</td>
</tr>
<tr>
<td>Motorized Traffic Volumes:</td>
<td></td>
</tr>
<tr>
<td>Local Street</td>
<td>Counted &gt; 900 vpd</td>
</tr>
<tr>
<td>2-lane Collector Street</td>
<td>Counted &gt; 2,000 vpd</td>
</tr>
<tr>
<td><strong>Phase 2 If Phase 1 Minimums Are Met</strong></td>
<td></td>
</tr>
<tr>
<td>Cycling / Pedestrian Traffic Volumes</td>
<td>Counted or Observed</td>
</tr>
<tr>
<td>Collision History</td>
<td>Recorded</td>
</tr>
<tr>
<td>Emergency Response Use</td>
<td>Input</td>
</tr>
<tr>
<td>Transit Use</td>
<td>Input</td>
</tr>
<tr>
<td>Road Grade (max. 8%)</td>
<td>Calculated</td>
</tr>
<tr>
<td>Proximity to Schools and School Crosswalks</td>
<td>Observed</td>
</tr>
</tbody>
</table>
The Review/Warranting Process extending through the Phase 1 and Phase 2 screening investigations should not require polling of residents to determine any minimum level of support from the affected or general community, as required by the City’s current Traffic Calming Policy. Resident input will be collected and considered if a Study Process is found to be warranted from the Phase 1 and 2 investigations, but should not dictate whether a study is initiated. This policy change is recommended for a number of reasons, including the impact that traffic calming has on everybody using public streets (more than just the abutting residents), the change in resident circumstances and opinions, the changes in neighbourhood occupancy, the ability for early implementation (at the time of construction) and the duty of City Council to address traffic issues in the City.

13.2.3 STUDY PROCESS

The revised Traffic Calming Study process recommended for the City of Waterloo is shown on Exhibit 13-2, and as described as follows:

Exhibit 13-2: Recommended Traffic Calming Study Process

- City Staff will report the results of the Phase 1 and 2 screening investigation, and where the results warrant further consideration of a traffic calming program, Council should be asked to authorize City Staff to commence a Traffic Calming Study of the subject location or area.

- A Traffic Calming Study should be designed to include consultation with affected residents, the general community and involved stakeholders including City and Region departments.

- There should be no limitations on the types of traffic calming measures to be considered in Traffic Calming Studies. Instead, the Studies should evaluate all appropriate measures, with appropriateness determined by traffic conditions, terrain, adjacent land use, stakeholder and public input and best practice information on the application and effectiveness of traffic calming measures elsewhere in the City and Region, and in other comparable cities.

13.2.4 APPROVAL PROCESS

Traffic Calming Studies should include community involvement in a form and scope appropriate for each study. This should include a minimum of two (2) points of contact with the community and general public to: 1) discuss the problems and improvement options, and 2) to discuss the preferred traffic calming plan.
The final decision to implement a Traffic Calming Study should rest solely with City Council in response to technical information provided by the Study and input from affected residents and the larger community.

Any approval of a Traffic Calming Study should include a monitoring program to measure the degree of traffic change provided by the program up to two (2) years following installation.
14. TRAFFIC CONTROL

Traffic control measures, such as stop and yield signs, cross walks, speed limit signs, roundabouts and other traffic calming devices, aid in the timely recognition and understanding of a potential road conflict when they are applied correctly. Consistent and appropriate application of traffic control measures help road users properly react to “unexpected” events or situations, making roads safer to use.

A warrant is a method of determining the necessity for a traffic control measure and incorporates the following elements:

- **Logical and Consistent Application**
- **Priority Installations** – A jurisdiction may need to prioritize their installation of traffic control measures based on available funds and resources.
- **Installation Responsibility** – The Ontario Traffic Manual (OTM) provides a basis for road authorities to generate or update their own guidelines and standards.
- **Fundamental Responsibility** - The traffic practitioner’s fundamental responsibility is to exercise engineering judgment and experience on technical matters in the best interests of the public and workers.
- **Funding Responsibilities** – Changes in an area can create a warranted traffic control device. The City of Waterloo and Region of Waterloo can make use of traffic control warrants to determine potential needs and responsibilities.

It is important to stress that regardless of the location, the best means to achieve effective and safe traffic control is through the uniform application of realistic policies and standards within a municipality. Warrants for traffic control devices assist in attaining these goals.

14.1 Traffic Control Measures

14.1.1 TRAFFIC SIGNAL WARRANTS

According to Highway Traffic Act section 144(31), traffic control signals can only be installed in accordance with an approval obtained from a person designated to give such approvals by the municipality that has jurisdiction over traffic control signal systems. In the Region of Waterloo, the Region has this jurisdiction over all traffic controls, including those on local municipal roads.

The Region of Waterloo no longer supports installation of unwarranted signals no matter who pays. The reasons for this strong stance against unwarranted traffic control signals can be summarized as follows:

- While the public often equate traffic signals to enhanced intersection safety, Regional collision data shows that at least twice as many collisions occur at signalized intersections compared to stop-controlled intersections;
- Studies show that signals generally do not improve pedestrian safety, and in the Region their studies show that the majority of pedestrian collisions occur at signalized intersections. Rather than installing unwarranted signals, the Region is making increased use of raised pedestrian refuge islands (without railings) and roundabouts to enhance pedestrian safety on their regional roads;
Speed studies by the Region show that the average speed approaching a signalized intersection is higher than approaching a stop-control or uncontrolled intersection;

Un warranted signals cause travel delays that frustrate some drivers, resulting in decreased driver compliance through the intersection and shortcutting on other streets to avoid the unwarranted signals; and

Unnecessary driver delays and idling at unwarranted signals increases fuel consumption, carbon emissions and noise which all have negative environmental effects.

There are several possible justifications for traffic signals, including:

- Minimum vehicle volume in which signalization can be used to minimize total average vehicle delay at the intersection;
- Delay to cross traffic, where the traffic on the side street suffers excessive delay or hazard in entering or crossing the main street;
- Collision experience, where an unsignalized intersection has an unusually high collision record; and
- Pedestrian volume and delay, where the traffic volume on the main street is so heavy that pedestrians experience excessive delay or hazard in crossing the main street or where high pedestrian crossing volumes produce the likelihood of such delays.

14.1.2 MODERN ROUNDAUBTS

The modern roundabout is an unsignalized intersection in which traffic moves around a central island of varying size and design in a one-way direction. Roundabouts are engineered to offer several potential advantages over signalized and stop controlled intersections, including improved safety performance, less delay, shorter queues (particularly during lower volume periods), reduced speeds, and improved aesthetics for community enhancement. In some applications, roundabouts can avoid or prolong the need for expensive widening of an intersection approach that would otherwise be necessary under traffic signal control.

Modern roundabouts include specific design and traffic control features to promote slower entry speeds, safer driving conditions, and smooth and continuous flow. The fundamental principles of a modern roundabout that distinguish it from other circular intersections are:

- **Yield at Entry** - Traffic within the circulatory roadway has priority and entering vehicles must yield. This creates a smooth flow and eliminates the possibility of congestion developing within circulatory roadway;

- **Traffic Deflection** - Traffic entering the roundabout is directed or channelled to the right with an appropriate curved path into the circulating roadway that avoids the central island. This deflection helps to reduce speed as it forces drivers to make a change in direction when entering the roundabout; and

- **Geometric Curvature** - The radius of the circulatory road and the angles of entry can be designed to slow the speed of vehicles. Key geometric design parameters and the fastest speed path are critical to achieve proper design.
Based on the findings to date regarding a number of successful roundabouts in Waterloo Region, Ontario and North America, modern roundabouts are well suited to the operating speeds, traffic volumes, and vehicle types found on many of the City of Waterloo roadways.

The feasibility and benefit of providing a modern roundabout should be determined through an Initial Screening and Intersection Traffic Control Study and should be considered where:

- The installation of traffic signal control at an existing intersection has met the applicable warrants;
- At a new City road intersection; and/or
- Improvements at a City road intersection to address safety or capacity concerns.

14.1.3 OTHER MEASURES

A number of other measures were also evaluated for this TMP. They have less impacts on the TMP and are therefore not included. For more details on Pedestrian Signals, Stop Control, All-Way Stop Control, Yield Control and Pedestrian Crosswalks, refer to the Draft Intersection Control Policy (September 16, 2009) located in Appendix E.

14.2 Policy Recommendations

14.2.1 POLICY OPTIONS

Based on a review of the existing City of Waterloo warrants and practices, and those being applied in other jurisdictions, three policy options were identified for the City dealing with traffic controls:

- Provide additional warrants for traffic control devices not currently covered by the City’s warranting procedures;
- Modify existing City warrants to adhere to provincial/federal standards and/or recent research findings; or
- Maintain existing City warrants.

14.2.2 TRANSPORTATION MASTER PLAN RECOMMENDATIONS

It is recommended that the City maintain their existing traffic control device warrants, and introduce the new warrants for the use of roundabouts. By maintaining and expanding the City’s existing traffic control device warrants, the following benefits may be realized:

- Provide a relatively consistent application of traffic control;
- Establish priority funding of traffic control devices in a fair and logical approach;
- Reduce cases where traffic control is excessive or inappropriate, which causes additional person-delay and emissions;
- Reduce the potential for road user apathy and non-compliance, which may lead to an increase in collision potential;
- Facilitates the ability to effectively regulate and enforce traffic regulations and by-laws; and
- Provide the development community with a benchmark for establishing appropriate traffic control devices related to their development proposal impact.

In terms of implementing these recommendations, it is recommended that City staff, in association with the Region of Waterloo as required, continue to provide advice and documentation to Council on the appropriateness of proposed traffic control devices and that the impacts of varying from approved warrants be clearly documented.

In addition, the City should pursue opportunities to educate the public with regards to proper traffic control applications and the reasons behind the warrants that they have established. The City’s existing web site, in association with the Region’s web site, can both include valuable resource information relating to transportation matters such as a Speed Watch Program, Red Light Cameras, roundabout use, truck routes, the bicycle network, etc. The City’s web site and public correspondence (i.e., public information centres, responses to resident inquiries) are also good opportunities to provide the general information to inform residents of the rationale behind their warranting procedures.
15. PARKING MANAGEMENT

As in any municipality, the City of Waterloo enforces specific parking rules and regulations on and off public roadways. The TMP addresses the four main issues associated with parking in the City:

- Uptown Waterloo Parking
- Parking as part of Transportation Demand Management;
- Overnight On-Street Parking; and
- Parking Guidelines.

15.1 Uptown Waterloo Parking Cost

There are approximately 3,370 parking stalls in the Uptown Waterloo BIA area. About 2,000 stall are off-street with cost for use charged by the City. Another 1,130 are private stalls with rates dictated by the private sector. The approximately 240 remaining stall are located on streets within Uptown Waterloo and are available for from one to two hours at no cost.

For Uptown Waterloo, the TMP recommends that the City should continue to apply the guiding principles and recommendations from the 2008 Uptown Parking Strategy summarized as follows:

1. Maintain an appropriate supply of affordable, secure, convenient and appealing shared public parking that is accessible to all segments of the community.

2. Enhance the attractiveness of Uptown Waterloo by utilizing progressive urban design principles that support compact urban development, walk ability, safety, security and visual appeal.

3. Encourage and support sustainable economic development in the urban core by engaging the private sector in partnerships for the provision of strategically located municipal parking structures.

4. Provide facilities and programs that support public transit, taxis, ride sharing, cycling and walking by demonstrating Transportation Demand Management Leadership.

5. Operate as a financially self-sustaining parking enterprise in order to effectively deliver services that support good urban design, economic development and transportation demand management.

6. Engage the community in consultation to support decision making and operate with transparency by regularly communicating with Community stakeholders.

The conclusions from this Strategy do not require any refinement. However, periodically, the City’s parking by-laws are reviewed and refined to meet the changes of legislation and the needs of the community. It is recommended that these reviews include consideration of the cost being charged for public parking, and of the fines charged for parking infractions. The goal here should be to ensure that while the cost of public parking is reasonable in Uptown Waterloo, it does not discourage the use of transit, cycling, walking and other Transportation Demand Management initiatives (i.e. ride sharing) as promoted in the Uptown Parking Strategy and the TMP. Commuters in particular can be encouraged to use alternative modes of travel to and from the Uptown by raising the daily and monthly parking charges at municipal lots.
An ample supply of inexpensive parking competes directly with the use of public transit and active transportation. To minimize the impacts of this competition on transit ridership for example, it is important to ensure, as a rule of thumb, that the cost of parking is generally more than the cost of transit. For example, the current cost of a Grand River Transit monthly adult pass is $60, compared to the cost of a monthly public parking permit from $52.33 (Tier 4) to $77.03 (Tier 1) excluding taxes. The City should ensure that all Tier 1 to Tier 4 monthly public parking permit rates are maintained above the monthly adult transit pass rate.

In summary, the cost of parking can affect people's decisions on how to travel. By reducing financial incentives to drive, the demand for parking can be reduced. By structuring parking pricing to discourage all-day parking, commuters will be encouraged to find less expensive ways to travel, such as car-pooling, walking, bicycling and using transit. This can be accomplished with policies that limit the number of hours a car can park, or increasing the cost of parking. Pricing structures that facilitate parking for business-oriented customers in Uptown Waterloo can be achieved by providing low cost short-term parking, or free on street parking (as currently done in Uptown Waterloo). The challenge is to find pricing options that encourage sustainable travel behaviour, while allowing customers easy access to local businesses.

15.2 Parking as Part of Transportation Demand Management (TDM)

The cost and supply of parking in a city is one of the most effective measures supporting Transportation Demand Management (TDM). Parking cost and supply heavily influence travel decisions made by the public, especially involving long-term or “storage” employee commuter parking. In response, the Region of Waterloo has developed a TDM parking and trip reduction strategy called travelwise with the goal to shift individual commuters to transit, carpooling, cycling and walking instead of auto use. The results are intended to reduce the demand for parking in the city, and improve employee health, productivity and retention. The City of Waterloo is a funding partner in travelwise along with the Region, the Cities of Kitchener and Cambridge and Transport Canada.4

Examples of some of the employers focused on by travelwise included Uptown Waterloo, the City of Waterloo and major employers such as Sun Life. The strategy targets people who are willing and able.

The travelwise strategy is intended to encourage parking supply reductions for new developments where the developer provides specific TDM initiatives. These can include:

- access to transit;

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4 The travelwise strategy was developed by Transport Canada ecoMOBILITY, the Region of Waterloo and BA Group.
• pedestrian-friendly site design;
• bike storage and change facilities;
• reduced heat island effect of the project provided by reduced surface asphalt;
• provision of car-sharing program and transit passes; and
• and provision of preferred parking for alternative fuel vehicles.

The methodology and checklist approach used to implement these types of reduced parking incentives are used in some other Canadian cities, and are further discussed as part of section 18 of the TMP.

15.3 Overnight On-Street Parking

The City Traffic and Parking By-law prohibits vehicles from parking on municipal streets for more than three consecutive hours to encourage turnaround and to maximize the on-street parking supply as well as to limit other nuisance type concerns. On-street parking is also prohibited between the hours of 2:30 AM and 6:00 AM. This overnight on-street parking restriction applies to all areas of the City, and was originally intended to ensure parked vehicles would not disrupt street maintenance, limit municipal liabilities as well as limit nuisance concerns and enhanced crime prevention.

Prohibiting overnight parking on-street in the City of Waterloo only during the winter months leaves the streets available as a parking facility (during the summer months), which is one element of the Complete Streets approach being promoted by the TMP. In considering this type of change, factors including increased nuisance concerns and elimination of crime prevention elements would need to be considered. In addition, it is recognized that this would not apply across the entire city, but within specific areas that would be selected through a detailed and systematic review program developed by staff.

15.4 Parking Guidelines

15.4.1 RAPID TRANSIT PARKING STRATEGY

The Region of Waterloo conducted a pilot Station Area Study for its proposed rapid transit system⁵, which reflects one of the basic principles of Transit Oriented Development, which is:

REDUCED PARKING STANDARDS

*By reducing parking standards to reflect increased transit use and walking, the amount of site area that can be used for active uses or public amenities increases.*

Furthermore, the Station Area Study includes the following design guidelines for the provision of parking in Rapid Transit Station Areas:

*Where parking is provided, it should be incorporated into the design of buildings and not allowed to dominate the streetscape or separate pedestrians from the streetfront.*

⁵ The Station Area Plan Pilot Project: Final Report, A Reurbanization Working Group Initiative, IBI Group, February 2008
As Station Areas are designed to reduce reliance on automobiles, parking requirements should be less in number than conventional development standards.

Key guidelines:

- Parking is not allowed in the street frontage or primary pedestrian corridors and should be located in the rear of buildings, in the interior of blocks or in underground structures;

- Consolidated below grade parking is strongly encouraged;

- Shared parking should be strategically located to encourage users to walk past storefronts; and

- Surface parking should be screened from view and well lit.

15.4.2 URBAN DESIGN MANUAL

The City of Waterloo’s Urban Design Manual which came into effect in 2009 contains guidelines on the design of parking structures that are well integrated into the site and building design, and maintain a pedestrian friendly streetscape. The site plan standards included in the Urban Design manual and implemented through the Zoning Bylaw deal with parking standards, barrier free parking, parking lot design and associated sidewalk standards.
16. TRANSPORTATION DEMAND MANAGEMENT RECOMMENDATIONS

16.1 Regional Transportation Master Plan TDM Recommendations

Section 7 of the RTMP includes a list of 52 initiatives that are recommended as TDM strategies to be implemented in the Region of Waterloo in support of Transportation Demand Management (TDM). TDM, branded as Travelwise by the Region, is a general term for strategies that result in more efficient use of transportation resources by influencing how, when and why people travel within a municipality. These 52 initiatives fall into four categories as follows:

- Land Use and Transportation Integration;
- Transportation Supply;
- Education, Promotion and Outreach;
- Travel Incentives and Disincentives.

Of these 52 RTMP initiatives, the target market for the following 11 initiatives is “Community Wide” with implementation being the responsibility of the municipalities. The City of Waterloo must determine which of the following Regional TDM initiatives it will incorporate into its policies and practices. It is also expected that any initiative that involves transit planning, service, infrastructure and information will be the responsibility of the Region through Grand River Transit:

16.1.1 SHORT TERM PLANNING HORIZON (0-5 YEARS)

Land Use and Transportation Integration

1. Create a standardized list of TDM initiatives, based on real world experience, to enable developers to reduce auto trip numbers and parking spaces;

2. Establish maximum parking requirements for residential, commercial, industrial and institutional sites;

3. Require road networks to be transit friendly (i.e. grid structure);

4. Review development staging in new communities to ensure high density is contained in initial phasing;

5. Use trees and other green infrastructure to provide shelter, aesthetic value, shade and separation from motorized traffic; and

6. Pursue changes to Leadership in Energy and Environmental Design (LEED) rating systems transportation and parking credits (see more below in Section 16.1).

Transportation Supply

7. Develop an incident detection and management system (IMS) for motorized vehicles that informs drivers of traffic congestion and alternative routes;

8. Expansion of a privately operated shared vehicle program (i.e. Grand River Car Share); and
9. Implement a bicycle sharing program (such as that being promoted at the University of Waterloo).

**Education Promotion and Outreach**

10. Develop separate web based trip planners for cycling and walking, and provide on-route signage and maps;

### 16.1.2 Long Term Planning Horizon (Recommended for Further Study)

**Travel Incentives and Disincentives**

11. Study the use of Transportation Pricing:

<table>
<thead>
<tr>
<th>Road tolls</th>
<th>High Occupancy Toll (HOT) Lanes</th>
<th>Road space rationing</th>
<th>Parking Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestion pricing</td>
<td>Vehicle user fees</td>
<td>Emission fees</td>
<td>Distance based fees</td>
</tr>
<tr>
<td>Area specific tolls</td>
<td></td>
<td>Fuel tax increases</td>
<td></td>
</tr>
<tr>
<td>Distance-based auto insurance</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In developing this City of Waterloo TMP, the TMP Project Team responded generally favourably to these recommended “Community Wide” initiatives. As a result, they are incorporated into the City of Waterloo TMP. However, in terms of the City’s role in implementing these “Community Wide” TDM initiatives, and the potential implications for transportation in the City, most of the initiatives, further clarification from the Region will be requested relative to implementation in the following key areas:

### 16.2 TDM Implementation Tools

It is expect that at the local municipality level, the TDM initiatives for the City of Waterloo will be implemented as part of the Development Agreement process. This needs to be better defined because the opportunities for the City to enter into development agreements are limited, and it cannot be assumed that this tool will be available through the development approval process in all cases. While municipalities have been given the tools to apply conditions through zoning under recent amendments to the Planning Act, the scope of these tools (i.e. details regarding appropriate conditions and how they may be applied) is not well understood in the absence of Provincial Regulations to accompany the legislation.

TDM implementation should also be policy-led. Therefore, both City and Region Councils should have policies on which to make TDM implementation decisions. While the Regional and City TMPs can establish the policy foundation, the Official Plan is the appropriate sources of the policies (see Section 18.3).

A non-land use based approach can also be taken in implementing TDM that does not involve the Development Approval process. This usually involves the municipality setting a role model with TDM initiatives for its employees, for example offering a “cash-out” on free employee parking in exchange for transit passes.

Another example of non-land use based TDM implementation is through related process such as Leadership in Energy and Environmental Design (LEED). While some municipalities are encouraging LEED, some developers are also doing it on their own without any requirement to do
so as part of the current “green thinking” trend. LEED includes 5 transportation-related credits that can support TDM implementation:

- Credit 4.1: Public Transportation Access
- Credit 4.2: Bicycle Storage and Change Rooms
- Credit 4.3: Hybrid and Alternative Fuel Vehicles
- Credit 4.4: Parking Capacity
- Credit 7.1: Heat Island Effect: Non-Roof

Other non-land use TDM initiatives include the building operation certificate program (BOMA Go Green Plus Program) that can be applied to the design of buildings with some TDM-related elements (i.e. access to public transit, provision of cycling facilities).
17. SIDEWALK MAINTENANCE (WINTER CONTROL)

The TMP recognizes and supports the rationale for the City to develop a sidewalk winter maintenance program that reflects the growing need of a changing community. Current City practice is for abutting property owners to clear sidewalks. However, the problems and issues with non-compliance and the City's need to rectify are numerous, and must be considered against the “Complete Streets” approach on which this TMP is based, including what makes a “walkable community” that is “accessible for all”. There is a fundamental need to support this Complete Streets approach, with added support for an Accessible City and the Pedestrian Charter, to ensure that all public sidewalks are accessible for all residents. This includes the timely removal of snow and ice from sidewalks (winter control).

Winter maintenance has been one of the key points raised by the community regarding transportation and mobility in the City of Waterloo, and the number one issue raised by the Grand River Accessibility Advisory Committee. In recent years, the total costs of winter control on City streets each year from 2000 to 2008 ranged from a low of $730,000 in 2006 to a high of $1,390,000 in 2007.

These costs do not include any claims made on the City by members of the community if they trip or fall due to sidewalk conditions. Between January 1, 2001 and December 31, 2010, 69 trip and fall claims were made against the City of Waterloo. The City/Waterloo Region Municipalities Insurance Pool paid out $579,788 to settle claims.

17.1 Current Sidewalk Maintenance Practice

Currently, City staff maintains the following types of sidewalks and pathways:

- Sidewalks in front of City property
- Access sidewalks to City property and for operator/equipment safety
- Sidewalks on highway overpasses
- Sidewalks adjacent back-lotted properties
- Block-to-block walkway links
- Current cost recoverable sidewalks
- Park pathways that are school routes

All other winter maintenance of sidewalks is the responsibility of the abutting property owners(s). The practice of the City, through Snow and Ice Bylaw enforcement and social marketing campaigns, is to clear snow and ice where required at the property owners expense.

17.2 Walkability and Accessibility

Walkability and accessibility mean different things to many Waterloo citizens. To the majority, a snow or ice-covered sidewalk is still passable and therefore walkable and accessible: But to many, particularly vulnerable users such as parents with young children, pedestrians with impairments, and the elderly, this is a significant barrier and potential safety hazard. To a person with an impairment, particularly those vulnerable to falls or users of mobility devices, not only is it a safety
hazard, but is also a social issue as this may restrict them from many of the simple, daily aspects/needs of life the majority of us take for granted.

The current Snow and Ice Bylaw requires the clearing of snow and ice from sidewalks abutting a home or business within 24 hours after the end of a snowfall. Not only does this time frame restrict accessibility for many, but there is inconsistency in when individuals can clear the sidewalk, in addition to the level of consistency of the cleared surface itself. The Bylaw’s time frame is not conducive to the commuter periods, and therefore negatively impacts pedestrians, and transit user commute and recreational trips.

Walkability is a measure of Quality of Life. It is instrumental in developing an Age Friendly Community, a Healthy Community and an Economically Vibrant Community. This point is well documented. A 2009 report by Walkscore, a web site that rates neighbourhoods in terms of pedestrian access, evaluated the effect of “walkability” on U.S. housing prices, using 95,000 real estate transactions. The study found that making it easier for people to get around on foot raised housing values in 13 out of 15 markets.

The report is concluded by Todd Litmann, a transportation economist and executive director of the Victoria Transport Policy Institute, stating:

"Some of the money cities currently spend to increase travel speeds could be spent more efficiently improving the comfort, convenience and security of walking, cycling and public transport."

17.3 Future Conditions

Intensification of the City of Waterloo, particularly in the Uptown core and along the primary corridors, is planning for an increase in future pedestrian and cycling trips. Transit ridership is planned to double in Waterloo by year 2031. All of these modes are highly dependent on the presence and maintenance of the active transportation infrastructure. Therefore, future trips shifting to these modes are subject to this condition being met.

If a lack of pedestrian accessibility to the active transportation and transit infrastructure is experienced due to maintenance issues, it is reasonable to expect that trips by walking, cycling or transit will not be a year-round, viable alternative and therefore, the future number of riders expected will not occur. This in turn means it is reasonable to assume those future trips will be made by the private automobile.

The planned road improvements in the City of Waterloo shown in Exhibit 10-1 result from a planned shift in transit ridership from 4.3% to 8.5% in the city. If this mode share is not achieved, as reported next in Section 18.1, it is expected that there will be an increase in the number of auto trips that will put further pressure on the City’s aging infrastructure, both in terms of Capital Program costs through further road widening, intersection capacity improvements, and Operating costs through various additional maintenance operations.
17.4 Sidewalk Winter Control Options

In 2008, the City considered alternatives to winter sidewalk maintenance as it affects accessibility and level of service. Four options were investigated with associated costs as noted in Exhibit 17.1:

<table>
<thead>
<tr>
<th>WINTER CONTROL OPTIONS</th>
<th>AVERAGE ANNUAL COST</th>
<th>1-TIME COST (EQUIPMENT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maintain Current Level-of-Service</td>
<td>$285,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2. City Clears All City Streets/Sidewalks</td>
<td>$1.2 M</td>
<td>$4.2 M equipment</td>
</tr>
<tr>
<td>3. City Clears All Class 2 and 3 Streets/Sidewalks</td>
<td>$261,000</td>
<td>$900,000 equipment</td>
</tr>
<tr>
<td>4. City Clears Along GRT Routes</td>
<td>$261,000</td>
<td>$900,000</td>
</tr>
</tbody>
</table>

Being cognizant of these costs, the TMP reviewed some further options including those areas of the City that see higher pedestrian traffic, such as Uptown Waterloo, university areas and priority transit routes. Using these as examples would add approximately a further 80km of sidewalk to be cleared at an additional cost in the range of $250,000 per year (based on the 2008 Staff report).

17.5 Sidewalk Winter Control Recommendations

The TMP recommends that the City of Waterloo’s current sidewalk snow clearing program be expanded to promote and enhance safe and accessible pedestrian movement that will encourage greater pedestrian and transit use, and to reduce the negative impact and cost of having to widen more roads and intersections as reported next in Section 18. This recommendation is in addition to the current practice carried out by the City, and should be considered in the next budget process to implement this improved program. This recommendation is made because winter control is a fundamental service provided by the City, and is reflected in the following key City of Waterloo Strategic Plan elements:

- **Our Living Environment** – staff have implemented a Salt Management Plan, and Best Management Practices to reduce the use of road salt to improve Our Living Environment, and the same can be done for winter sidewalk maintenance.

- **A Healthy and Safe Community** – facilitating the safe movement of people and vehicles, and mitigating the limitation to mobility caused by a low winter sidewalk maintenance level-of-service. Note that the Grand River Accessibility Advisory Committee (GRAAC) continues to recommend full sidewalk clearance.

- **Economic Vitality** – maintaining a safe and reliable transportation network is fundamental to the movement of people, vehicles and goods.

- **Partnerships and Collaboration** – Ongoing improvements to services and adding additional services under the Joint Services agreement with the City of Kitchener.
Furthermore, this TMP recommendation for improved winter sidewalk maintenance through enhanced City involvement conforms to the following principles on which this TMP is based:

- The Complete Streets approach and the role of walking;
- The “Accessible To All” guiding principle in the 2007-2010 Strategic Plan;
- The objective to support public transit as a way of reducing roadway network enhancement;
- The objective to enhance community safety;
- Create an inclusive community (furthering accessibility initiatives); and
- Support a vibrant Uptown Core.

It is understood that the City would require time to change its current winter sidewalk maintenance practice, and changes would be developed and phased in to address the increase in winter operation cost and the budget process. The following steps are recommended to make these changes:

- Focus first on the higher existing and future pedestrian areas and high transit ridership routes over the next five (5) years;
- Review the existing program to identify efficiencies in service;
- Increase the existing sidewalk snow clearing program budget by $100,000 per year for the next five years and use the funds to implement improved services in key areas;
- Investigate potential partnerships with key stakeholders including the Region of Waterloo and universities;
- After five years, budget additional funds to expand the sidewalk snow clearing program to meet the expectations of the community; and
- Monitor the impacts of the program and develop a long term strategy to further expand the program where necessary.
18. TRANSPORTATION MASTER PLAN IMPLEMENTATION

18.1 Implications of a Business As Usual Future

In developing this City of Waterloo TMP, a sensitivity analysis was conducted to quantify the potential impacts of not achieving the Complete Streets approach recommended for the City of Waterloo, and the Transit-Oriented approach that is the basis for the new RTMP. This resulting future condition at year 2016 and 2031 is referred to as the Business As Usual (BAU) scenario, where the travel model shares to private automobiles, ride-sharing, public transit, cycling and walking remain basically the same as today, with travel in the City remaining heavily auto-oriented.

Appendix F of this TMP presents traffic levels-of-service (LOS) for year 2016 and 2031 under this BAU sensitivity analysis. This includes a traffic assessment of strategic intersection LOS in Waterloo under the “BAU Scenario” compared to the RTMP “Base Case” in 2016 and 2031. This RTMP Base Case, also termed the Transit-Oriented Scenario, includes rapid transit service and a transit share approaching 29% for trips to central Waterloo.

The results of this BAU Scenario compared to the Transit-Oriented Base Scenario shows that if the Transit-Oriented Scenario is not achieved in the City of Waterloo, the following three major implications for transportation planning are expected to result.

18.1.1 INCREASED LANE-KILOMETRES OF CONGESTED ROADWAY

Exhibit 18.1 illustrates the change in congested roadway lane kilometres forecast on the City of Waterloo roadway network if the BAU Scenario is maintained. By 2031, it is expected to result in a 28% increase in congested lane kilometres compared to the Transit-Oriented Base in the PM Peak Period. This would equate to 172 kilometres of congested roadway lanes by 2031 in the PM Peak Period, or about 40 more lane-kilometres of congested road lanes compared to the Transit-Oriented Base. At a very general level, widening 40 lane-kilometres of major road widening to accommodate BAU traffic growth equates to at least $20 M in construction cost.

Congested lane kilometres is an indicator of the amount of lane kilometres of roadway that would be needed to reduce congestion on the roadway network to an acceptable level below LOS E in the city. With congestion comes increased vehicle emissions, extended travel time and trip lengths and driver frustration and associated safety issues:

Exhibit 18.1 - Lane Kilometres of Congested Roadways in City of Waterloo

<table>
<thead>
<tr>
<th>Horizon Period</th>
<th>Congested Lane-Kilometres</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transit-Oriented Base</td>
<td>BAU</td>
</tr>
<tr>
<td>2016 AM</td>
<td>87</td>
<td>104</td>
</tr>
<tr>
<td>2016 PM</td>
<td>108</td>
<td>113</td>
</tr>
<tr>
<td>2031 AM</td>
<td>127</td>
<td>152</td>
</tr>
<tr>
<td>2031 PM</td>
<td>135</td>
<td>172</td>
</tr>
</tbody>
</table>

18.1.2 SCREENLINE DEFICIENCIES

Exhibits 18.2 illustrates the number of forecasted road capacity enhancements that would be required under the BAU Scenario compared to the Transit-Oriented Base Scenario measured as additional travel lanes needed at a screenline level.
Forecasting of future roadway network deficiencies requires that travel demand and system performance be understood at strategic locations around the City. One way to do this is through the use of screenlines, which are imaginary lines drawn across major transportation facilities in a corridor. Screenlines typically follow a natural barrier to travel, such as a river or freeway, that has limited crossing opportunities. Many screenlines are significant barriers to walking and cycling, and are not very useful tools for examining travel by these modes. As a result, screenline crossing measurements and forecasts are typically for motorized vehicle travel. Since most urban travel is by motorized vehicles, screenline crossing measurements are very helpful to understand existing and future travel patterns at a strategic level.

Exhibit 18.2 – Comparison of Additional Screenline Lane Requirements by 2031
The Transit-Oriented Base would require eight (8) additional travel lanes per direction in the city, which would be provided by existing road widening or new road construction. This compares to 12 additional lanes per direction required under the Business As Usual scenario. As illustrated in Exhibit 18.2, the BAU scenario results in a requirement for one additional lane of travel per direction across University Ave and across the CN Rail line into and from the City of Kitchener compared to the Transit-Oriented Base Scenario. This could involve either widening an existing road or introducing a new road link into this established Kitchener/Waterloo urban area.

18.1.3 ROADWAY LEVEL-OF-SERVICE (LOS)

Technical information provided in Appendix F (Exhibit A.7) shows that if the Transit-Oriented Base Scenario is not achieved in the City of Waterloo, potentially major intersection improvements may be required at 16 key intersections in the City by 2031. These improvements could involve the addition of turn lanes or introduction of modern roundabouts. Four (4) locations are at City/City road intersections, seven (7) at shared City/Region intersections and five (5) at Region/Region intersections as listed below:

**City / City Intersections:**
1. Columbia Street W @ Albert Street
2. Columbia Street E @ Marsland Drive
3. Conservation Drive @ Westmount Road
4. University Avenue E @ Woolwich Street (near New Bedford Drive).

**City / Region Intersections:**
1. Columbia Street W @ Westmount Road
2. Erbsville Road @ Columbia Street W
3. Erbsville Road @ Keats Way
4. Columbia Street W @ Fischer-Hallman Road
5. Fischer-Hallman Road @ Keats Way
6. Fischer-Hallman @ Laurelwood Drive
7. Northfield Drive @ Davenport Road

**Region / Region Intersections**
1. King Street N @ Northfield Drive
2. King Street N @ Weber Street
3. University Avenue @ King Street N
4. Weber Street @ Northfield Drive
5. Westmount Road @ Bearinger Road

Improving the capacity and operational capability of these strategic intersections is expected to cost between a low estimate of about $4.2 M assuming two legs of each intersection are provided with dedicated turn lanes, to a high in the order of $16 M if each intersection was converted to a modern roundabout to accommodate traffic growth. This compares to between about $2 M to $9 M under the transit-oriented base scenario.
18.2 Use of the Transportation Master Plan

The Transportation Master Plan (TMP) is the overarching strategic document that provides a framework for how the City of Waterloo will address its future transportation needs. It describes, anticipates and plans for the strategic movement of people and goods in a transportation system that is "accessible to all".

The TMP is not a provincially legislated document, and therefore has no statutory authority. That authority is provided through the City’s Official Plan by incorporating the main policy directions of the TMP. The primary purpose of the TMP is to guide the City’s transportation-related decision making. It also provides the need and justification for transportation infrastructure projects that require approval under the Municipal Class EA process, thereby satisfying Phases 1 and 2 of that process with problem or opportunity identification and evaluation of alternative solutions.

The TMP also provides the public with clear identification of the role and function of streets within the City, how these streets are intended to operate and how they relate to and impact on the land uses that they serve. This is why the road classification system developed for the TMP is also incorporated into the Official Plan.

In addition, the TMP is not just a plan of infrastructure actions. It also provides the policy frameworks on which to make concrete operational decisions for the City. The TMP has been designed with the City’s Strategic Plan 2007-2010 community vision statement on “accessible to all”, and will help to ensure that this vision is realized as part of further Strategic Plan updates.

18.3 Transportation Master Plan Review and Updates

The City’s TMP is not intended to be a static document. It must be regularly reviewed to ensure it meets the transportation needs of the City. Changing community expectations or growth and development patterns can necessitate a review of the Plan’s primary recommendations, for example involving roadway capacity enhancements or adjustments. This should be done as follows:

- Update the City’s 10 Year Capital Projects – Roads to include the short-term projects recommended in the TMP, including capacity enhancements and adjustments, cycling and trails route development and support facilities;

- Prepare an annual staff report to City Council on the "State of the Transportation System", reporting on local transportation conditions, behaviours, needs and trends with joint input from Public Works Services, Development Services, Community, Culture and Recreation Services and Protective Services plus the Region of Waterloo including Grand River Transit, the City of Kitchener, the Transportation and Trails Advisory Committee, Grand River Accessibility Advisory Committee and neighbourhood associations; and

- To address transportation issues on an annual and consistent basis, this "State of the Transportation System" report should document:
  i. Results of the traffic count updates;
  ii. New trends and technologies in traffic operations and management;
  iii. Uptown Waterloo parking supply and demand;
  iv. Public and private sector TDM initiatives (i.e. car pooling, preferential parking, transit service delivery, flexible work hours, cycling facilities);
v. Status of related Regional initiatives involving transit service and Regional Roads;

vi. Status of provincial initiatives, policies and funding programs; and

vii. Any need to review, amend or update components of the Transportation Master Plan.

The TMP requires regular updating to remain relevant and effective in dealing with the City’s local transportation needs. Therefore, it is further recommended that the Plan undergo a full review at the next five year mandatory review of the Official Plan, and every five years thereafter in association with future statutory assessments of the Official Plan.

18.4 Funding Opportunities

The TMP development included a review of potential federal and provincial funding opportunities to meet the master plan implementation work plan. The following summary of alternative funding sources for transportation infrastructure was prepared based on research conducted by IBI Group, and information obtained from a working paper on the subject prepared by the National Round Table on Sustainable Infrastructure.

18.4.1 PROVINCE OF ONTARIO PROGRAMS

Infrastructure Ontario’s Loan Program has replaced the previous Ontario Municipal Economic Infrastructure Financing Authority (OMEIFA) which was intended to promote healthy and prosperous communities by providing municipalities with more flexibility in investing in much-needed capital infrastructure such as water works, sewage treatment infrastructure, municipal roads and bridges, waste management facilities and public transit. OMEIFA had a $1.12 billion capital reserve, and also issues infrastructure bonds. The money raised by selling infrastructure bonds was used by OMEIFA to provide low-interest loans to municipalities. The investment proceeds from the capital reserve helped subsidize fifty per cent of the interest costs of any funds borrowed through OMEIFA. This was beneficial to smaller municipalities that were not able to borrow in the capital markets because of prohibitive costs.

As the OMEIFA replacement in 2006, Infrastructure Ontario’s Loan Program provides various benefits for public sector borrowers:

- Affordable rates
- Access to capital market financing without any fees or commissions
- Longer terms designed to match the life of the asset
- No need to refinance over the life of the loan
- May be used for any depreciable capital expenditure
- Application and forms available online
- Access to dedicated and experienced staff

Capital expenditures for roads and bridges are eligible for either long-term financing, or short term or construction financing during the construction period of an approved project.

18.4.2 FEDERAL PROGRAMS

Canada Strategic Infrastructure Fund (CSIF) has been helping to support large-scale projects of major federal and regional significance in areas that are vital to sustaining economic growth and enhancing the quality of life in Canada. CSIF projects support infrastructure in the following five investment categories:
• Highways and railways
• Local transportation
• Tourism or urban development
• Water or sewage
• Broadband (telecommunications connectivity)

CSIF has placed emphasis on partnerships with any combination of municipal, provincial and territorial governments, as well as the private sector. Each partnership is governed by specifically-tailored arrangements. Investments are directed to projects of major national and regional significance, and are to be made in areas that are vital to sustaining economic growth and supporting an enhanced quality of life for Canadians. The fund is delivered through negotiated agreements with provincial, territorial or local governments, private partners or non-governmental organizations. Contribution agreements are tailored based on the project requirements. The CSIF is also designed to end in 2012/2013.

Most CSIF funding has also been committed, except for limited funding remaining in Ontario, Yukon, and Newfoundland and Labrador. For these reasons, it is not considered as a viable federal infrastructure funding source for City of Waterloo road works.

18.4.3 DEVELOPMENT CHARGES

A Development Charge (DC) by-law permits a municipality to collect development charges to provide a capital funding source to assist the municipality in providing the infrastructure required for future development. This includes roads and other capital cost items related to growth within the municipality.

In the City of Waterloo, the schedule of development charges is adjusted annually in accordance with changes in the regulated construction index during the previous year. For example, the City of Waterloo DC Bylaw was adjusted on January 1, 2011, increasing the charge for a single or semi-detached dwelling by 1% to $13,662 compared to $13,527 in 2010.

18.4.4 OTHER ALTERNATIVE INFRASTRUCTURE FUNDING MECHANISMS

In addition to the limited opportunities for provincial and federal funding programs for municipal infrastructure construction, and Development Charges as a standard funding source, other tools exist to finance core municipal infrastructure such as roads and bridges. This list is not ranked in any way as it is difficult to capture the advantages and disadvantages of any funding mechanism as used by different, individual municipalities.

User Pay – User fees are now commonly used for municipal services such as libraries, swimming pools, arenas, etc. This is done to help manage the demand for infrastructure and provide more sustainable alternatives. Most user fees are calculated based on a “utility model” that uses the principle that the price of a product (i.e. library services) should reflect the actual costs of producing the product.

The advantages of user pay programs is that it requires strong management of the infrastructure assets that are being charged and can provide opportunities for accessing private sector capital markets (i.e. toll highways, transit systems). The main disadvantages of user pay programs is that there can be social equity issues (some can afford to pay for the service while others cannot), and it is often difficult for political decision-makers to justify and support the user charges compared to the social needs.
User pay is already used in the City of Waterloo transportation system in the form of parking charges and transit rates. To expect that there would be political and public support to extend user pay to other forms of transportation such as toll roads, congestion pricing and even bicycle licensing, enough to generate sufficient funds to support infrastructure development, is not considered viable within the 20 year timeframe of the Transportation Master Plan.

**Transfer Payments** – Transfer payments from one order of government to another can include unconditional block transfers, grants and flexible transfer payments. They can also include permanent dedicated revenue flows such as the 2% of the gasoline tax in Ontario that is directed to public transit.

One advantage of transfer payments is that it is a widely used form of financing infrastructure in Canada, for example the Canada Strategic Infrastructure Fund. The disadvantages include potential social inequities for people who pay for the transfer but do not use the related service (i.e. gas tax when you don not use transit), and there may be no predictability in longer term funding. However, the City of Waterloo already benefits from transportation-related transfer payments to either the City or the Region of Waterloo and this is expected to continue.

**Bonds** – All three levels of government in Canada can issue and sell bonds for infrastructure. Municipal bonds in Canada are uncommon because bonds issued by a Municipal Finance Authority are usually fully guaranteed by the province, and so are considered provincial bonds rather than municipal bonds. The potential use of municipal bonds is also limited by the bond rating of smaller municipalities, and so are not considered a viable funding alternative for City of Waterloo infrastructure funding.

**Trust Funds** – This is termed “earmarked taxation” where a percentage of municipal tax revenue is dedicated to a specific investment area, for example municipal roads. The trust fund must be used for its intended purpose (i.e. to fund road construction). In the USA trust funds provide for most of the federal funding for highways and transit projects.

One of the main challenges with using trust funds for infrastructure funding is to ensure that funded project are equally distributed across the community so that no one area or areas benefit while the entire community pays taxes.

**Tax Increment Financing** – Through tax increment financing, municipalities can reinvest property tax revenues to meet community economic development objectives involving housing development, job creation and core revitalization.

As applied in Ontario, tax increment financing is based on municipal grants and loans that can be given under the Planning Act community improvement provisions. For example, Tax Increment Financing is used by the City of Cambridge to provided funding for community improvements in the Galt City Centre. By calculating a grant or loan on the higher property tax that is generated from development (the tax increment), municipalities can offer eligible developers financing incentives that will put lands and buildings that might not otherwise be developed back into productive use. Such redevelopment can often involve road improvements.

Advantages of Tax Increment Financing include its focus on infrastructure investment as part of community revitalization, and the higher tax generation potential that comes from such revitalization. However, it has only a very limited application in Canada, is not suitable for large scale infrastructure projects and can create risks and liabilities for the municipality in the future if anticipated revenue increases do not materialize.

**Public-Private Partnerships (P3s)** – P3s are financing arrangements that increase involvement of the private sector in public service delivery, and transfer some risk and reward to the public sector.
Ontario examples include the Highway 407 ETR and the York Region Transit VIVA service. Private sector involvement can range from minimal such as garbage collection services, to comprehensive through the designing, building, owning, operating and financing infrastructure (one option for the Region’s planned LRT project). Within these two extremes are various levels of public and private sector involvement that are typically suited to specific projects.

The advantages of P3s include the opportunities for more construction and/or operational efficiencies and risk is transferred to the private sector. One main disadvantage can include strong public and political opposition to P3s. In the context of the City of Waterloo, opportunities for P3s to implement required transportation system developments, except for the public transit system, appear very limited and unrealistic.

**Focused Advertising** – Some municipalities allow the private sector to advertise on public infrastructure. Two common examples include advertising of public transit buses and at stops and stations, and on public golf courses. The same approach can be applied to bikeway and trail systems where private advertising opportunities are offered at strategic system locations.

**Cash-in-lieu of Parking** – On a site-specific basis, municipal councils can, at their discretion, enter into an agreement with a landowner to provide for an exemption from providing the required parking or a reduction in the parking requirement specified in the Zoning By-law. This agreement provides for the owner to make one or more payments of money to the City as consideration for the granting of the exemption or reduction, and sets the basis on which such payment is calculated. In Ontario, cash-in-lieu of parking funds must be saved in a parking reserve fund and reinvested into the supply and management of public parking. Cash-in-lieu of parking is being considered for implementation in the City of Waterloo through the updated Official Plan and associated Zoning Bylaw.

### 18.5 Implementation Through the Official Plan

The City of Waterloo Official Plan (OP) is a statutory planning document which is required by provincial legislation. According to the Draft OP dated June 2010, the City’s transportation system is:

“designed to facilitate the safe and convenient movement of people and goods between land uses within the City and to external destinations. Achieving a healthy and livable City and a transportation system that is sustainable into the future will require placing emphasis on moving people rather than cars – this means managing our travel in order to reduce reliance on the automobile in favour of more active forms of movement such as walking, cycling and transit.

*Managing travel to reduce automobile reliance can occur through a range of measures that can be incorporated throughout all stages of planning, site design and use of lands.*

The transportation component of the new OP will be implemented through the TMP as it related to the following OP components:

**Networks**
- Parks, Trails and Open Space policies;
- Road Network policies; and
- Transportation System Policies.
Transportation

- Objectives;
- Supporting Documents and Implementation (including this TMP);
- Integrating Transportation and Land Use;
- Supporting Alternative Forms of Travel;
  - Pedestrian & Bicycle Travel
  - Transit Travel
- Parking; and
- Emergency Response.

18.6 Implementation Through the Development Approval Process

18.6.1 IMPLEMENTATION THROUGH POLICY

The City of Waterloo TMP provides new opportunities for the City to implement the “accessible to all” vision into the land development review and approval process. A municipality can integrate its transportation plan into the land development process through integrated transportation/land use planning, as illustrated next on this graphic from The Case for TDM in Canada.

Transportation plans dealing with transportation demand (amount and type of travel) and transportation supply (travel mode and infrastructure) are provided by the TMP, and the land use plans by the Official Plan. They can be integrated through the development approval process by how the City addresses transportation system needs including:

1) Transportation Demand Management;
2) Sustainable Transportation Options and;
3) Transportation-Supportive Land Use Practices, all following the Complete Streets approach.

Examples of how TDM policies can be implemented through the planning process include:

- Use parking supply and demand policies in the Official Plan as a specific TDM tool to manage the amount of long term off street parking provided in major employment nodes such as Uptown Waterloo, the university campus areas and major new office buildings;
- Include Official Plan policies that balance the demand for transportation infrastructure (i.e. road widening) with supply to reduce costs and improve transportation system efficiency;
• Require that a TDM plan must be prepared as part of the development application process for commercial/employment projects over a set size; and

• Ensure that the cost of monthly parking permits in municipal lots and garages is more than the cost of a monthly transit pass.

18.6.2 IMPLEMENTATION THROUGH DEVELOPMENT INCENTIVES

Municipalities can also encourage TDM features to be provided as part of development project approval. So far in Ontario, the main focus of these incentives is in the parking provisions of zoning bylaws, including:

• Minimum vs. maximum parking supply standards;
• Inclusion of bicycle parking requirements; and
• Parking as a TDM initiative using already establish LEED criteria and further development approval checklists that can be applied in development approval processes including rezoning, minor variances and site plan approval.

The following example of a TDM Checklist is taken from a number of researched and applied development approval processes in Canada as presented in the Waterloo Region TDM Parking and Trip Reduction Strategy. A custom-made checklist would have to be developed specifically for the City of Waterloo development approval process, but the focus of a TDM checklist in the development approval process is on:

• Site Access
• Public Transit Access
• Parking; and
• Trip Reduction Incentives

This focus can promote pedestrian and cycling use and transit access, reduce parking supply to match expected demand and offer TDM incentives and bonuses. For example, provision of a ride-share program as part of a proposed office development can be acknowledged as part of the development approval process.

Some municipalities are also implementing TMP policies through the LEED Neighbourhood Development (ND) Certification in Canada. Transportation-related LEED credits are for:

• Public transit access;
• Bicycle storage & change rooms;
• Hybrid & alternative fuel vehicle preferred parking;
• Parking capacity; and
• Heat island effect – non-roof (amount of exposed surface asphalt).

18.6.3 ACTIVE TRANSPORTATION / TDM MANAGER

In order to implement the multiple TDM and Active Transportation programs and infrastructure recommendations of this TMP, and develop the associated policies and programs, the City should add a full time staff person as the Active Transportation Program Manager, to oversee all aspects of TDM and active transportation within the City of Waterloo. Given that TDM and Active

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7 Government of Canada ecoMOBILITY, Region of Waterloo, BA Group, November 24, 2010
Transportation in general involves many City departments, it is suggested to centralize the position, and therefore recommend the role reside within the Chief Administrator's Office.

### 18.7 Action Items

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<thead>
<tr>
<th>Transportation Master Plan (TMP) ACTION ITEMS</th>
<th>FUNDING STATUS</th>
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<tbody>
<tr>
<td><strong>SHORT-TERM: 0-5 YEARS</strong></td>
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<tr>
<td>1. Integrate key TMP recommendations into Official Plan Update including: a. Transportation Vision and Objectives; b. Complete Streets Policy; c. Road Classification; and d. Roadway Widenings.</td>
<td>No cost assumed</td>
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<td>2. Integrate a Transportation Demand Management (TDM) checklist and incentives into the City's Zoning Bylaw and development approval process.</td>
<td>No cost assumed</td>
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<tr>
<td>3. Create an Active Transportation / TDM Manager staff position in the CAO's office to guide implementation of the TMP.</td>
<td>2012 – 2014 Budget Process</td>
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<td>4. Update the City's Traffic Calming Policy as recommended in the TMP with new processes for initiating new projects, conducted associated traffic calming studies, approving the studies and monitoring the results.</td>
<td>No cost assumed</td>
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<td>5. Continue to apply the guiding principles and recommendations of the 2008 Uptown Parking Strategy that are compatible with the transportation vision and objectives set in the TMP. Review Uptown Waterloo public parking costs to ensure they do provide a financial incentive to use public transit.</td>
<td>No cost assumed</td>
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<tr>
<td>6. Update the City's sidewalk winter control practice with staged implementation of City responsibility for winter sidewalk maintenance (snow and ice removal). This begins with the City taking responsibility for sidewalk winter control in key high pedestrian areas of the City in response to the Complete Streets and transit-oriented objectives.</td>
<td>$285,000 per year (for existing 95 kms)</td>
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<td>7. Develop a new overnight on-street parking policy that permits overnight on-street parking in areas of the City where such parking is compatible with the street context. This includes implementation of a process for</td>
<td>$500,000 Revenue</td>
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City staff to determine where such parking is appropriate and compatible.

8. Implement the recommended Bikeways and Trails Master Plan with seven (7) recommended bikeway and trail projects in Year 1 ($105,000), followed by 36 projects in Year 2-5 ($1.7 Million) as identified in the TMP. | $1.8M

9. Provide annual “State of the Transportation System” reports to City Council. | No cost assumed No cost assumed No cost assumed

MEDIUM TERM 5-10 YEARS

10. Conduct the first TMP review and update in 2016 in association with review of the Official Plan, followed by the second review and update in 2021. | $80,000 (2011 dollars)

11. Prioritize and implement Bikeways and Trails Master Plan projects within the 5+ Year timeframe (approximately 50 projects). | $2.85M

12. Construct road improvements to Columbia Street West between Fischer-Hallman Road and Erbsville Road in accordance with the TMP and an approved Municipal Class Environmental Assessments. | $6M

13. Support the Region of Waterloo in the approval of Municipal Class Environmental Assessments and construction of improvements to the following road sections as recommended in the City and Region TMPs:
   a. Erb St. W from Erbsville Court to Beechwood Dr. (widen to 4 lanes);
   b. Northfield Dr. from Davenport Rd. to University Ave. (widen);
   c. University Ave. from Fischer-Hallman Rd to Keats Way (widening and transit priority); and
   d. Ira Needles Blvd from city boundary to Erb St. W (widen). | TBD TBD TBD

14. Provide annual “State of the Transportation System” reports to City Council. | No cost assumed No cost assumed No cost assumed

LONG TERM 10-20 YEARS

15. Conduct the third TMP review and update in 2026, and fourth in 2031 in association with Official Plan reviews. | $80,000 (2011 dollars)

16. Prioritize and implement Bikeways and Trails Master Plan projects within the 5+ Year timeframe (approximately 50 projects). | $2.85M

17. Construct an extension of Laurelwood Rd. from Bearinger Rd. to Westmount Rd. | Yes
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<tr>
<td><strong>18.</strong> Support the Region of Waterloo in the approval of Municipal Class Environmental Assessments and construction of improvements to the following road sections as recommended in the City and Region TMPs:</td>
<td>TBD</td>
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<tr>
<td></td>
<td>a. Northfield Dr. from Westmount Rd. to Davenport Rd. (transit improvements);</td>
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<td>b. Bridge St. from University Ave. to Northfield Dr. (transit priority);</td>
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<td></td>
<td>c. Fischer-Hallman Rd. from Highway 7/8 to Columbia St. (transit lanes);</td>
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<td></td>
<td>d. Fischer-Hallman Rd. from Columbia St. to Westmount Rd. (widen);</td>
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<td></td>
<td>e. Erbsville Rd. from Erb St. to Columbia St (widen); and</td>
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<td></td>
<td>f. Bridge St. W. from King St. to Northfield Dr. (widen or new road).</td>
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<td><strong>19.</strong> Support the Ministry of Transportation in widening Highway 85 from the city boundary to King St. N interchange.</td>
<td>No cost assumed</td>
<td>No cost assumed</td>
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<tr>
<td><strong>20.</strong> Provide annual “State of the Transportation System” reports to City Council.</td>
<td>No cost assumed</td>
<td>No cost assumed</td>
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