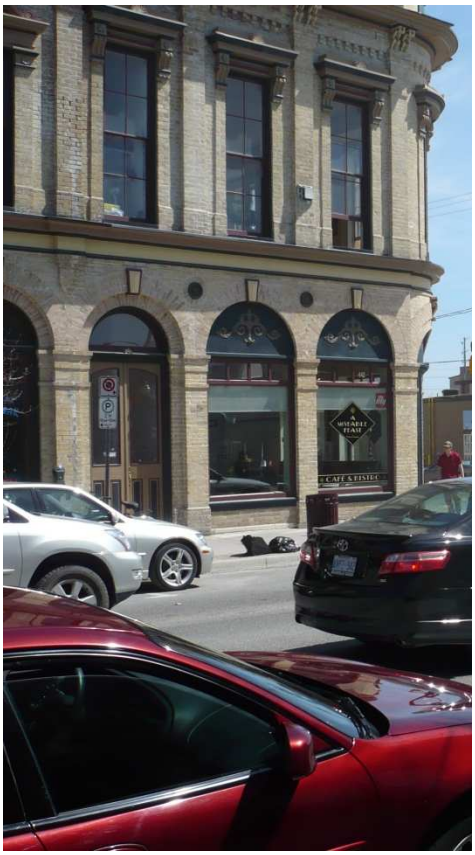
City of Peterborough

Comprehensive Transportation Plan



AUGUST 2012

MORRISON HERSHFIELD

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1 INTRODUCTION

1.1 RATIONALE FOR PLAN UPDATE

Peterborough's 2012 Transportation Plan was initiated as an update of the 2002 Comprehensive Transportation Plan. The two plans chart a similar course in terms of policy direction. However, the 2012 Transportation Plan can be characterized as requiring a substantially smaller road capital program to support it, and having a greater emphasis on active transportation.

The 2012 Transportation Plan Update was initiated in order to:

- Comply with Ontario's Planning Act, which requires an update to the Transportation Plan on a regular periodic basis.
- Ensure that the City's long-term infrastructure requirements are based on the population & employment projections that have recently been established as part of the Greater Golden Horseshoe Growth Plan.
- Confirm the need for the "West Side Corridor", commonly referred to as the "The Parkway", and explore alternatives to it as the corridor was not approved as part of the 2002 Comprehensive Transportation Plan.
- Support the City's multi-year capital planning process by identifying priority needs within the context of a multi-modal transportation network.
- Provide direction and input for future updates of the City's Official Plan.

1.2 LEGISLATIVE CONTEXT

The enactment of the ***Places to Grow (P2G) Act*** in 2005 represented a major reform to land use planning in Ontario. The ***Greater Golden Horseshoe (GGH) Growth Plan***, released in 2006, was the first provincial plan under the Places to Grow Act. City of Peterborough is part of the Greater Golden Horseshow region, and as such must comply with it.

With a vision to building stronger, more prosperous, and complete communities, the Growth Plan aims to guide municipal and provincial decisions on a wide range of issues that include transportation, infrastructure planning, land use planning, urban form, housing, natural heritage, and resource protection. The Growth Plan intends to achieve this overall vision through specific policy directions that aim to:

- Revitalize downtowns to become vibrant and convenient centres;
- Create complete communities that offer more opportunities for living, working, shopping and playing;

- Provide greater choice in housing types to meet the needs of people at all stages in life;
- Curb urban sprawl and protect farmlands and green spaces; and,
- Reduce traffic gridlock by improving access to a greater range of transportation choices.

The Growth Plan for the Greater Golden Horseshoe establishes a planning policy framework to implement the Province's vision for managing population and employment growth in the Greater Golden Horseshoe region to 2031. The policy framework in turn sets growth & density targets to be achieved. Generally speaking, these targets call for lower growth rates, greater density and tighter distribution of growth activities. As such, it is acknowledged that the drive to achieve these targets will result in a significant shift in growth patterns, and by implication, infrastructure requirements.

1.3 MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT PROCESS

The Municipal Class Environmental Assessment (EA) Process was developed to meet the requirements of the Environmental Assessment Act.

The Class EA process seeks to minimize the impact of projects on the environment. The process includes five phases, as illustrated in Figure 1, which are required to initiate construction of municipal roads, and water and wastewater projects in Ontario.

The Class EA process recognizes that it is preferable to plan infrastructure based on overall system needs, rather than individual project needs. As such, the City of Peterborough's 2012 Transportation Plan Update was undertaken in a manner that respects and conforms to the Class EA requirements.

In order to comply with the Municipal Class EA Process, Transportation Plans are required to subject all required infrastructure projects to the early "need and justification" phases of the process, which include analysis of existing conditions, project justification and evaluation of alternative solutions. This approach streamlines the infrastructure planning and design process and reduces overall implementation risks.

Transportation plans do not typically address site-specific problems such as traffic operations at individual intersections or in specific neighbourhoods. They are broader in nature, and intended to provide the basis for identifying network-wide improvements and priorities. After approval of the Transportation Plan, individual roadway projects may proceed to Phase 3 of the Class EA Process with more detailed environmental evaluations and preliminary design work.

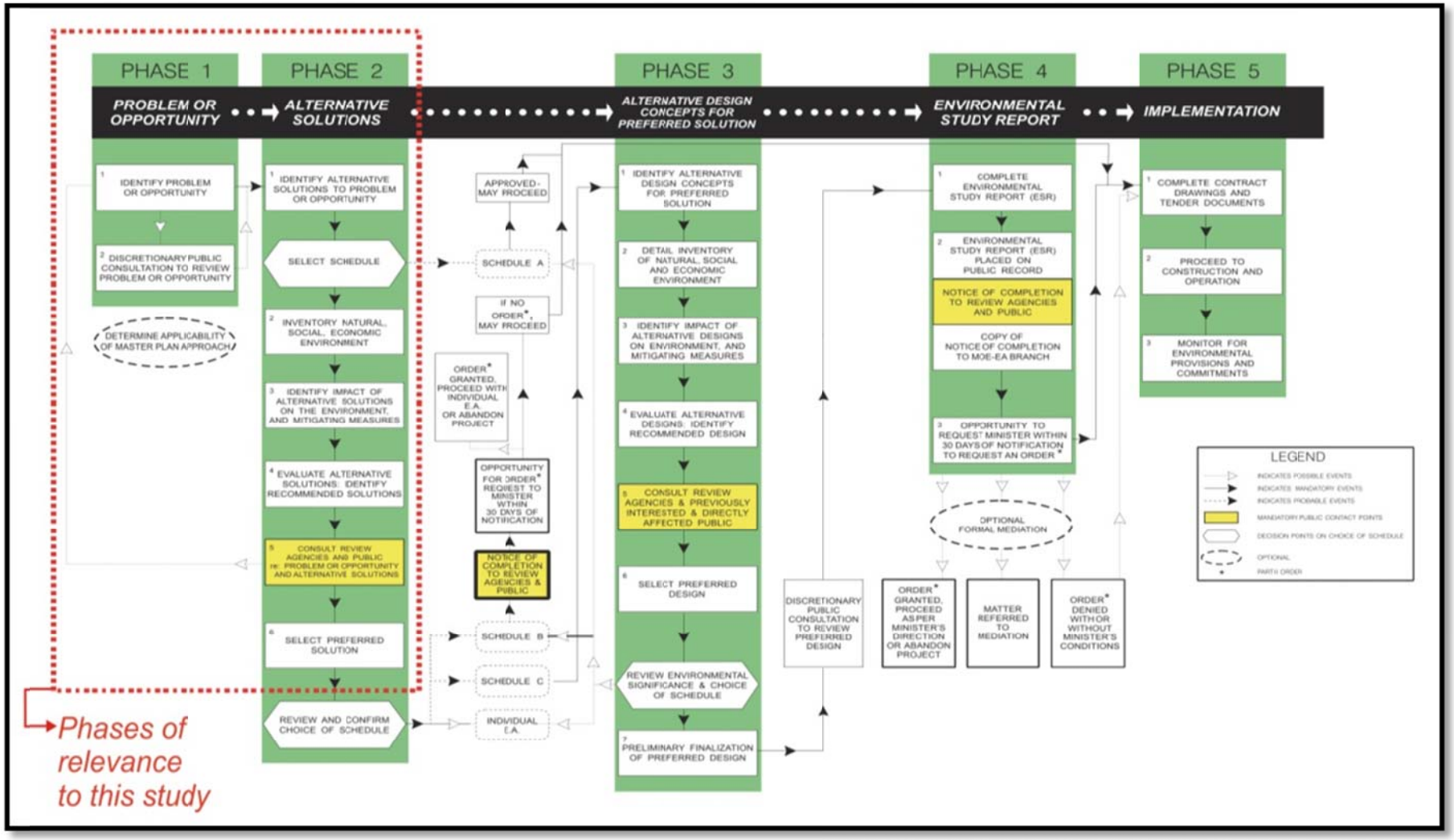


Figure 1 Municipal Class EA Process

1.4 PROJECT STEERING COMMITTEE

The Transportation Plan Update was guided by a Steering Committee which included representatives from the City of Peterborough, Councillors from the City & County of Peterborough, and the Mayor of the City of Peterborough. The role of the steering committee was primarily to guide the study in the following ways:

- Provide input and feedback on the various stages of the project including the development of a project statement, setting of targets, formulation and evaluation of network improvements options, and identification of supporting policies & programs
- Ensure that the study objectives, process, and guiding principles are adhered to
- Represent the diversity of opinions of residents of the larger Peterborough area

The steering committee members were:

- Brian Horton, CAO City of Peterborough (post February 25, 2011)
- Chris Bradley, Director Public Works County of Peterborough
- Daryl Bennett, Mayor
- Dan McWilliams, Councillor (Chair Public Works)
- Jim Kimble, Manager Transportation
- Len Vass, Councillor (Chair Transportation)
- Linda Reed, CAO City of Peterborough (prior to February 25, 2011)
- Ron Gerow, Councillor County of Peterborough
- Wayne Jackson, Director of Utility Services Department

1.5 PUBLIC CONSULTATION

Community and stakeholder consultation was conducted in several capacities to solicit feedback and engage the community in the update process. In accordance with the Municipal Class EA Process, three points of public consultation in the form of Public Involvement Centres (PICs) were held. These PICs represented significant points of consultation where opinions were sought from members of the community, and progress on the study update was presented.

Additional agencies with a vested interest were contacted and invited to participate in the study update with invitations to PIC #1. These agencies included utility companies, Ministry of Natural Resources, Ministry of the Environment, Canadian National Institute for the Blind, the police department and several others.

As well as the Steering Committee, stakeholders with an interest in active transportation were engaged in the development of the active transportation network and supportive

policies. Groups which were involved in the consultation included: Peterborough County-City Health Unit (PCCHU), Peterborough Cycling Club, Peterborough Bicycle Advisory Committee (P-BAC), Active and Safe Routes to School, Active and Safe Community Routes, and B!KE.

The key consultation points included the following:

Table 1 Public Consultation Schedule

Timeline	Milestone
September 9th, 2010	Notice of Study Commencement Issued
January 14th, 2010	Steering Committee Meeting #1
February 9th, 2010	Public Involvement Centre #1
February 8th, 2011	Steering Committee Meeting #2
February 23rd, 2011	Public Involvement Centre #2
April 18th, 2011	Active Transportation Stakeholder Meeting
June 28th, 2011	Public Involvement Centre #3
October 21st, 2011	Steering Committee Meeting #3

A comprehensive record of public consultation activities has been issued under a separate cover that supports the 2012 Transportation Plan Update. The document provides a synthesis of all comments received as well as the consulting team's response to the feedback received throughout the process.

2 THE EXISTING TRANSPORTATION SYSTEM

2.1 ROAD NETWORK

The City of Peterborough's road network consists of freeways, arterials (low, medium, and high capacity), collectors (low and high capacity) and local roads.

Figure 2 Road Network Classifications

The road network is influenced by the natural features and topography of Peterborough, including the Otonabee River and the Trent Canal. These water bodies bisect the City and create distinct segments and neighbourhoods. As a result, limited capacity is available over these crossing points in the form of bridges. Unique features of the roadway network include one-way street couplets in the downtown formed by George St/Water St, extending from Sherbrooke St in the south to Hilliard St. in the north, and at Reid St/Rubidge St from Park St N to McDonnel St, as well as the presence of Provincial Highway 7. The highway runs south of the downtown through Peterborough, continuing on to connect with Highway 115 to Highway 401 in the west. In addition, the City's road network is tied into that of the larger County of Peterborough to provide access to neighbouring communities and greater connectivity. The roadway network as defined in the Official Plan is illustrated in Figure 3.

The existing level of service (LOS) and performance of the current roadway network is presented in Section 3.1.

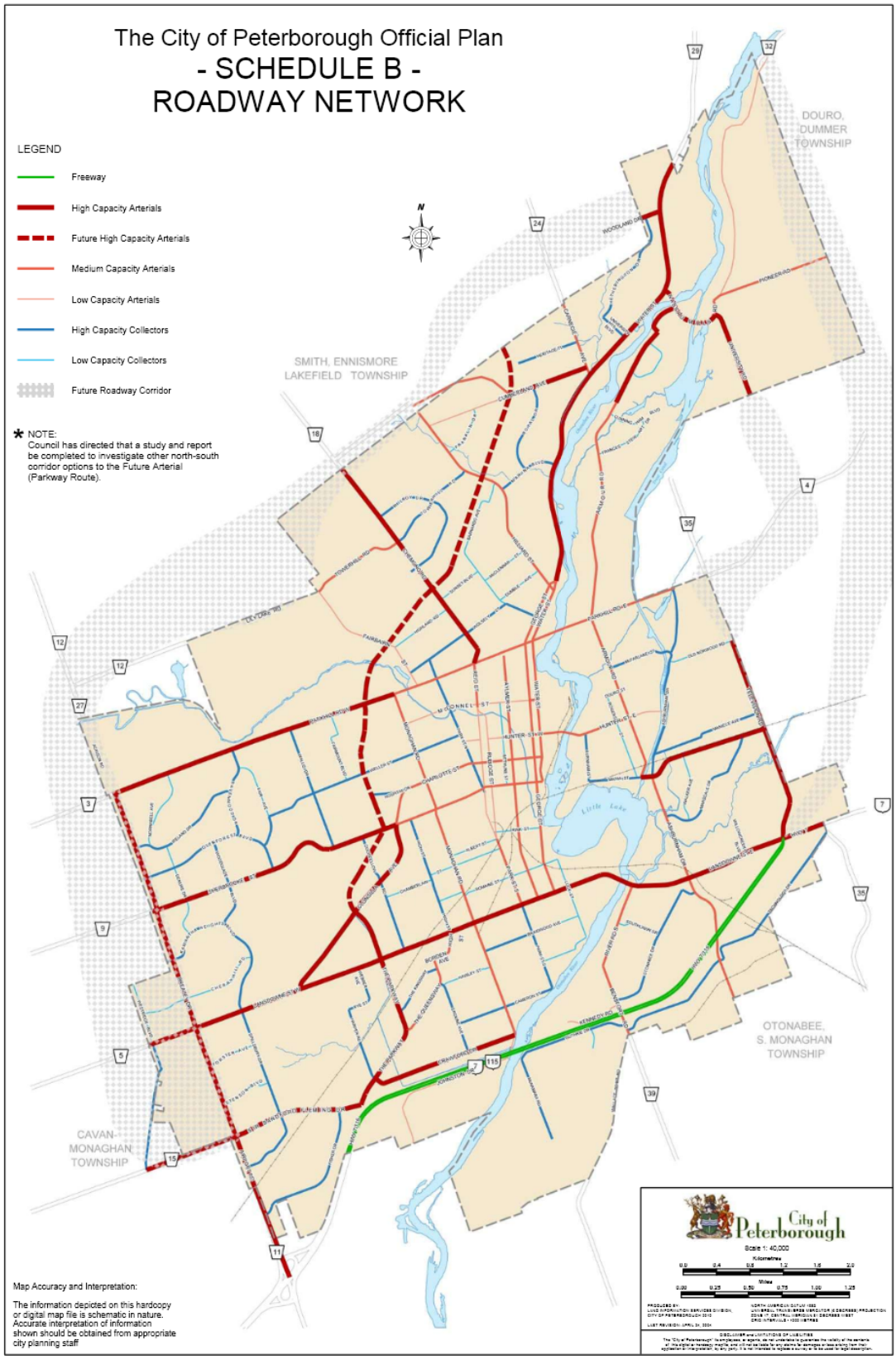


Figure 3 City of Peterborough Roadway Network

2.2 TRANSIT SERVICE

Public transit is an important component of the Peterborough transportation system. Public transit provides a convenient and reliable form of mobility for all citizens of the City, regardless of their age, car ownership or socioeconomic status. Public transit service supports higher concentrations of activity in the downtown area, the University, College and other important City activity centres. It also contributes to a more sustainable transportation system by offering an alternative to automobile use within the City.

The existing transit service in Peterborough provides twelve regular routes and three express routes, as well as access to Transcab and Handi-Van services.

A summary of the regular and express routes available is shown below in Table 2.

Table 2 Peterborough Transit Routes

Regular Service Routes	Express Service Routes
Route 1 – George St. north	Trent University Express
Route 2 – Chemong Road	Fleming College Express
Route 3 – Highland Road	Technology Drive Express
Route 4 – Jackson Park	
Route 5 – Charlotte West	
Route 6 – SSFC/Kawartha	
Route 7 – Lansdowne West	
Route 8 – Monaghan Road	
Route 9 – Nichols Park	
Route 10 - Collision	
Route 11 - Ashburnham	
Route 12 – Major Bennet	

Transit service in Peterborough is generally focused on the downtown Peterborough Bus Terminal where scheduled connections are provided between different routes for travel to and from areas of the city. This terminal also provides connections with inter-city bus services, including GO Transit.

At present, the regular routes operate at a frequency of 40 minutes, with hours of operation for various routes illustrated below in Table 3.

Table 3 Peterborough Transit Hours of Operation

Routes	Monday - Friday	Saturday	Sunday
1-11	6:00 AM – 11:20 PM	6:40 AM – 11:20 PM	8:00 AM – 7:20 PM
12	6:00 AM – 11:20 PM	6:40 AM – 6:40 PM	9:20 AM – 6:00 AM

Fares for all regular and express routes are shown below in Table 4.

Table 4 Current Transit Fares

Category	Cash	Day Pass	10 Ride Pass	30-Day Pass	Season Passes
Adult	$2.25	$7	$20	$55	Not available
High School Student	$2.25	$7	$20	$50	Not available
Senior	$2.25	$7	$20	$33	$120/semi-annual $200/annual
Child (2-12 years)	$2.25	$7	$20	$33	Not available
Fleming Student	$2.25	$7	$20	$55	$200.00/semester
Trent Student	$2.25	$7	$20	$55	Included in tuition

In addition to conventional service, Peterborough Transit also operates the Handi-Van service for persons unable to use regular transit services. The service requires that users register with the program in advance. Handi-Van is offered as a door-to-door service, on a pre-booked basis, using wheelchair accessible small buses. The fare for the Handi-Van service is the same as the regular adult fare for conventional service ($2.25), and operating hours are 7:00 AM – 10:15 PM (Monday – Saturday), and 8:15 AM – 7:15 PM (Sunday).

The following unique transit service features in Peterborough should also be noted:

- Peterborough has successfully used Transcab (i.e. contracted taxi service) for many years as an efficient form of transit service to low ridership areas. In a number of cases, this service has been used as an introductory service to newly developing areas. As ridership response to the service increases, the service can be replaced with conventional fixed route service.

- A close working relationship with Trent University has resulted in a universal student pass program encouraging transit use, increased system revenue and enhanced University service. Additional services to the College have also been implemented with a positive response.

- Peterborough has developed an accessibility plan for the regular transit services to improve accessibility to the service for frail elderly people and also for people using mobility aids (i.e. wheelchairs, walkers, scooters).

A map illustrating current (2011/2012) transit routes in the City of Peterborough is provided in Figure 4.

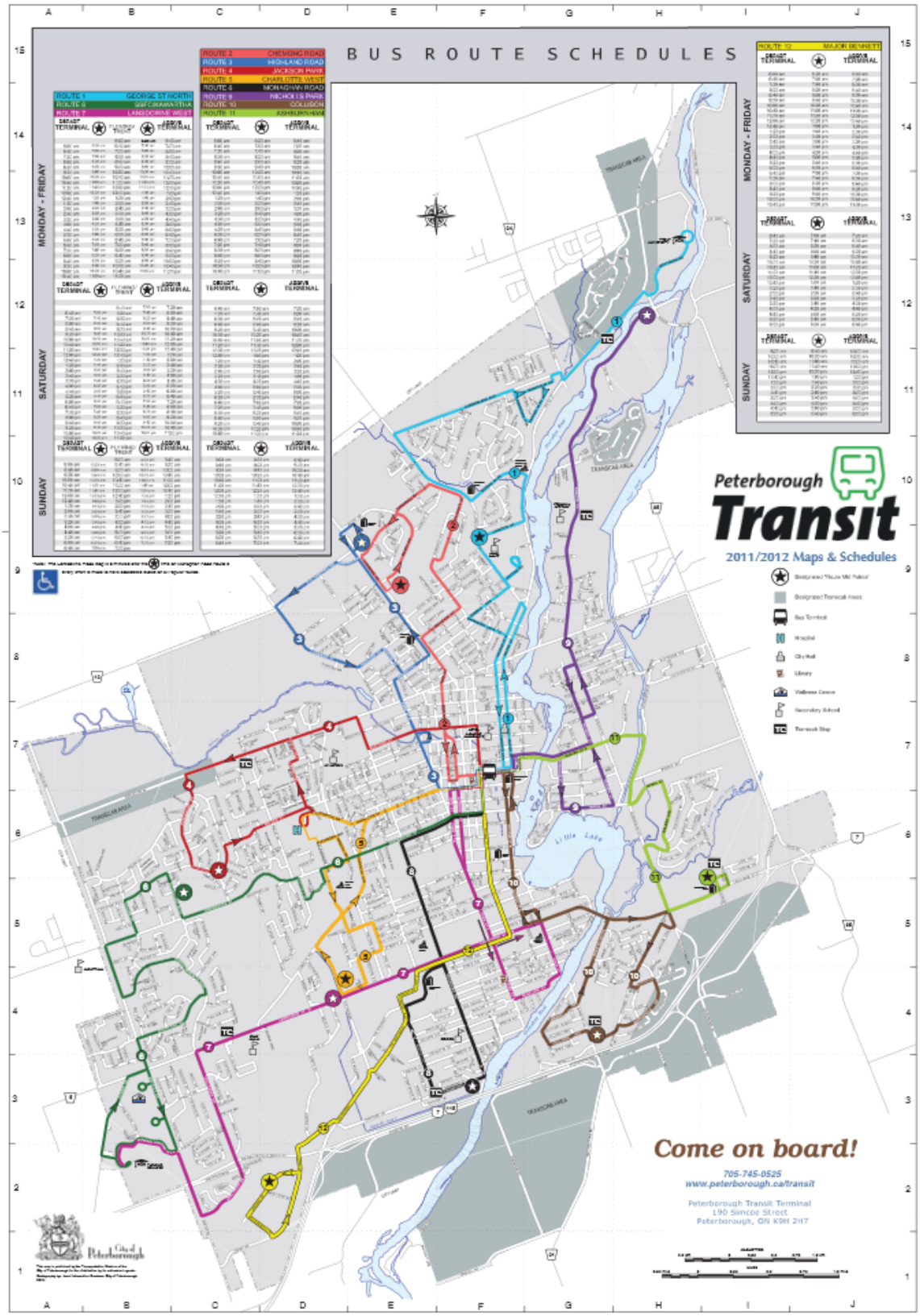


Figure 4 Peterborough Transit Routes

2.1.1 TRANSIT SYSTEM PERFORMANCE

Looking back to the 2000 to 2007 period, the annual passenger ridership in City of Peterborough increased from 2.0 million annual trips to 2.7 million annual trips, an increase of over 35%. The annual ridership figures during this period are shown in Figure 5. This trend of ridership growth has been reported by the City to have continued further in subsequent years as a result of pursuing recommendations arising from the 2006 – 2009 Business Plan[1].

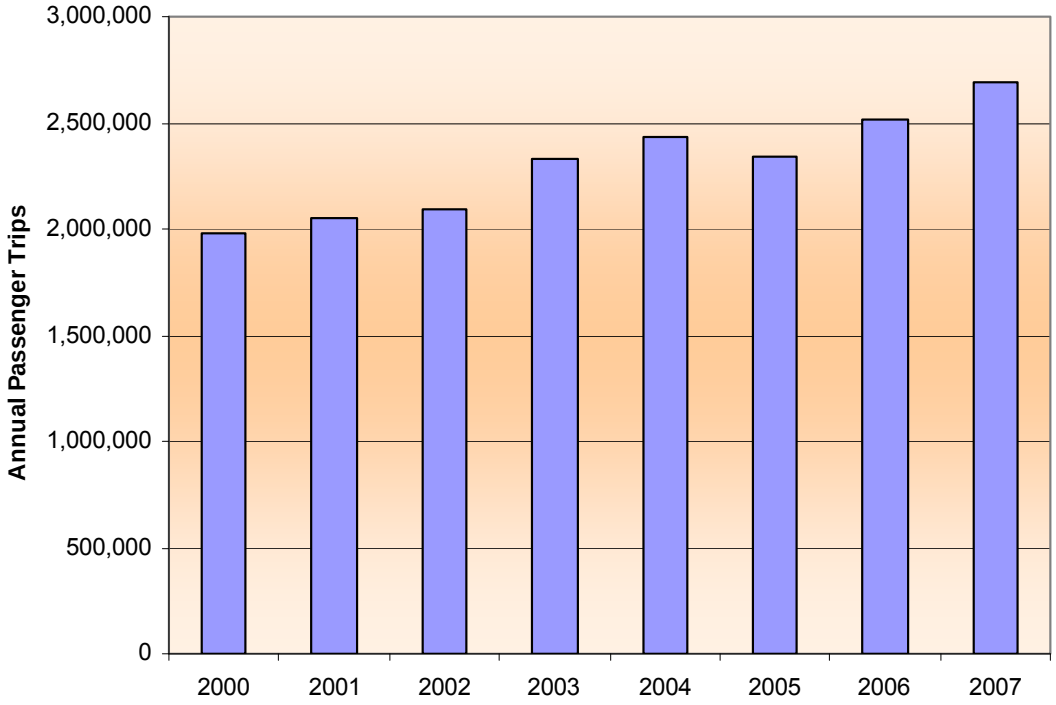


Figure 5 Peterborough Transit Annual Ridership

The increase in transit daily ridership between 2000 and 2007 as reported by Peterborough Transit has been accompanied by an increase in transit mode share according to the Transportation Tomorrow Survey which shows transit share of daily trips to have grown from **3 to 4%** during the 2001 to 2006 period, as shown in Table 5.

The gains on the mode share front reflect the improved relative attractiveness of transit over the private vehicle as a result of improvement in transit service and higher fuel and insurance costs that must be borne by drivers.

[1] City of Peterborough Public Transit Business Plan 2006 – 2009, Appendix B to Report USTR06-016, July 2006.

Table 5 Transit Mode Share - TTS Survey

Year	Daily	Peak Period
1996	5%	4%
2001	3%	3%
2006	4%	3%

Moving forward, there are a number of factors that are beyond the control of the City and Peterborough Transit, which could influence the relative attractiveness of transit compared to other modes, and in turn affect the role and share of transit in Peterborough. Some of the more significant factors are as follows:

- ***Real cost of private vehicle ownership***, in particular fuel prices at the pump.
- ***Aging demographics***. While the growing 65-plus population is expected to increase transit ridership in the off-peak hours, this will be offset by the steep reduction in the 15-24 age group which is typically the group with the highest transit usage in the peak hours.
- ***Population growth and housing density***. Increases in residential density have been consistently shown to boost transit mode share. The inability to meet increased density targets and corresponding zoning and site plan application requirements due to market demand and supply forces would be detrimental.
- ***Employment growth and distribution***. The subdued future employment growth compared to the population growth will lead to more trips beyond the City boundary. Such trips are difficult to capture by Peterborough Transit.
- ***Level of provincial and federal investment*** and support for the provision of transit services. The national and provincial environmental agendas may provide the opportunity for increased funding – be it for transit vehicle replacement or transit service upgrade/expansion.
- ***Federal and provincial policies*** hold the promise for a significant uplift in transit demand. Examples of such policies include increased taxation levels on gasoline sales and/or vehicle registration, as well as introduction of tax-exempt provisions for transit benefits provided by employers to their employees.
- ***Short distances between many destinations***, making walking and cycling as efficient or more efficient than transit for many trips

2.2 ACTIVE TRANSPORTATION

2.2.1 PEDESTRIAN NETWORK

Peterborough has a well-developed pedestrian network consisting of numerous off-street trails and paths, as well as sidewalks. The walking mode share for work trips (7.9%) is the second highest among 15 comparable 'Category D' cities according to the TAC Urban Transportation Indicators Fourth Survey, which indicates that Peterborough's pedestrian network is popular amongst residents. Figure 6, below, compares the walking mode share in Peterborough with some of the other 'Category D' cities.

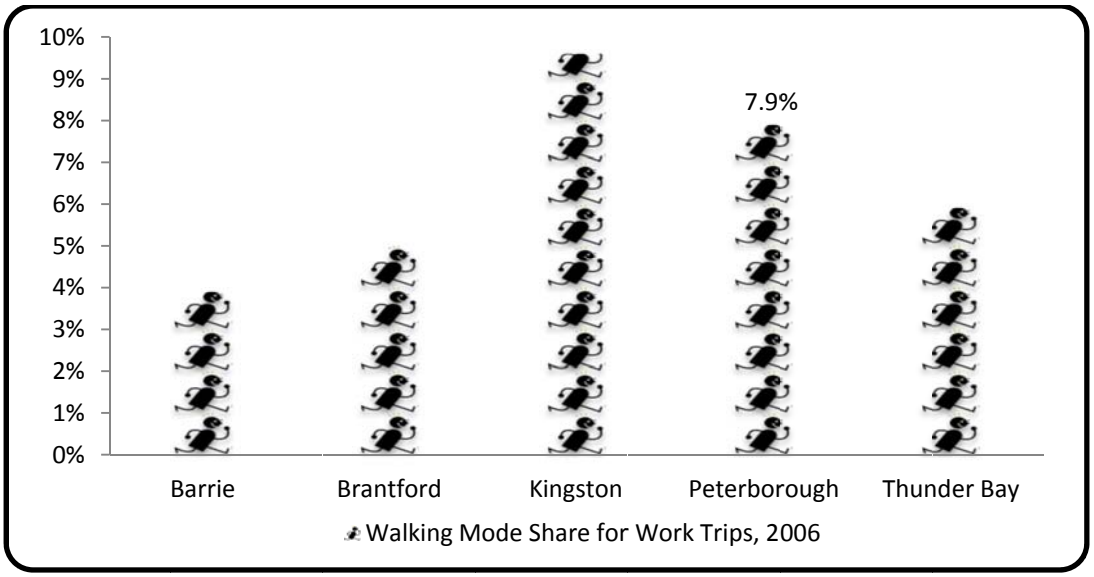


Figure 6 Walking Mode Share for Work Trips, 2006

As sidewalks play an important role in improving the comfort of pedestrians, Peterborough developed a 'Sidewalk Policy' and complementary 'Sidewalk Strategic Plan'. The sidewalk policy, included in the Official Plan, provides direction for new development with regard to pedestrian amenities. In any new residential developments, sidewalks are required on both sides of arterial and collector streets and on both sides of local streets, including cul-de-sacs with thirty or more residential units and any cul-de-sac having a through pedestrian connection. An exception can be made if council determines that physical or practical circumstances would not warrant or prohibit a sidewalk connection. In 2011, council reaffirmed the sidewalk policy.

To complement the Sidewalk Policy, the Sidewalk Strategic Plan was developed and adopted by Council in 2008. The Strategic Plan catalogues and ranks missing sidewalk sections across the City, with timelines and budgets for installation based on priority. As part of the Sidewalk Plan, an inventory of sidewalks was compiled. The map in Figure 7 illustrates sections of roadway where sidewalks are currently not provided.

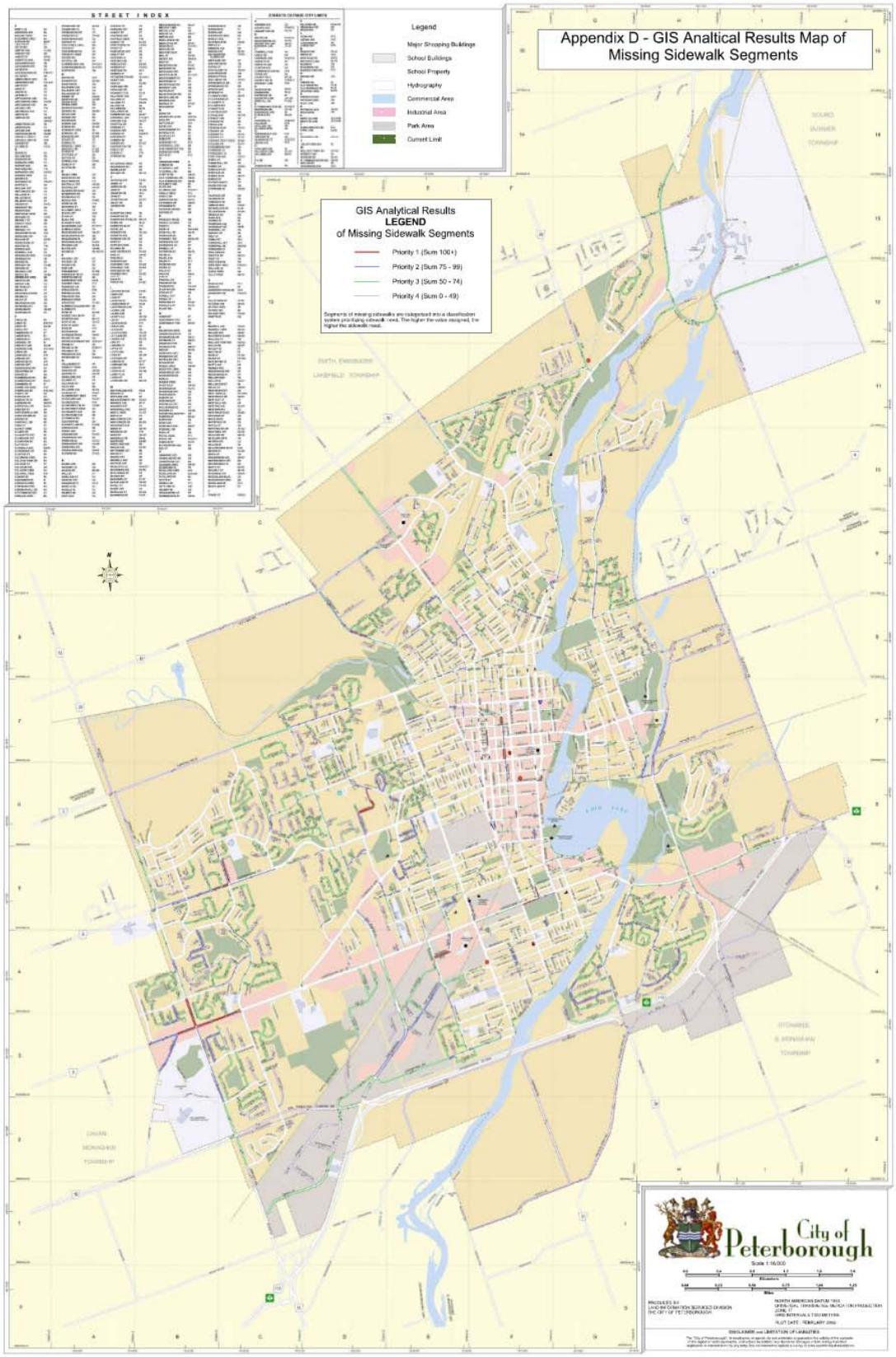


Figure 7 Missing Sidewalk Segments from the Sidewalk Strategic Plan

A number of multi-use, off-road trails are also present for use by pedestrians within Peterborough. The Official Plan states that off-road pedestrian trails should be constructed to link to major open space areas and may be extended through them to improve public accessibility and mobility in areas of new development. All pedestrian infrastructure is to be planned with consideration of pedestrians with special needs, including geometric standards, placement of furniture and landscaping, use of curb cuts and ramps, drainage and route signage.

2.2.2 CYCLING NETWORK

Similar to walking, the cycling mode share in Peterborough for work trips (2.3%) is ranked second highest among the 15 comparable 'Category D' cities included in the TAC Urban Transportation Indicators Fourth Survey. Figure 8, below, compares the cycling mode share for Peterborough with several of its peer cities.

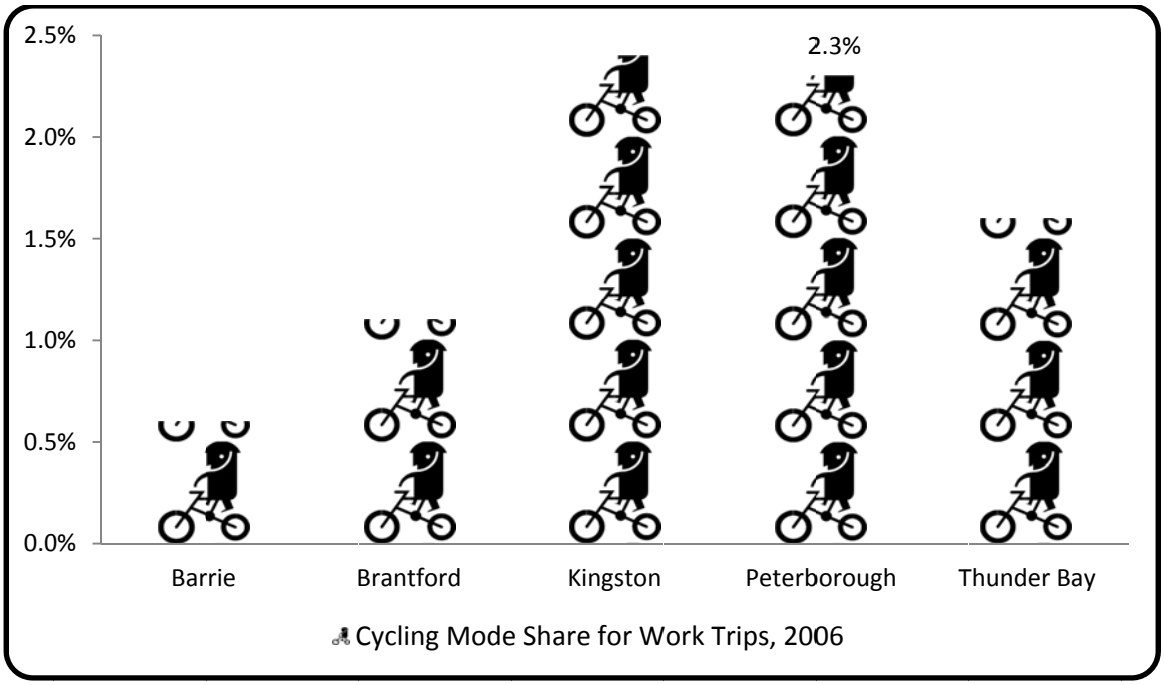


Figure 8 Cycling Mode Share for Work Trips, 2006

Existing cycling infrastructure in the City of Peterborough includes off-street trails (multi-use trails) and on-street facilities (cycling lanes, side paths and share the road signs). Wayfinding signage is provided throughout the bikeway network. The existing network is heavily weighted in favour of off-road facilities (38 km) over on-road facilities (15 km).

As part of the 2002 Transportation Plan, a proposed bicycle network was developed. Since that time, several of the projects have been implemented and incorporated into the existing network. Figure 9 illustrates the existing cycling network (2011), which is shown overlaid with important community destinations.

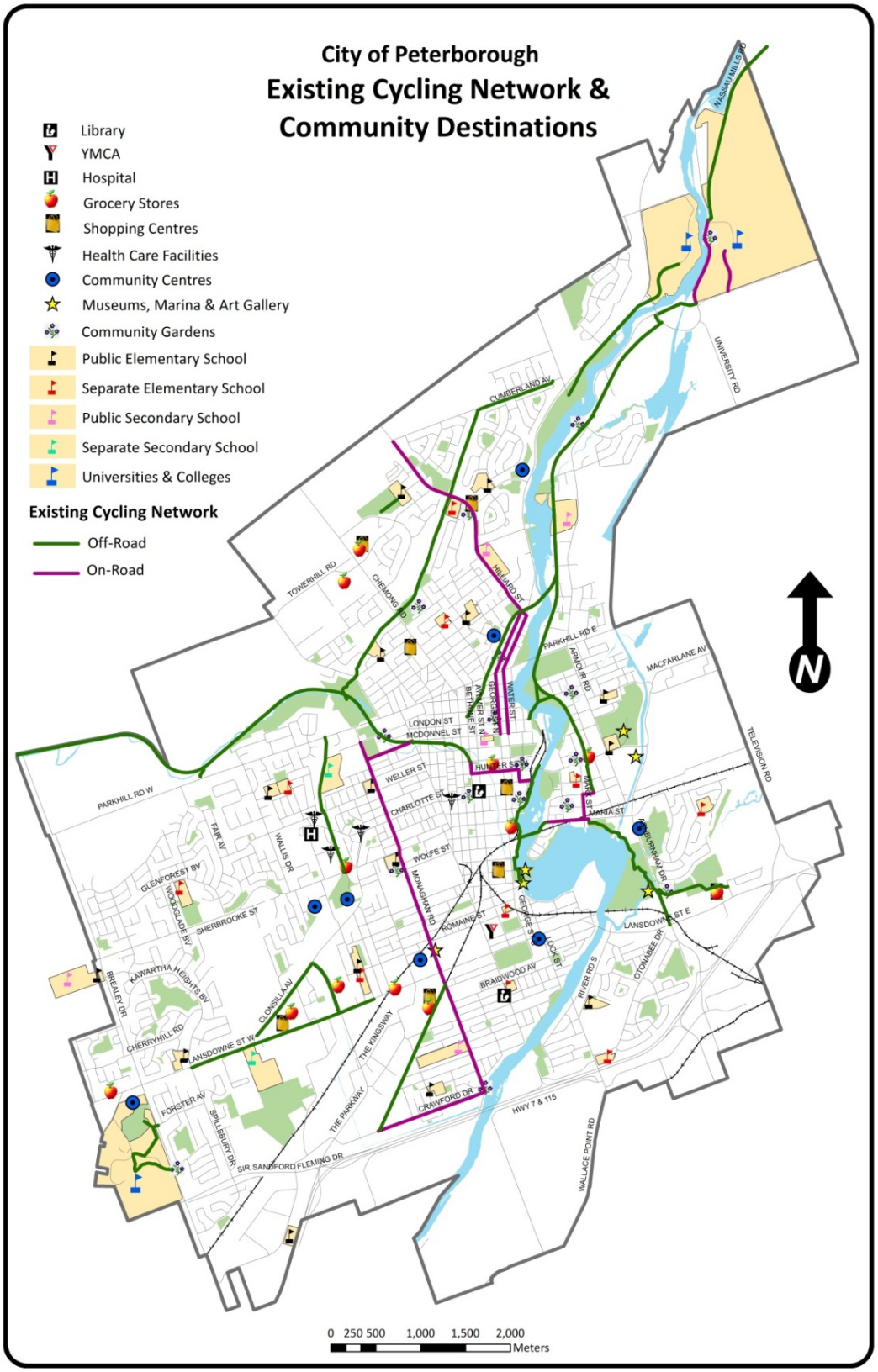


Figure 9 City of Peterborough Existing Cycling Map

The City of Peterborough offers a number of initiatives supporting cycling activity and regularly publishes a Trails and Bikeways Map for use by cyclists and pedestrians. The map provides general use information on existing cycling facilities, including the location of on-road, off-road developed and off-road undeveloped bikeways, plus the multi-use Trans-Canada Trail, Parkway Trail and Rotary Greenway Trail. The map also indicates the location of associated cycling features, such as steep hills.

Figure 10 Examples of Cycling Infrastructure in Peterborough

2.2.3 PERFORMANCE OF THE ACTIVE TRANSPORTATION NETWORK

As suggested by the mode share statistics presented in Section 2.2.1 and 2.2.2, both walking and cycling have achieved high mode shares compared to cities of similar scale. This would indicate that the cycling and pedestrian networks are currently performing well. During the course of the Transportation Plan Update, much feedback was received indicating a strong desire for increased access to cycling and pedestrian infrastructure. Such feedback confirms that although the active transportation network attracts many users, there is significant demand for improvement and expansion. Key issues to be addressed include:

- **Poor connectivity.** There are large gaps in the network where existing facilities do not meet up with key destinations, particularly in the downtown, where space constraints have presented challenges to implementing cycling improvements.
- **Hazardous trail crossings & intersections.** For both pedestrians and cyclists there is a desire for improvements at trail crossings and intersections.

2.3 GOODS MOVEMENT

Owing to Peterborough's strategic location in south-central Ontario, and convenient access to the Highway 35/115, 7 and 401 corridors, commercial goods movement is an important component of the area's transportation system.

In a local context, truck movements are often seen as a nuisance, and municipalities are often requested to enact by-laws and restrictions to control the movement of trucks within local neighbourhoods. On the other hand, trucking is the lifeblood of many industries and commercial operations, and the ability to accommodate trucking movements in an efficient

manner within the transportation network is recognized as a significant competitive advantage to business and the local economy. As a result, the City of Peterborough designates heavy truck routes and time restrictions through Bylaw 91-393 to establish and designate streets in the City for heavy truck use.

According to this Bylaw, heavy trucks are permitted to travel on any streets designated as collector, arterials or freeways in the Official Plan Schedule B, with the exception of the following:

- Cumberland Avenue (Water Street to Hilliard Street)
- Hawley Street (Monaghan Road to Erskine Avenue)
- Hilliard Street (Water Street to north City limits)
- Romaine Street (Monaghan Road to High Street)
- Former 4th Line Smith Township (Hetherington Drive to the west City limits)
- Cameron Street (Erskine Avenue to Park Street)
- Edison Avenue (Park Street to Monaghan Road [91-292])
- Weller Street (Park Street to Monaghan Road [99-210])
- Monaghan Road (Sherbrooke Street to Parkhill Rd, and Crawford Drive to Braidwood Avenue) between the hours of 7:00 PM in the afternoon and 7:00 AM in the forenoon
- Crawford Drive (Monaghan Road to Erskine Avenue) between the hours of 7:00 PM in the afternoon and 7:00 AM in the forenoon

As part of the 2002 Transportation Plan, a more detailed goods movement study was conducted in conjunction with the master plan. This study included an origin-destination study to determine commercial vehicle travel patterns. Some of the conclusions of this study are included below:

- Throughout the day, truck trips are fairly evenly distributed with 31% occurring in the morning peak period, 39% occurring in the afternoon peak period, and 30% occurring mid-day.

- There is a strong demand for truck movements in both the east-west direction, along the Lansdowne Street corridor, and in the north-south direction, along the Monaghan Rd / Park Street corridors.

- The north-south routing pattern is of particular concern since there are limited arterial road connections from the south end of the city to the north end of the city suitable for heavy truck traffic. The George Street / Water St one way system is already very busy with automobile traffic, and local truck related deliveries to downtown

The Ministry of Transportation of Ontario is currently completing the Peterborough Area & Highway 7 Corridor study which is expected to play an important role in analyzing goods movement in Peterborough. As part of this study, an updated origin-destination study was carried out which will be useful to compare to the data gathered in 2002.

2.4 EXISTING TRAVEL CHARACTERISTICS

As part of the Transportation Plan update, data from the 2006 Transportation Tomorrow Survey Data was reviewed to provide some basic information on the travel characteristics of Peterborough.[2] The Transportation Tomorrow Survey is conducted in the City and County of Peterborough, as well as other municipalities in south-central Ontario. The survey involves an extensive telephone interview with a sample of households to collect travel information for the proceeding weekday.

In reviewing the travel data, particular attention was given to the following characteristics to gain an appreciation of how, when, where and why people travel.

- Travel Mode Share – What mode of transportation was used?
- Destination Activity – Where did the trip end?
- Origin Activity – Where did the trip begin?
- Origin/Destination Patterns – What patterns exist between frequent origin and destination pairs i.e. what are high demand corridors in the city?
- Number of Trips/Person – Average number of trip per day made by each person
- Trip Purpose – Why was the trip conducted?

The following observations can be noted:

- 64% of the total work trips into Peterborough are made by City of Peterborough residents, with another 25% coming from the County of Peterborough. The remaining 10% come from communities further away including the City of Kawartha Lakes (6%), Durham (3%) and Toronto (1%)
- 80% of working residents of Peterborough are employed within the City of Peterborough, with another 8% employed within the County of Peterborough
- The private vehicle is the dominant mode of choice in the City of Peterborough, attracting roughly 85 percent of person trips.
- The morning peak hour (8:00 a.m. to 9:00 a.m.) is the most pronounced from a peaking perspective. This reflects the fact that peaking in school trips coincides with the peaking in the other trip purposes to a far greater extent in the morning than the afternoon peak hour.
- The afternoon peak period is longer in duration than the morning peak period, roughly 3 times as long. This is partly due to a higher share of “Home Based Other” and “Non Home Based” trips, and the relatively high degree of shift work in the afternoon in Peterborough.

The above observations suggests that accommodating the afternoon peak hour may be more appropriate than focusing on the morning peak hour for the following reasons:

[2] The Transportation Tomorrow Survey: 2006 Travel Survey, prepared for the Toronto Area Transportation Planning Data Collection Steering Committee by the Data Management Group, University of Toronto, Joint Program in Transportation, December 2008.

- Network investments aimed at addressing deficiencies in the afternoon, as opposed to the more pronounced morning, peak hour will bring more value to the City since the number of affected parties and therefore beneficiaries is greater.
- The lengthy duration of the afternoon peak period suggests there may be limited opportunity for peak spreading and greater potential for unmet demand to build up. This can't be said to be the case for the morning peak hour, where travellers could alter the trip starting time to benefit from reduced congestion outside the morning peak hour.

2.4.1 TIME OF TRAVEL

Figure 11 depicts the hourly travel demand for all person trips. The bars within each hour are comprised of the various modes of travel studied. The graph shows that the highest hour of person travel demand in the day occurs at 8:00 AM. It also shows that the AM peak period is much shorter in duration than that experienced in the afternoon peak hour. Walking trips largely appear between 8:00 AM and 9:00 AM; and in the afternoon between 3:00 PM and 4:00 PM indicating that they are highly correlated with school trips.

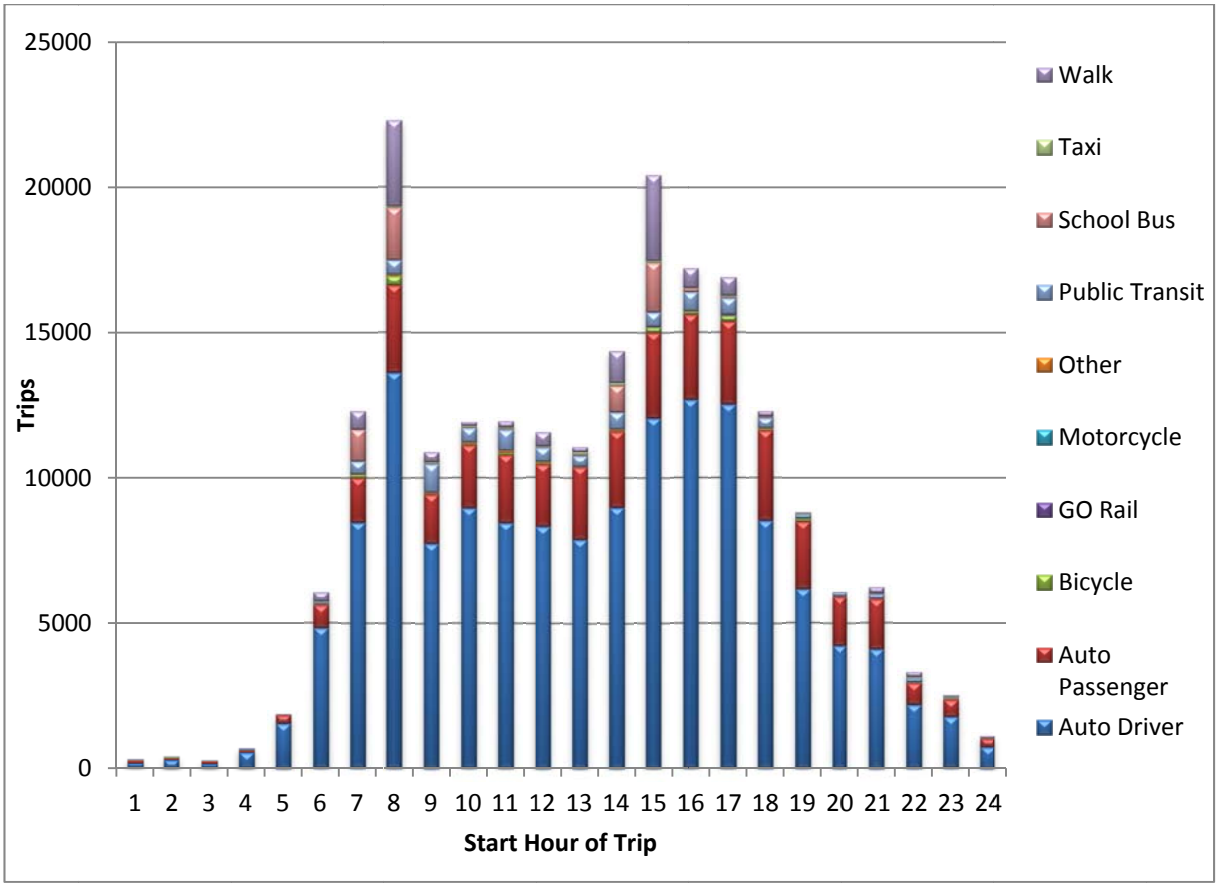


Figure 11 TTS Temporal Distribution in Person Trips

2.4.2 MODE OF TRAVEL

The mode of travel helps to give a clearer idea of how people move around the City. This information can be used to help understand what trends may occur in the future, however it also helps in setting new targets and goals.

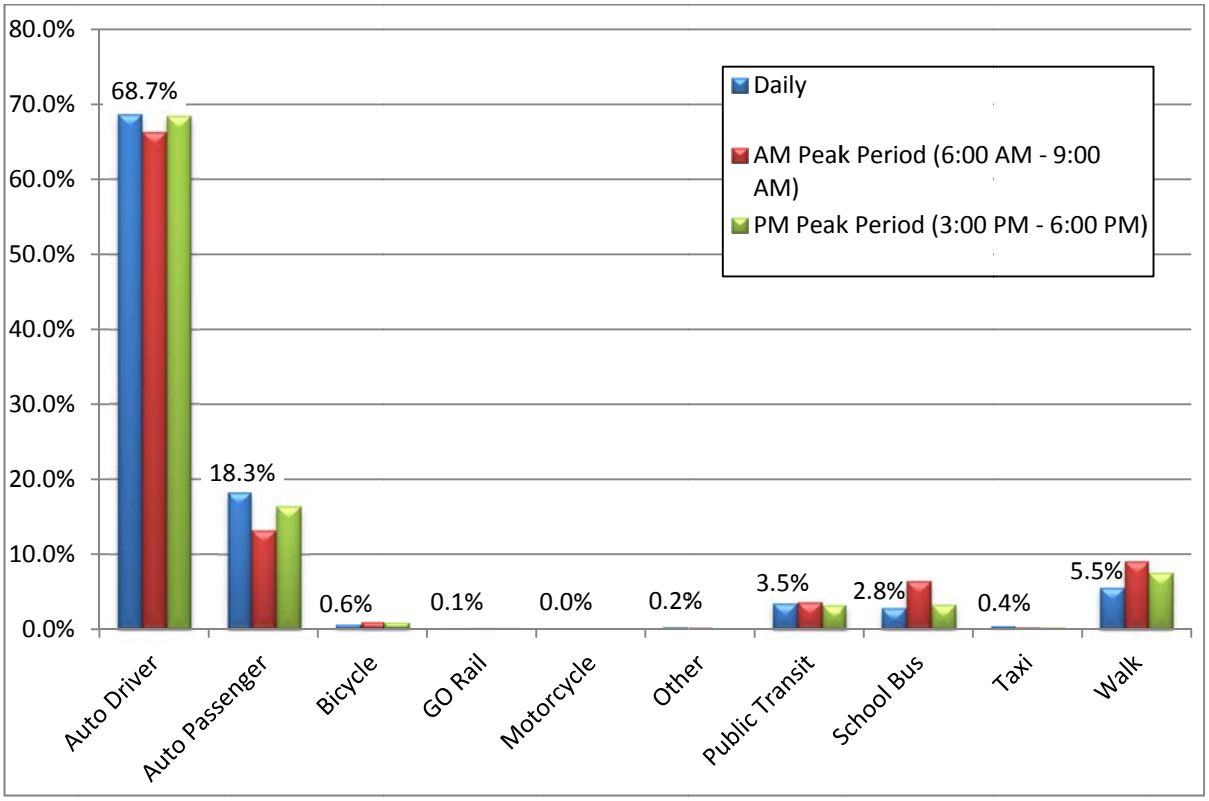


Figure 12 TTS Mode Share by Time of Day

Figure 12 depicts the mode of travel used during the morning (AM) peak period (6:00 AM to 9:00 AM), the afternoon (PM) peak period (3:00 PM to 6:00 PM) and for the entire day. The graph illustrates that auto driver and auto passenger demand comprise about 87% of the total daily demand, about 80% of the AM peak period demand and 85% of the PM peak period demand. Public transit ranged from 3.2% to 3.6% of the total demand through the day. The demand for school buses and walking reflect a strong correlation to school trips in the AM peak period with school buses accounting for about 6.4% and walking about 9%.

2.4.3 TRIP PURPOSE

The four basic trip types recorded in the TTS are Home-Based Work (HBW), Home-Based School (HBSch), Home-based Other (HBO) and Non Home-based (NHB). Figure 13 depicts the demand for each trip type use that occurs during the AM peak period (6:00 AM to 9:00 AM), the PM peak period (3:00 PM to 6:00 PM) and for the entire day as a means of contrasting and comparing the demands. The graph illustrates that HBW demand accounts

for about 42% of the AM peak period demand, 30% of the PM peak period demand and 24% of the daily demand. HBSch trips are most prevalent in the AM peak period with about 22% of the total demand being trips between home and school. During the PM peak period the split being HBW (30.2%), HBSch (13.1%), HBO (38.4%) and NHB (18.3%).

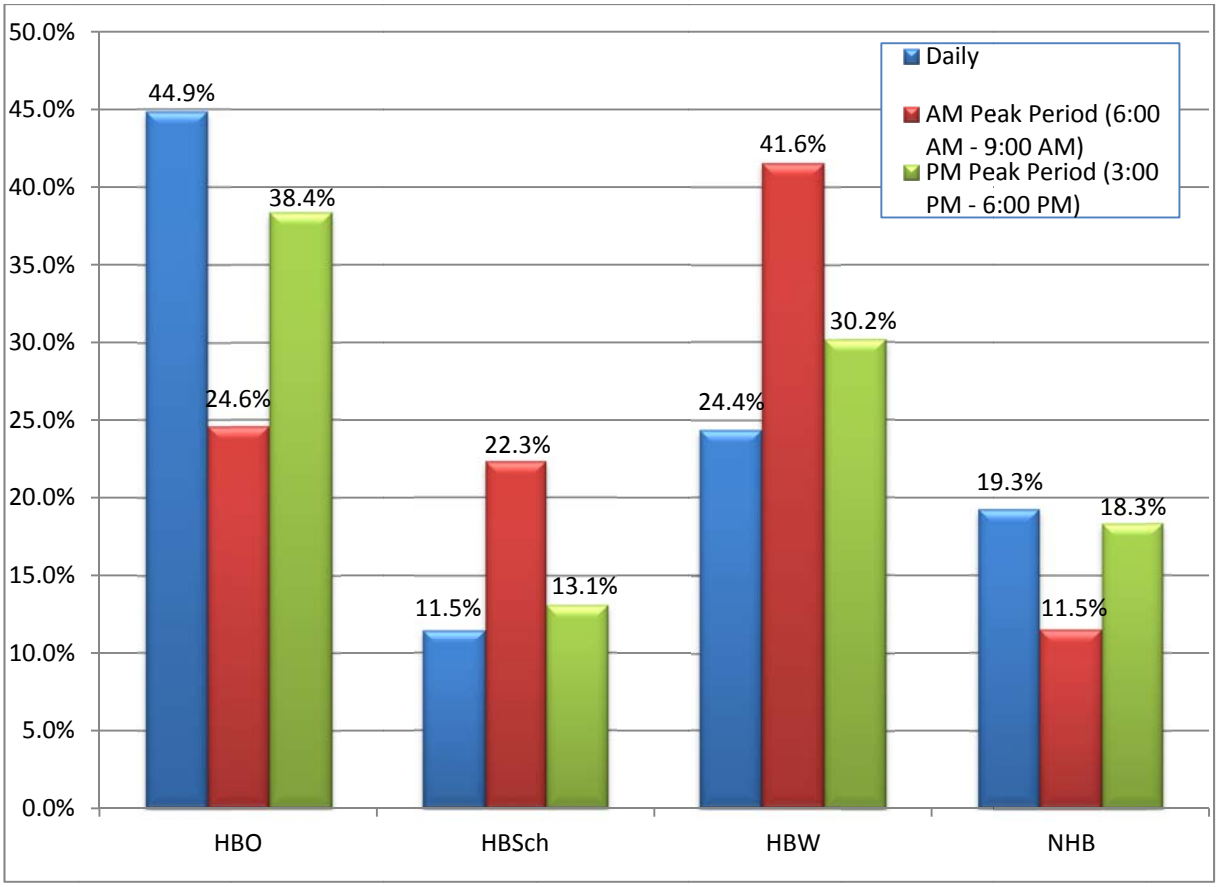


Figure 13 TTS Trip Type by Time of Day

A summary of the Transportation Tomorrow Survey data for Peterborough is provided in Appendix A.

3 TRANSPORTATION NEEDS ASSESSMENT

3.1 EXISTING TRANSPORTATION SYSTEM PERFORMANCE

3.1.1 MEASURING PERFORMANCE

Addressing performance on the roadway network is critical to the ultimate improvement of the overall system for all travel modes. Performance of the road network can be affected by capacity deficiencies (availability of space to accommodate vehicles), operational deficiencies (localized issues primarily focused on intersections such as lack of dedicated turn lanes), and other factors such as safety.

For the purpose of this update, only capacity deficiencies were addressed. Operational deficiencies will continue to be addressed by the City and County on an ongoing basis, while the emphasis on capacity deficiencies in this Plan Update focuses on optimizing the entire roadway network's ability to carry traffic safely and efficiently.

Road Segment Evaluation

Roadway capacity is identified by the maximum number of vehicles that a road section can accommodate under prevailing conditions, similar to the number of people that a bus can carry. For the purposes of this Transportation Plan Update, the planning capacities used for Peterborough's various roadway categories are illustrated in Figure 14:

Functional Classification	Class	Planning Capacity *(vehicles/hour/lane)*
Freeway	-	1800
Freeway Ramps	Freeway to Arterial	1300
	Freeway to Freeway	1500
Highway	-	1000
Arterial	High	800
	Medium	700
	Low	600
Collector	High	500
	Medium	400
Local	-	300

Figure 14 Planning Capacities

The functional classification of Peterborough area roadways are based on existing roadway characteristics (lanes, abutting land use, driveways and access points). In addition, it is important to note the following:

- The assumed lane capacities are consistent with what was used in the 2002 Transportation Plan and the Alternative West Side Corridor Analysis.

- The assumed lane capacities can differ between municipalities and within a given municipality. Differences in per lane capacity between different municipalities typically reflect the prevailing design standards. Design elements that affect per lane capacity include lane width, shoulder width/type, lane edge obstructions, design speed, among others. Differences in per lane capacity within the same municipality are possible, and may reflect road character (e.g., building offsets from the street curb, landscaping elements, etc.); road operations (e.g., friction from on-street parking lanes, relative spacing and type of traffic control devices, etc.) as well as nature and intensity of abutting land uses.

- High capacity arterials are assumed to have left turn lanes at major intersections, while medium and low capacity arterials do not.

- The Parkway was coded as having 900 vphpl as opposed to the 800 vphpl associated with high capacity arterial elsewhere on the network due to the limited accesses along the parkway and in keeping with the assumptions used in the 2002/2003 exercise.

Once the capacities of specific roadways have been established, performance can be evaluated with respect to capacity deficiencies.

Screenline Evaluation

Eight screenlines were selected for the purposes of evaluating travel demand across the entire network, as depicted in Figure 15.

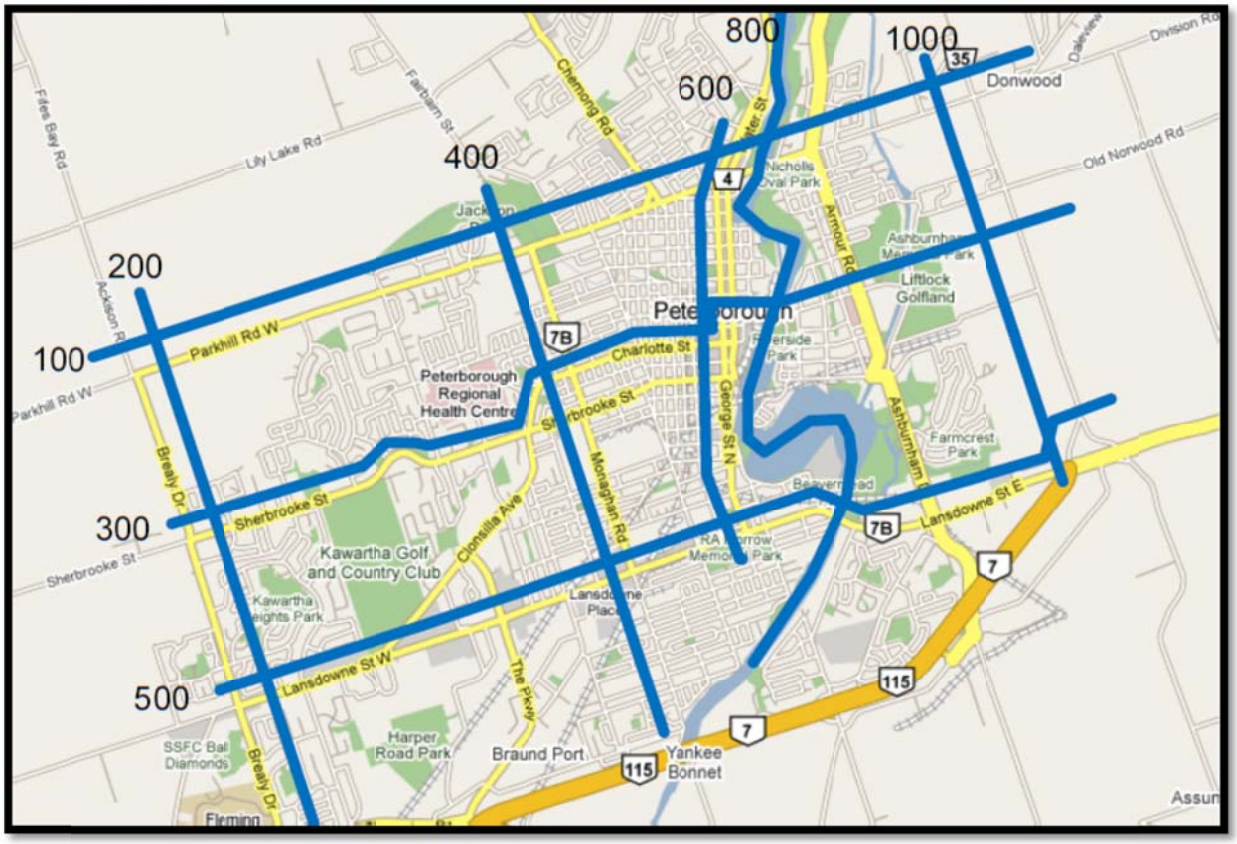


Figure 15 Screenlines used in Comprehensive Transportation Plan Update

Screenlines are fictitious lines drawn across a transportation network which are used to determine the total traffic moving across certain key barriers (i.e. rivers and railways) or moving through a particular area in a city (i.e. into/out of the downtown), along a number of roads or routes. Screenlines are used in calibrating transportation models since they provide a combined measure of travel demand. Since travellers make decisions about the network, rather than on a road by road basis (i.e. they select a **route** based on traffic congestion, number and type of signals, etc.), analysis at the screenline level better captures the travel trends and patterns in a city.

Once the screenlines have been selected, the performance of the network at a screenline level can be carried out by determining the total demand and supply across the screenline. In transportation planning, the demand is measured as the total volume of vehicles crossing the screenline, while the supply is the total capacity of all of the roads which may be used to cross the screenline. When total volume and capacity have been determined, a ratio of Volume/Capacity, or V/C, is calculated. This V/C Ratio establishes the roadway's Level-Of-Service (LOS), which is a measurement of mobility on a roadway.

Figure 16 V/C Ratios provide a LOS Measure

LOS is measured by a grading system where "A" is the best LOS, and "F" is the worst (see Figure 16). At level-of-service "F", which indicates the roadway is operating at 100 % of its capacity, the flow of traffic is generally considered to be unstable and unacceptable. Gridlock occurs, intersections operate at capacity with no flow progression and very long cycle lengths are needed at traffic signals. LOS "E" operates at 90% (V/C of 0.90) of the roadway capacity, and LOS "D" operates at 80%. LOS indicates the extent of capacity deficiencies, and therefore when improvements should be made.

The City of Peterborough official plan deems levels of service 'E' and 'F' to be unacceptable. As such, LOS 'E' is usually treated as a trigger for the consideration of capacity enhancements or demand reduction measures.

3.1.2 ROADWAY CAPACITY DEFICIENCIES

At present, the Peterborough road network operates reasonably well – a sentiment echoed by residents of the community during the consultation process. While certain road sections are experiencing failure conditions, the problems tend to be localized.

Figure 17 illustrates the 'existing' (2006) Level of Service on the road network during the afternoon peak hour. This figure is based on results from the transportation model that was developed for the Peterborough area to assess existing and future infrastructure needs (refer to Section 3.2.2). As shown in Figure 17, the majority of roads in Peterborough are currently operating at an acceptable Level of Service. Only five roads are experiencing failure conditions, where the volume of traffic exceeds the road capacity. A listing of these roads is provided in Table 6, along with the limits of failure and the corresponding direction of travel.

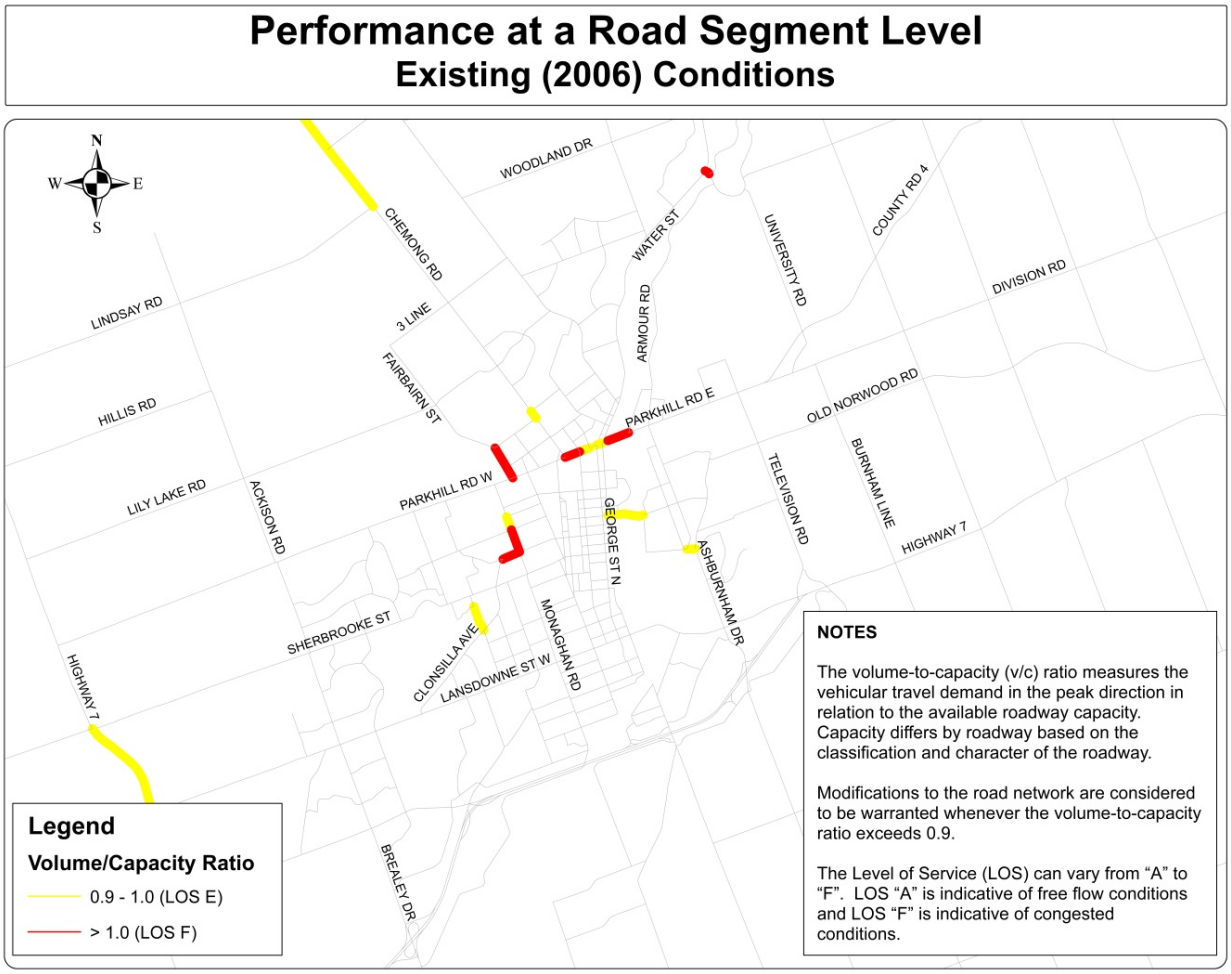


Figure 17 Existing Conditions – Road Network

Table 6 Existing PM Peak Hour Roadway Link Deficiencies at LOS F

Roadway Section	Direction	From	To
Charlotte St.	Both	Clonsilla Ave	Monaghan Rd
Fairbairn St.	NB	Highland Rd	Parkhill Rd
Monaghan Rd	NB	Weller St	Charlotte St
Nassau Mills Rd	WB	West Bank Dr	Water St
Parkhill Rd	Both WB	Auburn St Aylmer St N	Water St Chemong Rd

3.1.3 TRANSPORTATION ISSUES IDENTIFIED BY THE COMMUNITY

At the initial public information center, and at subsequent consultation points, members of the public were asked to provide insight into the transportation issues facing Peterborough. Generally, a number of the key issues which emerged included:

- Strong interest and support for an expanded and improved active transportation network, including both on and off street facilities as well as access to facilities which are maintained year-round

- Desire for increased transit frequency and reliability, with aggressive transit mode share targets. Regional transit was also raised as an issue of interest.

- Further analysis of downtown routes, including the current one-way streets, George and Water, to determine the applicability of conversion to two-way and the subsequent effect on the larger road network

- Need for improved access to the hospital

- Identification of issues in the north part of the city where growth has occurred, particularly on Fairbairn, Towerhill, and Hilliard

- Desire for improved access from the north part of the city to Highway 115/7

- Desire for a review of signal timing and traffic control at key intersections

In general, the public wanted to maintain the aspects of their community which were highly valued by the community, including multi-use trails in natural settings, a vibrant downtown, local streets with character, without compromising on the ease of travelling by automobile through the city.

3.2 FUTURE ROAD NETWORK PERFORMANCE

3.2.1 POPULATION AND EMPLOYMENT GROWTH

The City of Peterborough Council adopted ***Official Plan Amendment No. 142*** at its meeting of August 10, 2009. The OP Amendment revised the City's earlier population & employment projections downwards, and brought it in compliance with the Growth Plan for the Greater Golden Horseshoe Area.

Population and employment projections for the various time horizons are shown in Table 7. The same information is shown graphically in Figure 18 and Figure 19 respectively. It should be noted that Analysis Zones "1" through "14" fall within the City of Peterborough, whereas Analysis Zones "15" through "19" fall within the County of Peterborough.

Table 7 Population & Employment Projections

Analysis Zone	2006		2021		2031		2006-2021 Growth Rate	
	Pop'n	Emp't	Pop'n	Emp't	Pop'n	Emp't	Pop'n	Emp't
1	636	4502	558	4553	491	4553	-23%	1%
2	18412	6152	18473	6360	18721	6360	2%	3%
3	6798	5947	6519	6000	6501	6000	-4%	1%
4	5967	2297	5336	2373	5363	2373	-10%	3%
5	4160	753	3889	755	3696	755	-11%	0%
6	7754	2581	7693	2628	8595	2628	11%	2%
7	2009	7477	3408	7731	4320	7731	115%	3%
8	11883	2818	11440	2865	11417	2865	-4%	2%
9	15547	3040	20145	3109	21647	3109	39%	2%
10	3211	1071	4343	1207	4538	1207	41%	13%
11	0	2335	0	2473	0	2473	0%	6%
12	175	39	906	103	1419	103	711%	164%
13	27	6	27	6	26	6	-4%	0%
14	1223	1703	1263	1840	1263	1840	3%	8%
15	4022	871	4626	950	5029	950	25%	9%
16	2189	1012	2180	1104	2174	1104	-1%	9%
17	2236	520	2229	567	2224	567	-1%	9%
18	1803	1426	1814	1556	1821	1556	1%	9%
19	7424	2615	7803	2853	8055	2853	8%	9%
Subtotal (1-14)	77,802	40,721	84,000	42,003	87,997	42,003	13%	3%
Subtotal (15-19)	17,674	6,444	18,652	7,030	19,303	7,030	9%	9%
Total (1-19)	95,476	47,165	102,652	49,033	107,300	49,033	12%	4%

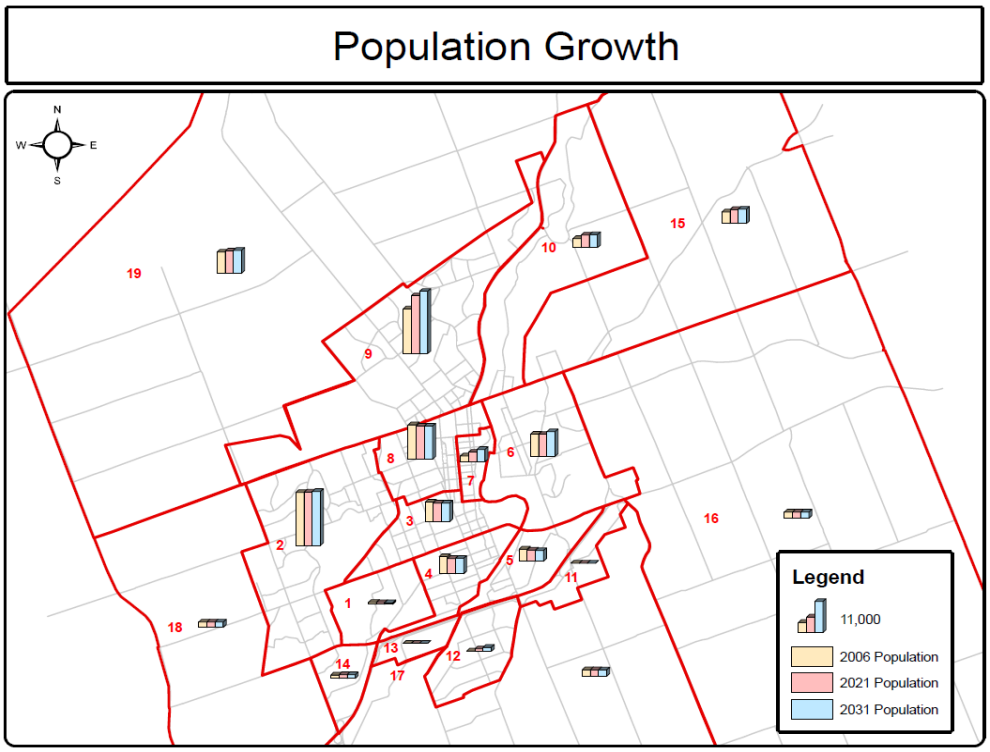


Figure 18 Population Distribution by Time Horizon

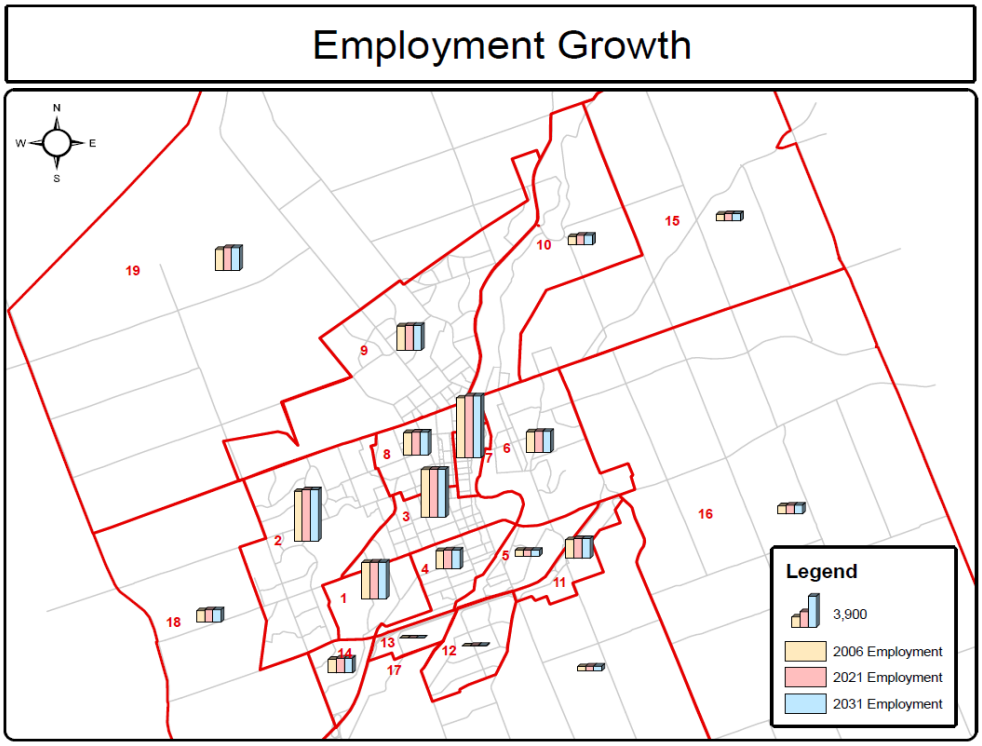


Figure 19 Employment Distribution by Time Horizon

The following observations can be made with respect to population and employment growth:

- Roughly 13% growth in population is expected between the 2006 to 2031 planning horizon. Average growth rate over the period is 0.5% per year.
- Majority of population growth is expected to take place in the northwest of the city.
- Roughly 4% growth in employment is expected to occur between the years 2006 to 2021.
- No employment growth is expected to occur between the years 2021 to 2031.
- Majority of employment growth is expected to take place in the southwest end of the city.
- Downtown's share of total employment (Zone 7 / Zones 1-19) will stay relatively constant at roughly 16%

The base year population figures for the City of Peterborough were developed based on the 2006 Census Data after adjusting it to account for Census undercounting, consistent with City's retail market analysis. The base year population figures for adjacent townships were estimated based on information provided by Statistics Canada.

The base year employment figures were derived from YLM (Your Market Place) Business Directory and the Greater Peterborough Economic Development Corporation Community Profile for 2008.

At the aggregate level, the extent and distribution of growth activities were developed in compliance with the GGH Growth Plan. At the more disaggregate level, spatial distribution & timing of growth activities took into account the City's expectations of development locations, progression, and intensification opportunities. The split in growth activity between the City and County of Peterborough took into consideration the County of Peterborough's Growth Plan dated June 24, 2009. Refinements to the split in the growth was negotiated with the County and approved by the Province.

On the population front, assumptions about the household size had to be adopted to translate the population growth projection limits in the GGH Growth plan to housing productions. The key assumptions were as follows:

a) City-wide household size will gradually decline over time as follows:
   - 2006 – 2.4 (base)
   - 2011 – 2.36
   - 2021 – 2.27
   - 2031 – 2.2

b) Greenfield areas experiencing new development will exhibit increasing household size while existing built areas will exhibit decreasing household size

c) Household size for the downtown will hold constant at 1.9

On the employment front, employment growth was generally anticipated in six areas. The two industrially designated areas, the Central Area of the City, the hospital and surrounding area, Sir Sandford Fleming College area and Trent University Area. Later in time, growth through mixed land use development was anticipated through growth plan policy projections and allocated to areas of new growth in the Chemong secondary planning area adjacent to Chemong Road.

The envisioned level and distribution of growth activity represent a significant deviation from what had been envisioned as part of the 2002 Transportation Plan development process. The projected land use activity for this 2012 Transportation Plan Update assumes lower growth level, greater density and tighter distribution than had previously been the case. The following is particularly worth noting:

a) Lower growth level:

- The basis for the 2002 Transportation Plan was a Population Target of 101,000 by 2021
- The basis for the 2012 Transportation Plan Update is a Population Target of 84,000 by 2031

b) Greater density:

- Urban Growth Centre is to go from the current level of 100 to 150 residents & jobs per hectare
- Designated Greenfield Areas is to go from the current level of 25 to 50 residents & jobs per hectare

c) Tighter distribution of growth activities:

- Built Area is to accommodate 40% of all new residential development
- Of the production to be directed to the Built Area, 40% is directed to the downtown Urban Growth Centre while the remainder is to be distributed to areas with identified intensification corridors

The foregoing points to the need for smaller Road Capital Program than that identified in the City's 2002 TMP and the County of Peterborough's 2004 TMP, which were completed prior to the enactment of P2G legislation.

3.2.2 TRAVEL DEMAND FORECASTING

To assess future infrastructure requirements, there is a need to project future travel demand on the road network. To produce such projection, models are developed which are capable of predicting travel activity as a function of land use. Typically, these models address four key elements of travel:

- How many trips are made in a given residential or employment area? (trip generation)
- Where do the trips begin and end? (trip distribution)
- What mode of travel is used for the trip? (modal split)
- What route is used to make the trip? (traffic assignment)

In general, the model inputs consist of land use data for each residential / business area within the city; and network data that describe the physical characteristics of the road links that connect these areas. The model outputs include an estimate of the traffic volume on each major road in the city and the average time for a vehicle to travel each road section.

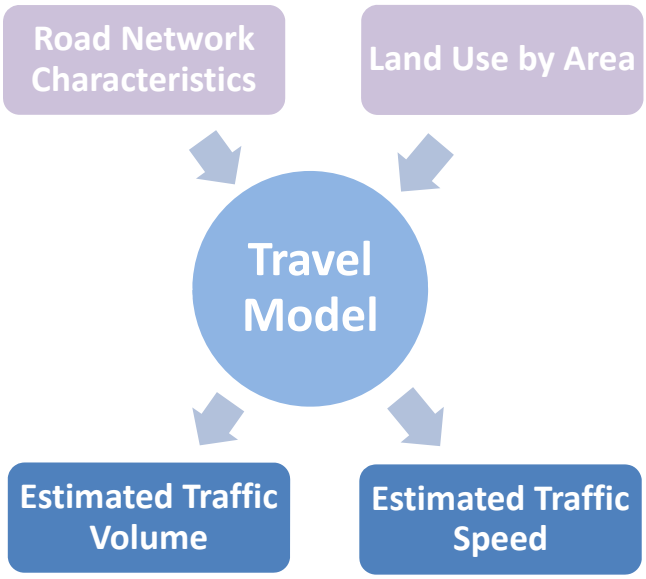


Figure 20 Travel Model Inputs & Outputs

The City of Peterborough's transportation model has been implemented in TransCAD, a GIS-based platform for transportation modelling and analysis. To capture trips which extend beyond the city boundary, the model includes not only the City of Peterborough, but also a portion of the surrounding County. Figure 21 illustrates the model limits, which extend from Lakefield in the northeast to the junction of County Road 21 and County Road 28 in the southwest, a distance of roughly 27 km.

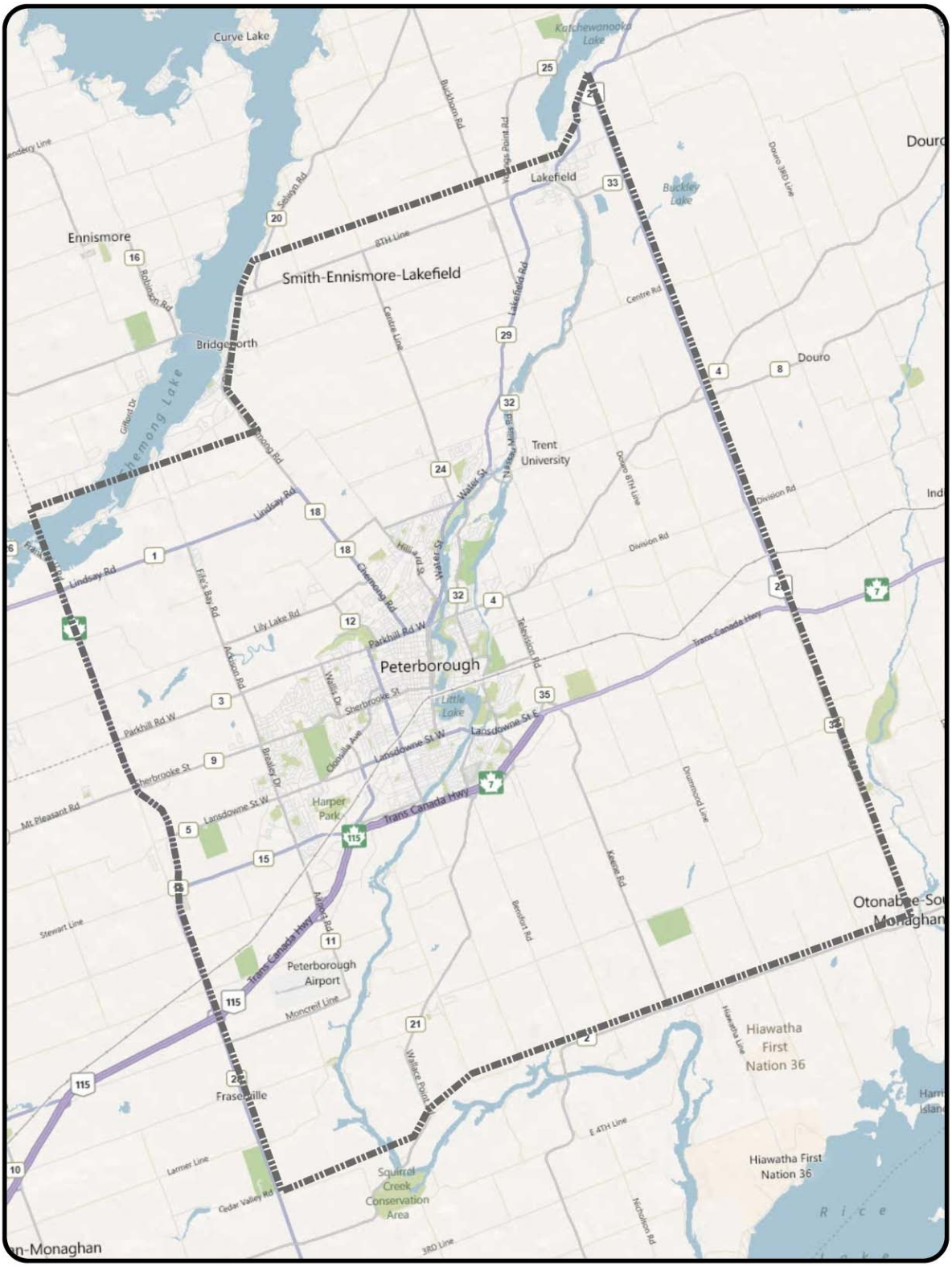


Figure 21 Model Limits

The model has a base year of 2006, and considers passenger vehicle travel only. Although commercial traffic is not explicitly represented, this was deemed to be acceptable given that truck traffic represents only 2% of traffic during the peak periods. Moreover, the share of truck traffic is not expected to increase in the future due to the limited extent of growth in employment.

Similar to other models, the City of Peterborough's TransCAD model is based on a four-stage transportation modelling procedure (refer to Figure 22). Each stage includes a number of mathematical relationships for predicting different aspects of travel activity. Other key elements of the model include:

- A traffic zone system[3] and associated land use data (population and employment)
- A base road network with information on the road segment length, number of lanes, speed characteristics, and maximum vehicle throughput (capacity)

[3] To model travel activity, the city is divided into zones, referred to as Traffic Analysis Zones. The center of activity of each zone is called the zone centroid. The population and employment within each zone are used to estimate the number of trips heading into or out of the zone. These trips are loaded onto the road network using hypothetical "network access points" referred to as Centroid Connectors. This is necessary since the model does not include individual driveways and may also exclude minor roads used exclusively for land access.

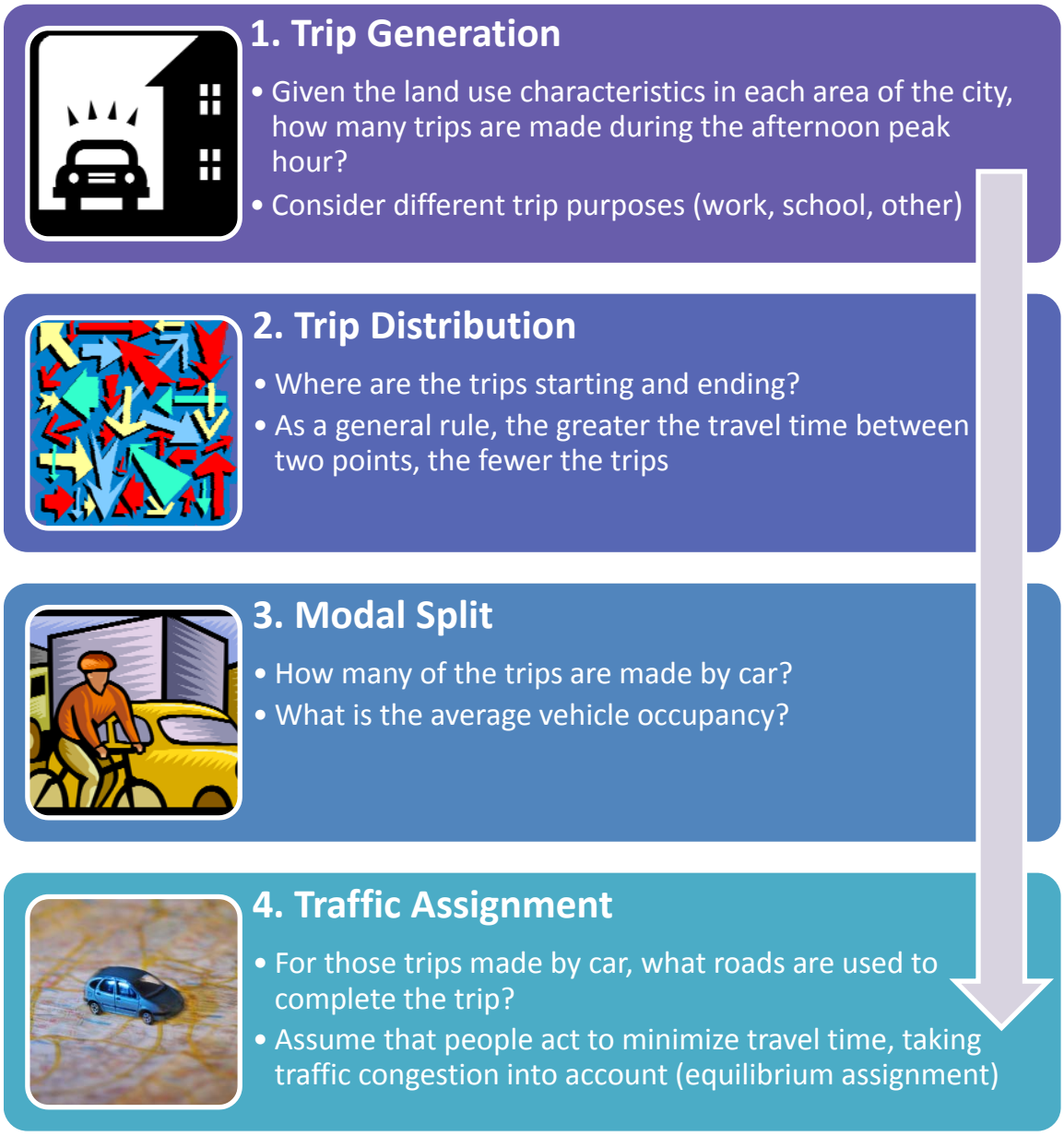


Figure 22 The 4-Stage Transportation Model

The TransCAD model was originally developed to support the previous 2002 Transportation Plan, and was extensively updated and refined for use in the current planning exercise. In particular:

- Road capacity projects implemented between 2001 and 2006 were coded into the model
- Selected Traffic Analysis Zones were disaggregated, increasing the number of zones from 338 to 353 and enhancing the resolution of the model

- The location of Centroid Connectors was refined, resulting in improved network loading, particularly in the Central Business District

- New trip generation and trip distribution models were created based on data from 2006 Transportation Tomorrow Survey

In addition, a special speed calibration exercise was undertaken to improve the model performance. By collecting information on the average time to travel different road sections within the city, improved relationships could be developed for predicting the travel time (speed) on a given road segment as a function of the level of congestion (as measured by the volume-capacity ratio).

Despite the complex mathematical equations employed by the model, they represent a simplification of human travel behaviour. Many of the data inputs as well as the formulas used to estimate travel represent average conditions or behaviour, and cannot hope to replicate the real world in all its detail. Therefore, while the model produces remarkably accurate estimates of travel over the system in general, and reasonable comparisons with observed counts on many individual roads, in some cases there will remain significant variations between observed and estimated values.

To assess the accuracy of the transportation model, the model was applied for existing (2006) conditions and the modelled traffic volumes were compared with the traffic volumes actually observed on the road network as recorded in traffic counts. This comparison was conducted at a screenline level, and also an individual road level. Results of the screenline comparison are provided in Table 8. With one exception, the screenline volume predicted by the model for the year 2006 is within 15% of the observed screenline volume, which is considered an acceptable level of accuracy for models of this type. Figure 23 illustrates the observed volume of traffic on each road in Peterborough where traffic count data was available compared to the volume estimated by the TransCAD model. Ideally, the two volumes would be the same, resulting in a diagonal line. The co-efficient of determination (R^2 value) is a statistical measure of the model "Goodness of Fit", with R^2 equal to 1 indicating a perfect correlation between the estimated and observed volumes. For the Peterborough model, an R^2 value of 0.89 was obtained, which meets industry standards for model development.

Table 8 Screenline Comparison of Observed & Modelled Results

North-South Screenlines	Observed		Modelled		% Error		Meets Target?	
	NB	SB	NB	SB	NB	SB	NB	SB
100 - North of Parkhill Road	3698	2840	3964	3138	7%	10%	Yes	Yes
300 - North of Sherbrooke / Charlotte / Hunter	4466	3482	4129	3595	-8%	3%	Yes	Yes
500 - North of Lansdowne	4520	3894	4297	3375	-5%	-13%	Yes	Yes

East-West Screenlines	Observed		Modelled		% Error		Meets Target?	
	EB	WB	EB	WB	EB	WB	EB	WB
200 - East of Brealey Road	1639	1213	1501	1549	-8%	28%	Yes	Yes
400 - West of Monaghan Road	3558	2493	2764	3680	6%	5%	Yes	Yes
600 - West of George St	2902	2897	3293	2809	13%	-3%	Yes	Yes
800 - River	2460	2901	2717	2766	10%	-5%	Yes	Yes
1000 - West of Television Road	977	1265	958	1159	-2%	-8%	Yes	Yes

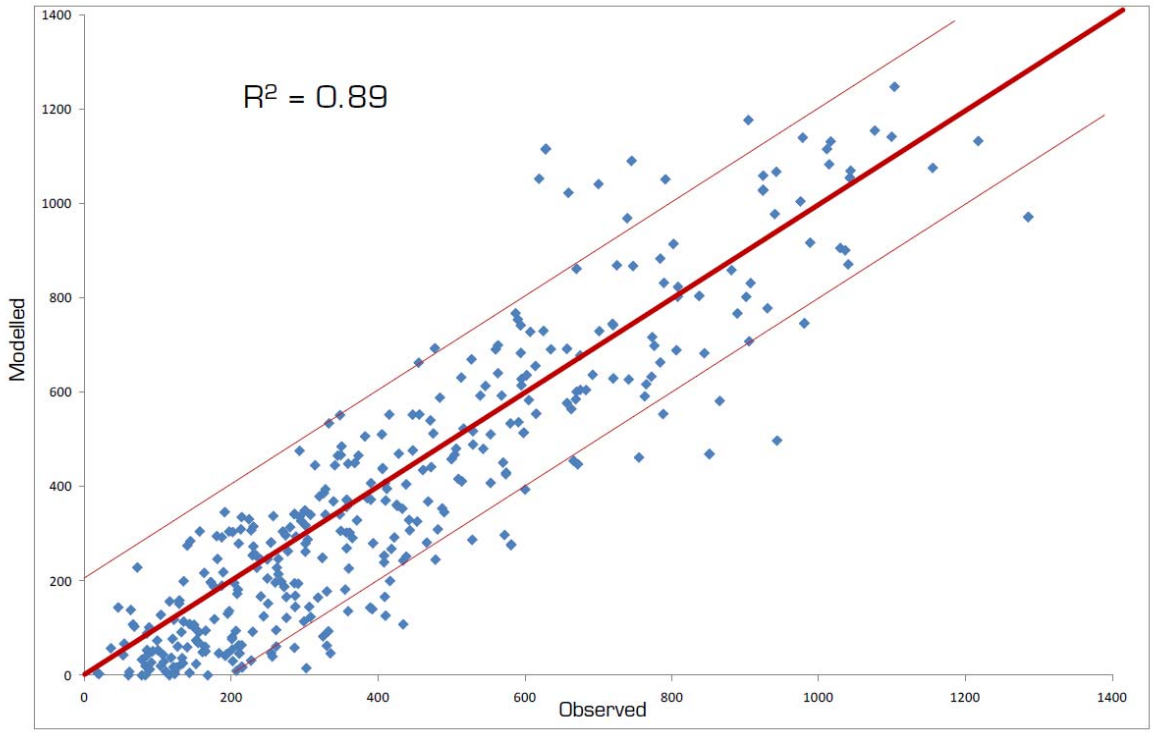


Figure 23 Model Calibration Results

Once the accuracy of the model was confirmed, it was used to estimate future traffic volumes on the road network based on the future population and employment. Such estimates of future travel activity provide the basis for assessing future network deficiencies (congestion bottlenecks), where the travel demand is expected to exceed the road capacity. Initially, the model was used to examine infrastructure requirements for a horizon year of 2031. However, traffic projections were also developed for 2016 and 2021 for assessing project timing.

It should be noted that the transportation model only considers failures at a “link level”, and is not intended to capture localized failures at individual intersections. Such failures are typically addressed by modifying the intersection design or signal timing, without the need for extensive network modifications. In contrast, the transportation model considers traffic flow at a corridor or network level, and helps to identify where improvements may be needed over an extended area (i.e. through road widening or the construction of new roads).

Table 9 presents a summary of the 2006 and 2031 travel activity as estimated by the TransCAD model, assuming no road network improvements are implemented in the future other than those which have already been approved by Council or committed to by other levels of government.

According to Table 9, the growth rate in internal-to-external and external-to-internal trips (i.e., trips with one trip end in the City of Peterborough) exceeds the rate of growth in internal-to-

internal trips (i.e., trips with both trip ends in the City of Peterborough). This trend reflects the following:

- Expectation for a higher growth rate in population compared to employment in the City of Peterborough
- Expectation for a higher employment growth rate in areas adjacent to the City of Peterborough (e.g., Region of Durham) compared to the City of Peterborough.

In addition, the average trip length on the road network is expected to increase as a result of the following:

- Distribution in population and employment growth within the City, with the largest increase in population occurring in the northern sectors of the City and the largest increase in employment occurring in the southern sectors of the City
- Disproportionate increase in trips where one of the trip ends is outside the city limits

Table 9 Summary of Travel Characteristics

	2006 Base Year	2031 Horizon	Percent Growth 2006 to 2031 (25 years)
Trips during Afternoon Peak Hour			
▪ Internal-to-internal	15,760	19,260	22%
▪ Internal-to-external & external-to- internal	9,640	13,090	36%
Average Trip Length (km)	8.1	8.5	5%
Network-Wide Travel Activity (vehicle-km)	206,140	275,240	34%

3.2.3 COMMITTED ROADWAY PROJECTS

In assessing future road network deficiencies, it is important to account for "committed" projects which will be built over the planning horizon. These include projects that have been approved in the City of Peterborough's 5-year capital plan, as well as projects that the County of Peterborough and Ontario Ministry of Transportation have committed to building. A summary of these projects is provided in Table 10 below, while Figure 24 illustrates the projects graphically for a horizon year of 2031. Since there is a reasonable expectation that these projects will be constructed, it is appropriate to include them in the transportation model for assessing future road network needs.

Table 10 Committed Projects

Project Number	Project Description	Jurisdiction	Time Horizon for Implementation
1	Widen Highway 7 from Highway 115 to Parkhill Road West	MTO	2021 to 2026
12	Widen County Road 18 to 5 lanes from County Road 1 to the Bridgenorth Bypass	County of Peterborough	2016 to 2021
13	Construct new 2-lane Bridgenorth Bypass from County Road 18 to the County Road 14 Causeway	County of Peterborough	2016 to 2021
17	Widen Lansdowne Street West from 2 to 5 lanes from the City's western limits to Kawartha Heights Boulevard	City of Peterborough	2011 to 2016
18a	Construct Hospital Access Road Extension from Parkhill to Sherbrooke	City of Peterborough	2011 to 2016
18b	Construct Hospital Access Road Extension from Sherbrooke to Clonsilla (under review)	City of Peterborough	2011 to 2016

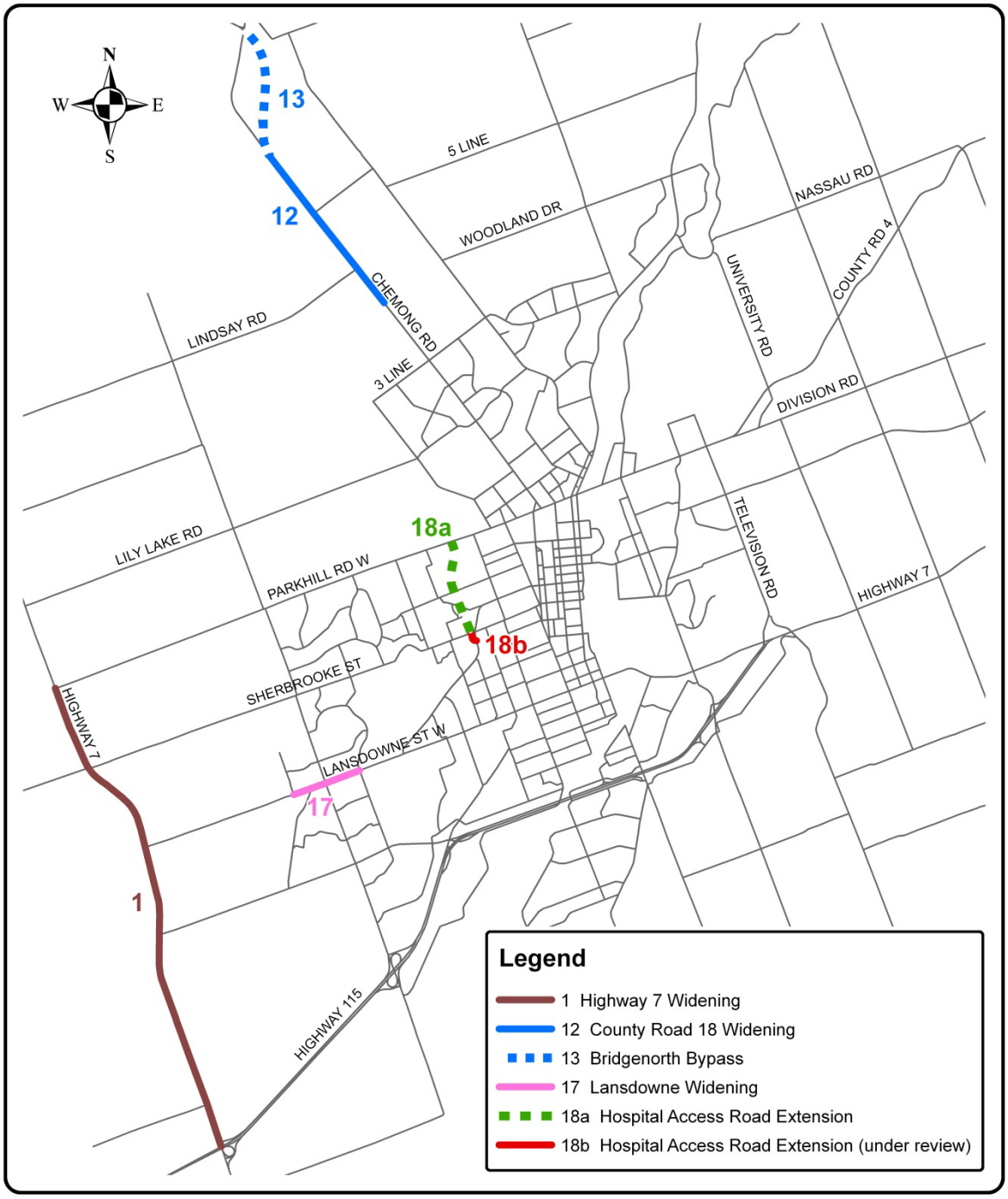


Figure 24 2031 Base Scenario (Committed Projects)

3.2.4 ANTICIPATED ROAD NETWORK DEFICIENCIES

To assess future road network deficiencies, the transportation model described in Section 3.2.2 was applied for a horizon year of 2031. The assessment was conducted assuming that all committed roadway projects described in Section 3.2.3 would be in place. It was further

assumed that the transit modal share would increase from its current value of roughly 4% to 6% by 2031 (refer to Section 4.2.1). The assessment thus provides an indication of what network deficiencies are expected to persist in the future after all committed projects have been implemented and a greater share of travelers are using transit. From the results, it can then be determined what additional infrastructure investment is required to address future mobility needs beyond current commitments.

Figure 25 illustrates the anticipated performance of the Peterborough road network at an aggregate level as estimated by the transportation model. In this figure, the amount of travel on arterial and collector roads has been divided into Level of Service categories. For the base year of 2006, only a very small proportion (approximately 3%) of the overall travel during the afternoon peak hour experienced unfavourable conditions, defined as Level of Service E or F. However, by 2031, nearly 13% of travel on the road network is expected to be at or approaching failure conditions.

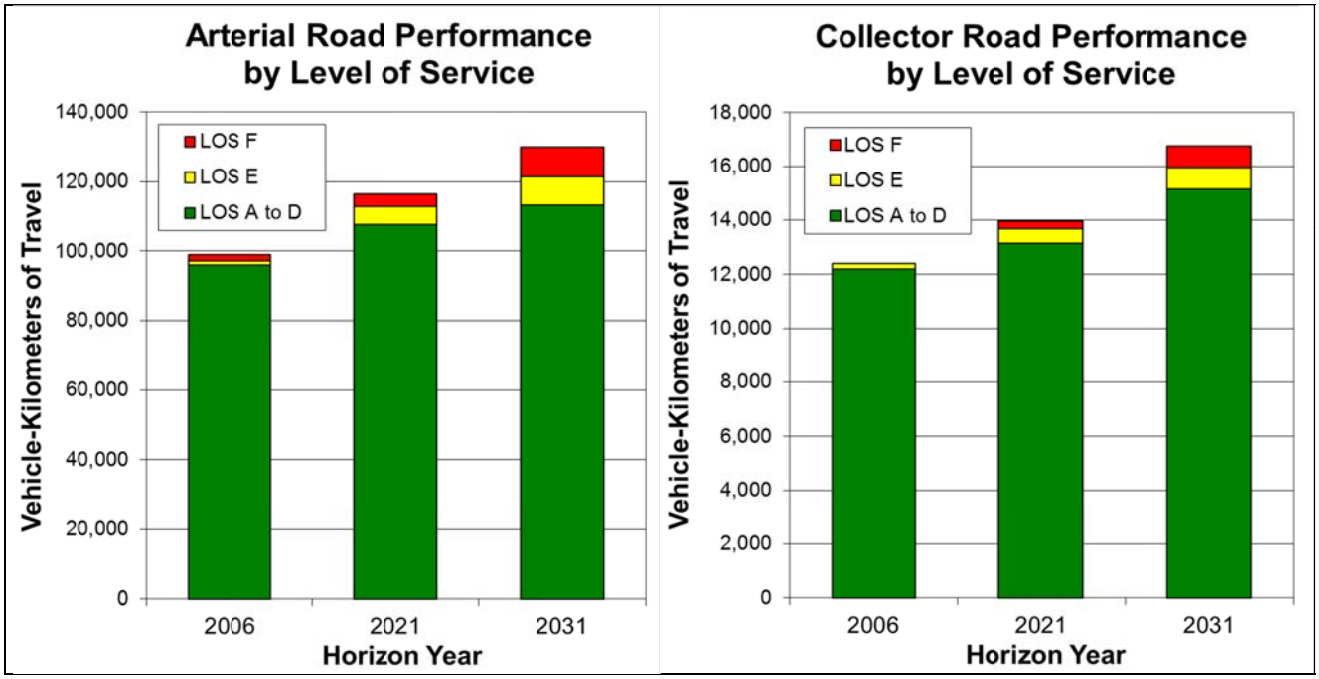


Figure 25 Network-Wide Arterial & Collector Performance

The performance of the road network at a screenline level is illustrated in Figure 26. In general, all of the screenlines are expected to operate at an acceptable Level of Service in 2031 with two notable exceptions:

- Screenline 800, which captures travel activity across the Otonabee River, is expected to fail, indicating insufficient bridge capacity to accommodate the anticipated crossing demand

- Screenline 101, which captures travel activity to/from the north, is expected to have a volume-to-capacity ratio that exceeds 0.9. Although not yet failing, improvements are considered to be warranted before operations deteriorate further

Individual road segment failures are shown in Figure 27 and summarized in Table 11. In general, deficiencies at the road segment level can be tolerated and not acted upon, so long as such deficiencies are not excessive and alternate roads are available within close proximity. However, deficiencies at the screenline level, or network-wide level, need to be addressed. If high and persisting congestion is unaddressed in these situations, it may lead to:

- Cut-through traffic on lower-order facilities as drivers cut through residential areas to avoid congestion;
- Reduced travel time reliability for public transit and private vehicles;
- Reduced ability to manage and respond to incidents; and,
- Increased response time for emergency service providers (fire and ambulance in particular).

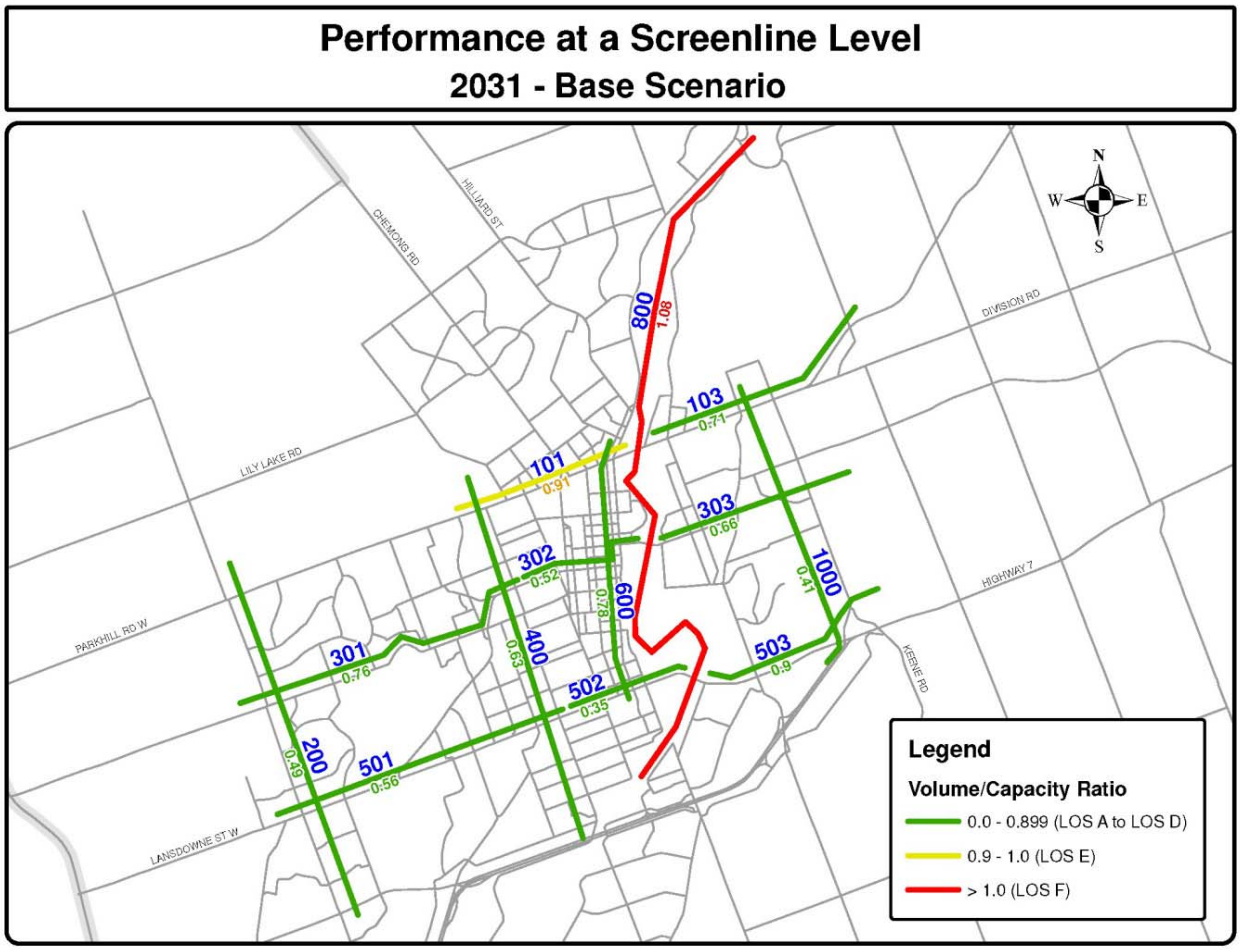


Figure 26 Screenline Performance - 2031

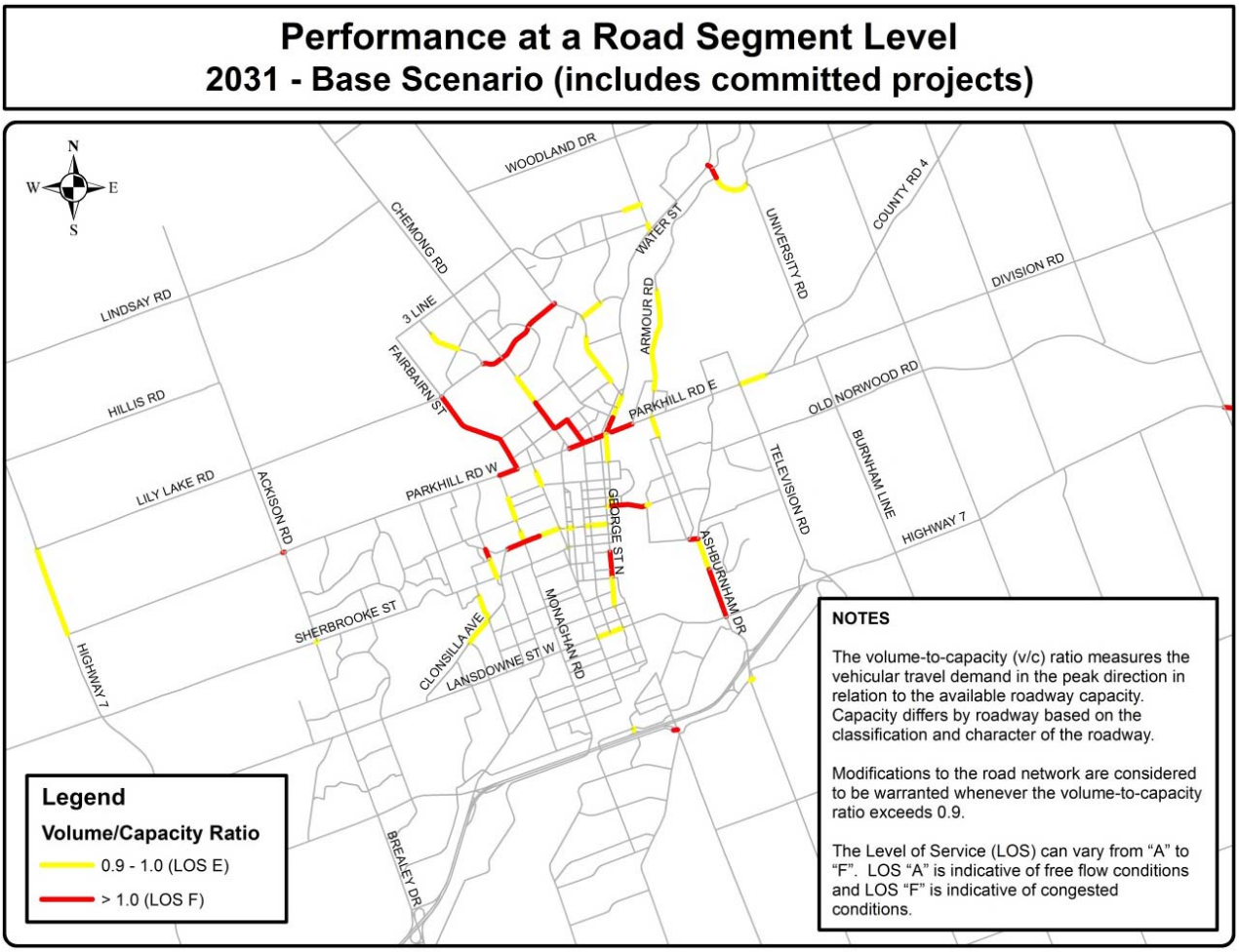


Figure 27 Link Level Performance - 2031

Table 11 Future PM Peak Hour Roadway Link Deficiencies at LOS F

Roadway Section	Direction	From	To
Ashburnham	NB	Marsdale Rd	Lansdowne St E
Aylmer	NB	Parkhill Rd	Wolsely St
Bridge Rd	WB	Ward St.	Robinson Rd
Charlotte St.	Both EB	Clonsilla Ave Elias Ave	Monaghan Rd Monaghan Rd
Chemong Rd	Both NB	Sunset Highland	Highland Wolsely
Fairbairn St	Both NB	Parkhill Lily Lake Rd	Wolsely Wolsely
Frank Hill Rd	NB	Highway 7	Model Limits
George St S	NB	Dalhousie St	Rink St

Roadway Section	Direction	From	To
Guthrie Dr	EB	Highway 7	Bensfort Rd
Highway 7	EB	Model Limits	Heritage Line Rd
Medical Drive	NB	Hospital Dr	Alexander Crt
Hunter St	Both	Burnham St	Water St
Maria St	Both	Ashburnham Dr	Armour Rd
Nassau Mills Rd	WB EB	Water St West Bank St	West Bank St Armour Rd
Parkhill Rd	Both	Auburn St	Chemong Rd
Parkhill Rd W	Both WB	Monaghan Rd Ackinson Rd	Fairbairn St Brealey Dr
Towerhill Rd	WB	Hilliard St	New Two-Lane Road
Water St	NB	Barnardo Ave	Parkhill Rd
Wolsely St	WB	Chemong Rd	Aylmer St N

3.2.5 SENSITIVITY TO DEMOGRAPHIC TRENDS

Some sensitivity analysis was undertaken to assess the potential implications associated with the aging of the population. This was deemed to be a worthwhile exercise in view of the anticipated future demographic profile of Peterborough's population. The anticipated future demographic profile is presented in Figure 28, which was extracted from a document entitled "Ontario Population Projections: 2008 to 2036". The document was published in the fall of 2009 by Ontario's Ministry of Finance. It covers Ontario's 49 Census Divisions, and is based on the 2006 Census data.

The above mentioned document suggests that approximately two-thirds of the population growth expected in the Peterborough Census Division will be associated with the age category of "65 years and over", resulting in an increase of this group from 18% in 2008 to 29% of the population in 2031. It should be noted that the document states that the projections presented in it do not represent Ontario government policy targets or desired population outcomes, nor do they incorporate explicit economic or planning assumptions. They are developed using a standard demographic methodology in which assumptions for population growth reflect recent trends in all streams of migration and the continuing evolution of long-term fertility and mortality patterns in each census division.

It is generally acknowledged that the aging of population can be expected to affect trip propensity, trip timing and transportation mode of choice. Unfortunately, travel demand models do not explicitly take into account the age of the population, and by implication they do not take into account differences in the trip making characteristics of various age groups - be it trip propensity, trip timing or transportation mode of choice. This is an emerging area of interest, and travel demand models may in the future incorporate population demographics as inputs. This will require cities to develop population profile by age group, and potentially population distribution by age group.

Travel demand models have limited ability to account for population aging, as trip generation rates are not a direct function of household demographics. Trip generation rates for various land use types are based on observed/empirical evidence, and as such are backward-looking. This doesn't introduce any bias when the population age profile remains stable. However, travel demand models will tend to underestimate trips when the age profile shifts to a younger population as was the case few decades back, and tend to overestimate trips when the age profile shifts to an older population as is expected to be the case for the next few decades. The extent of under/over estimation is difficult to foresee in a reliable manner. In practice, this problem is minimized by undertaking regular updates to the city-wide travel demand modelling exercise that incorporate updated trip generation rates that are calibrated against the observed trip making characteristics in the census area.

A review of the TTS data on person trip rates by age and gender for the years 1986 and 2001 for the Greater Toronto Area, as depicted in Figure 29, reveals that individuals aged 65+ make half as many trips during the day as younger individuals. However, the rate of decrease in trip making with age seems to decrease over time. This trend is expected to continue into the future.

Assuming that the difference in trip propensity is similar in the peak hour and that this difference will continue to hold into the future, the future trips projected on the road network may be **overstated to the tune of 5%** based on a consideration of the future demographics profile developed by the Ministry of Finance for the Peterborough Census Area.

Trip generation rate for tomorrow's seniors is expected to be higher than today's seniors due to the expected increase in interest to work after the age of 65 (be it on full or part time basis) and the generally healthier and more active lifestyle of seniors. The shift in trip making propensity of seniors has already been occurring. A review of the 1986 and 2001 data confirms that trip rates decrease with age, but more importantly it reveals that the rate of decrease in trip making seems to decrease over time. Furthermore, females are now more active both before and after retirement, and their rates are approaching those of the males.

Given the uncertainty involved and the desire to be conservative in identifying future network deficiencies, no downward revision to the future travel demand estimates across the City was made to account for the aging population.

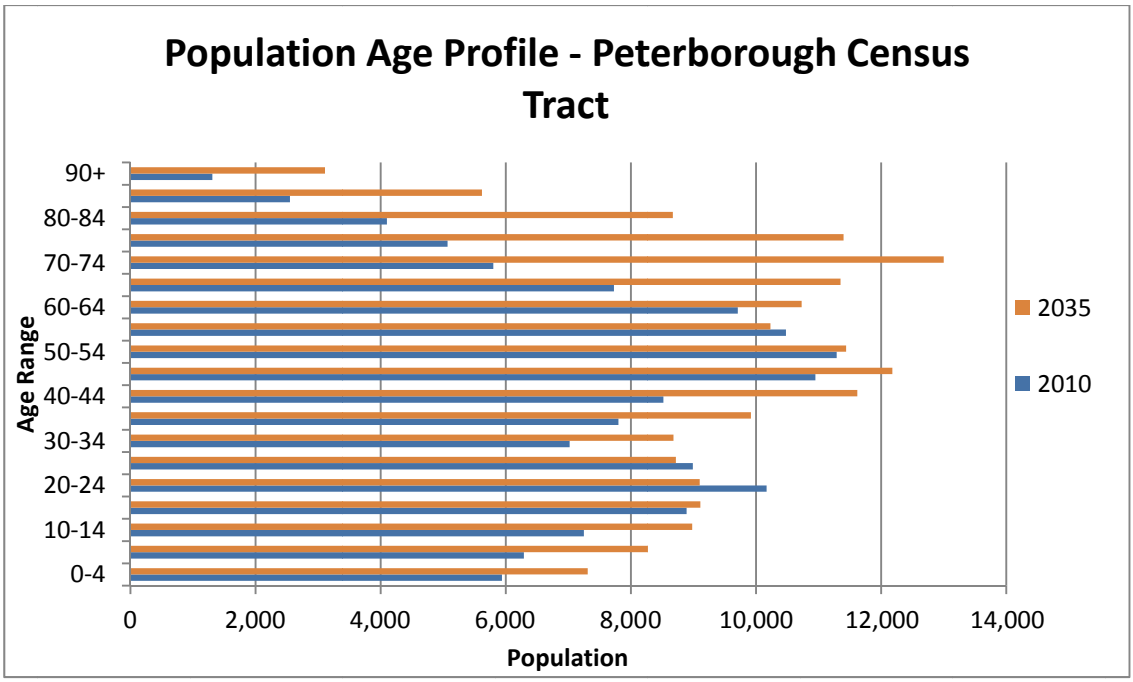


Figure 28 Population Age Profile (2010 & 2035) for Peterborough Census Area

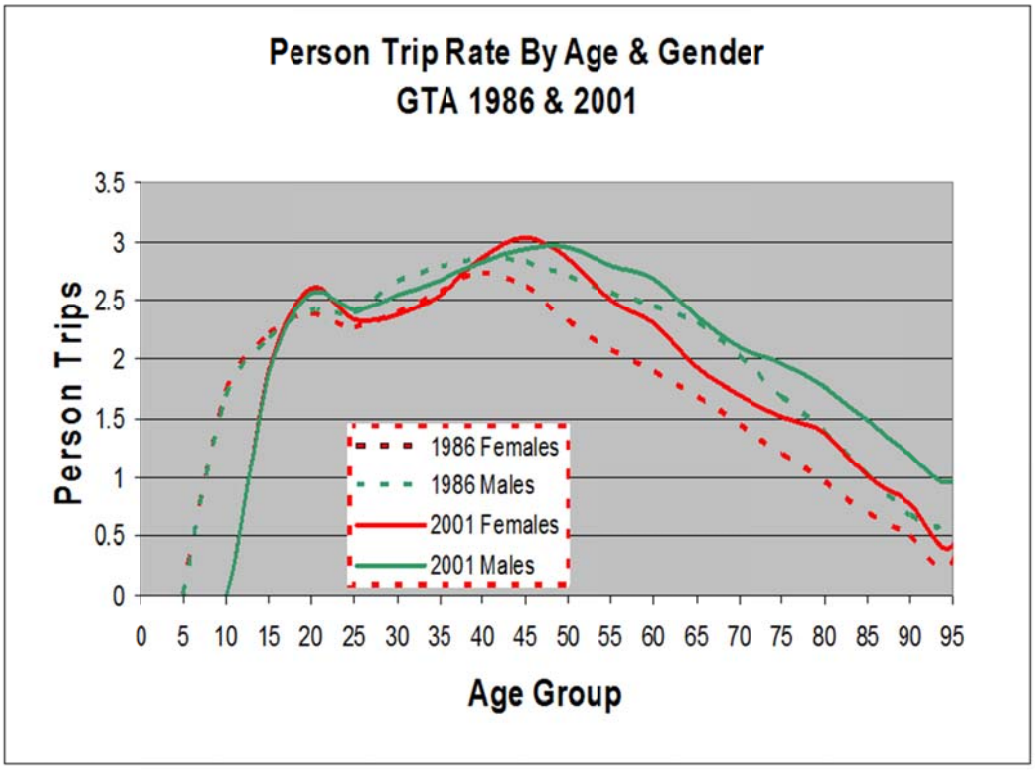


Figure 29 Person Trip Rates by Age & Gender for the Greater Toronto Area

3.2.6 SENSITIVITY TO FUEL PRICE

Some sensitivity analysis was undertaken to assess the potential implications associated with the increase in fuel price. This was deemed to be a worthwhile exercise in view of the recent sustained increase in fuel prices in both nominal and real terms over the past decade, and the potential for this trend to continue into the future.

It is generally acknowledged that an increase in the real cost of gasoline at the pump will dampen growth in travel demand. This would occur as a result of reduction in trip propensity, a shift in mode choice (i.e., less vehicular trips/capita), or reduction in trip lengths.

An assessment of the likely impact of increases in fuel price necessitates some knowledge or foresight about the likely extent of a future increase in fuel price, and the likely impact such an increase would have on travel demand. The following assumptions were relied upon in undertaking this assessment:

- Studies have shown that a 10 percent increase in crude oil prices would lead to a reduction in travel activity in the order of 0.75 and 1.5 percent in the short and long term respectively.
- The extent of the increase in the long term price of crude oil is uncertain, but an increase in the order of 100% to 200% from current levels seems to be possible.

In light of the above, traffic projections on the road network for the 2031 horizon could be overstated to the tune of **7.5 percent**, assuming 100% increase in the real price of crude oil.

Given the uncertainty involved and the desire to be conservative in identifying future network deficiencies, no downward revision to the future travel demand estimates across the City was made to account for the potential increase in fuel price.

It should be noted that applying a downward adjustment to the 2031 travel demand figures across the road network to account for demographic and fuel price trends would partially but not fully address the identified deficiencies across “Screenline 800 – Otonabee River”. The volume-to-capacity ratio across the screenline would be 1.08 assuming no adjustments, and 0.94 assuming a 12.5 percent downward adjustment to account for the aging demographics and price of fuel.

3.3 IMPLICATIONS FOR RAILROAD CROSSINGS

Given the potential physical and financial impacts associated with the introduction of grade separation, a cursory assessment was undertaken to identify potential future road/rail grade separation needs.

Figure 30 presents the current road/rail interactions within the City of Peterborough boundaries. The critical at-grade crossing locations were identified, in decreasing order of risk, as follows:

- The Parkway
- George Street N
- Airport Road
- Park Street S

An examination of the cross-product of the daily train frequency and the two-way vehicular travel demand in 2031 did not exceed the threshold that would trigger the need for grade separation. As such, no new rail/road grade separation needs are foreseen.

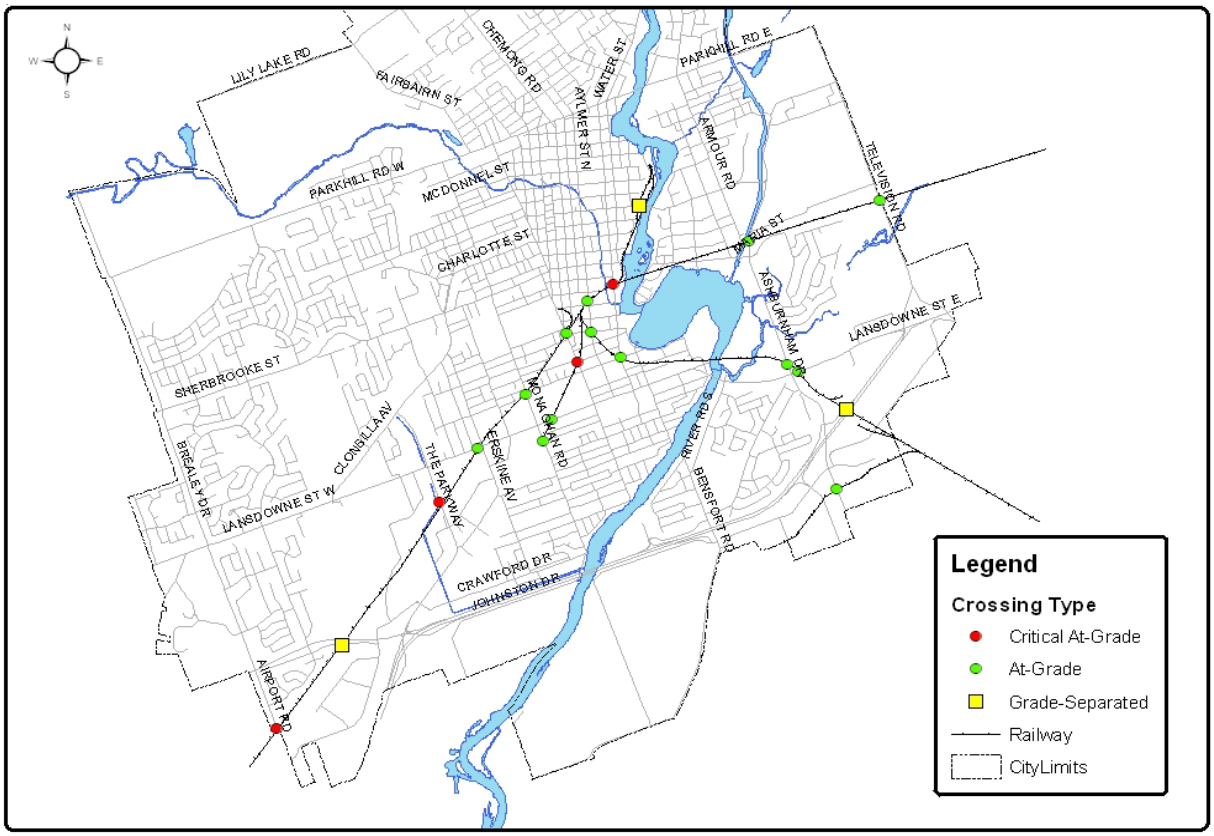


Figure 30 Rail/Road Crossings in City of Peterborough

3.4 PROBLEM STATEMENT

Based on the issues and opportunities identified in this Chapter, a problem statement was developed to guide the planning process. This problem statement was approved by City Council at the Committee of the Whole meeting on April 6, 2010. Subsequent to this meeting, a decision was made to refine the travel demand model to more accurately predict travel

speed. After this process of 'speed calibration', the model was generally found to predict less roadway congestion over the planning horizon. Accordingly, the problem statement was modified slightly to reflect the new results. The final problem statement incorporating these changes is presented below.

FINAL PROBLEM STATEMENT

- Over the planning period extending from 2006 to 2031, population will grow by 13%, and employment will grow by 4%.
- The anticipated growth will further increase the capacity deficiency in the north-south direction west of the Otonabee River, and in the east–west direction across the Otonabee River and in/out of the Central area. From a network-wide perspective, the anticipated growth will increase the portion of vehicular travel on arterial roads that will experience an unacceptable level of service (i.e., Worse than the acceptable threshold of LOS "D" as defined in the Official Plan). During the afternoon peak hour, the percentage of vehicular travel on arterial roads experiencing such conditions will increase from 3% in 2006 to 8% by 2021, and 13% by 2031.
- In light of the above, there is a need to explore options for bringing the demand on the network & the capacity of the network into better balance. Such options may include introduction of new roadways; widening /upgrades of existing roadways; acquisition of new buses to expand service coverage and/or increase service frequency; and addition of cycling and pedestrian facilities.

4 EVALUATION OF ALTERNATIVES

4.1 STRATEGIC TRANSPORTATION OPTIONS

Two types of transportation strategies are typically considered to address road network requirements: supply-side strategies aimed at increasing road capacity and demand-side strategies aimed at reducing travel demand.

4.1.1 STRATEGIES TO REDUCE TRAVEL DEMAND

Travel Demand Management (TDM) refers to a set of strategies to reduce auto vehicle travel during peak times so that more efficient use can be made of existing transportation infrastructure, reducing the impacts of traffic growth. TDM accomplishes this objective by encouraging people to shift their mode or time of travel, combine trips, or forego the trip entirely. For example, increasing the cost of parking may encourage people to shift to transit, adopting flexible working hours may help to spread the travel demand over a longer time period, and promoting telecommuting may eliminate some trips altogether. In general, TDM strategies fall into three basic categories:

- *Market-Based Strategies* – affecting the individual or collective cost to travel;
- *Behaviour-Based Strategies* – affecting the personal decision on when and how to travel, and;
- *Land Use-Based Strategies* – affecting the functional relationship and proximity between major travel origins and destinations, most notably the home/work trip.

The TDM objective is to create more “sustainable” mobility characteristics through changes in travel characteristics, and more integrated transportation/land use planning following themes of “Smart Growth”, “New Urbanism”, mixed land use planning, transit-supportive urban design and urban (i.e. brownfield) intensification.

Market-Based

- User Pay
- Parking Pricing

Behaviour-Based

- Transit Service
- Ride-Sharing
- Telecommuting
- Peak-Hour Shifts

Land Use Planning-Based

- Increase Density
- Mixed Land Use

In smaller cities such as Peterborough, the acceptance, effectiveness and therefore appropriateness of TDM strategies can vary significantly. This is because the applicability of any TDM strategy in any given city context is strongly influenced by a number of important factors that differ between cities, and influence the feasibility and success of TDM.

In most cases, the main factors that affect TDM feasibility are:

- **Traffic Conditions** – represented by travel distances, times and delays that influence the decision of when and how to travel. Smaller cities with generally convenient, acceptable travel conditions often have less functional need for TDM.
- **Public Awareness** – about traffic conditions, true travel costs, impacts to the community and availability of alternative services.
- **Demographics** – that influence the ability to drive and/or the ability to use alternative modes based on lifestyle (i.e. employment travel, child rearing) or physical capability (i.e. for cycling).
- **Availability of Alternative Systems** – to support TDM, on the basis that latent demand for alternatives modes will be realized through provision of needed infrastructure and services, such as transit service, cycling and pedestrian facilities, telecommuting program, etc.
- **Employment Density** – large concentrations or nodes of employment, for example in the downtown and business/industrial areas, can support efficient transit service, and therefore increased transit use, compared to decentralized and spread-out employment areas.
- **Population Density** – of a community influences the location and use of alternative travel modes, with higher density nodes and corridors more supportive of transit use than low density neighbourhoods.

- **Socio-Economics** – of residents influence their ability and need to travel by various modes, with higher income communities have a higher rate of two and even three auto households.
- **Climatic Conditions** – such as an extended winter season affect the ability to use non-motorized forms of transportation.
- **Parking Cost/Availability** – affects the competition between auto use, and alternatives modes that do not require vehicle parking.

With these realities in mind, a more specific summary of TDM effectiveness, limitations and recommendations considered appropriate for the Peterborough area is provided in Table 12.

Table 12 Expected TDM Effectiveness in the Peterborough Area

Strategy	Effectiveness		Costs		Implementation		Recommended
	Extent	Impact	To Users	To Society	Ease of Administration	Public Acceptability	Yes/No
Market Based							
Peak Hour Road Pricing	Broad	Great	Great	None	Moderate	Poor	No
User Pay	Broad	Great	Great	Great	Moderate	Poor	No
Increase Auto Costs	Broad	Moderate	Great	Moderate	Easy	Poor	No
Increase Long-Term Parking Costs	Broad	Great	Great	None	Easy	Poor	Yes
Behaviour Based							
Shift Peak Travel Hours	Variable	Minor	None	None	Moderate	Moderate	Yes
Telecommuting	Broad	Minor	None	None	Moderate	Good	Yes
Restrict Vehicle Use	Variable	Minor	Great	None	Hard	Poor	No
Intelligent Vehicle Systems	Narrow	Minor	Great	None	Hard	Moderate	Yes (1)
HOV Lanes	Variable	Moderate	None	Great	Hard	Moderate	No
Transit-Priority Systems	Variable	Moderate	None	Minor	Hard	Moderate	Yes
Ride-sharing	Narrow	Moderate	None	Minor	Hard	Good	Yes
Land-Use Based							
Increase Densities at Strategic Locations	Broad	Moderate	None	Minor	Moderate	Moderate	Yes (2)
Shorten Home/Work Distance	Broad	Minor	None	Moderate	Moderate	Moderate	Yes (2)

(1) Limited to signal system optimization
(2) Long term potential only

As this table indicates, only a select number of TDM measures are expected to be potentially effective in altering travel characteristics, and this is where the emphasis should be placed over the next 20 years. Since no one strategy alone can significantly alter travel behaviour, a package of appropriate strategies is needed, specifically tailored to conditions in the Peterborough area. Such strategies are discussed further in Section 5.2 in the context of the Transportation Master Plan.

While TDM holds considerable promise, it will not be sufficient on its own to address future mobility needs. Supply-side improvements will also be needed to resolve anticipated capacity deficiencies as described in the following section.

4.1.2 STRATEGIES TO INCREASE ROAD CAPACITY

Supply-side measures increase the physical capacity and/or operating capability of the transportation system to carry people and goods safely and efficiently. Examples of such measures are illustrated in Figure 31.

Figure 31 Supply–Side Strategies

Since travel demand management on its own will not be sufficient to address anticipated deficiencies in road network performance, a balanced approach is needed, in which measures to reduce travel demand are complemented with strategic road network improvements. Accordingly, the various measures in Figure 31 were carefully reviewed to determine what infrastructure projects may be needed to accommodate future population and employment growth in the Peterborough area.

To determine the recommended road network improvements, a six-step process was followed as illustrated in Figure 32. The objective of this process was to determine which alternative network best addresses future capacity deficiencies while also meeting the needs and aspirations of the community with respect to environmental protection, equity, economic development, fiscal responsibility, and other key goals.

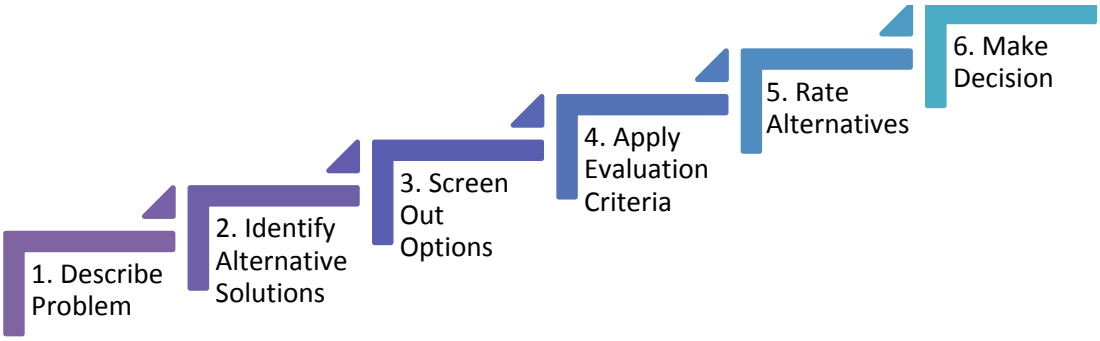


Figure 32 Overview of the Planning Process

The final three steps in the process are primarily concerned with the evaluation of alternatives: applying evaluation criteria, rating the comparative results and selecting the preferred scenario. In general, the evaluation process employed in the Transportation Plan Update meets three important evaluation objectives set by the Municipal Class EA process:

- **Compatibility** - rely on existing City and area policies and plans wherever possible in the evaluation, so that the resulting recommendations are compatible with other municipal and agency plans in the short and medium terms (0-20 years), as well as the long term (20 years and beyond) where appropriate.
- **Traceability** - follow a logical, consistent evaluation process so that the rationale for the final recommendations can be traced through clear and complete documentation.
- **Objectivity** - ensure that the evaluation process is free of any pre-conceived answers.

4.2 MODE SHARE TARGETS

4.2.1 TRANSIT

Two transit mode share targets for the year 2021 were examined to assess implications on ridership levels as well as capital and operating budgets. The two transit mode share targets of 5% and 6% were examined, which represent what was deemed to be achievable increases from the current transit mode share of 4% as revealed by the 2006 Transportation Tomorrow Survey. For comparison purposes, the 2002 Transportation Plan called for a 6% transit mode share target.

A transit analysis (refer to Table 13 and Table 14) indicated that increasing the mode share to 5% would increase annual ridership by 610,000 trips (representing a 22% increase from 2008 ridership level) and require an increase of $1.3 million and $0.21 million in capital budget and annual operating budgets respectively. Also, increasing the mode share to 6% would increase annual ridership by 1.29 million trips (representing a 46% increase from 2008 ridership level) and require an increase of $4.3 million and $1.19 million in capital budget and annual operating budgets respectively. All figures are in 2008 dollars.

An increase in transit mode share in Peterborough is achievable considering the wide range of opportunities that remain available including opportunity to enter into a Student Pass Agreement with Sir Sanford Fleming College; opportunity to enter into a Fare Integration Agreement with GO transit; opportunity to implement transit priority treatments at signalized intersections to improve transit service time and reliability; opportunity for adopting aggressive Transportation Demand Management Programs at public and large private employers; opportunity to achieve a fully accessible conventional transit service.

Table 13 Implications of 5% Mode Share target By Year 2021

Item	Description	Cost Impact (2008 Dollars)
Capital Costs	3 additional peak buses	**+ $1.3 million**
Additional Operating Costs	6,500 additional revenue hours	**+ $470,000 annually**
Additional Passenger Revenue	Revenue related to ridership increase of 610,000 trips	**+ $265,000 annually**
Additional Net Operating Costs		**+ $205,000 annually**

Table 14 Implications of 6% Mode Share target By Year 2021

Item	Description	Cost Impact (2008 Dollars)
Capital Costs	10 additional peak buses	**+ $4.3 million**
Additional Operating Costs	22,000 revenue hours plus additional overhead	**+ $2.2 million annually**
Additional Passenger Revenue	Revenue related to ridership increase of 1.29 million trips	**+$1.015 million annually**
Additional Net Operating Costs		**+ $1.19 million annually**

The follow should be noted with respect to the cost implications associated with the two scenarios outlined above:

1. Operating revenues associated with attracting new riders is lower under the 5% Scenario compared to the 6% Scenario since the lion's share in ridership gains under

the 5% Scenario is driven by the introduction of a student pass to Sir Sanford Fleming College, which tends to have lower revenues.

2. Capital costs required to attract new transit riders is lower under the 5% Scenario compared to the 6% Scenario due to the following reasons:

    - Presently, there is 10 to 15% spare capacity that can be tapped into.
    - The 2006 Transit Business Plan will continue to have a positive impact on ridership.
    - Costs associated with the transit priority program are not included as they are already included in the current Capital Budget Program.
    - There is no expansion requirements associated with bus storage and maintenance facilities.

There are a number of arguments that can be made in support of a conservative (i.e., 5%) or ambitions (i.e., 6%) transit mode share target. Arguments favouring the adoption of the higher target include expectation of higher energy costs and potentially more transit funding from higher order governments to combat the climate change challenge. Arguments favouring the adoption of the lower target include aging population, increased share of trips originating/destined beyond the City's boundary and expectation of no gains in downtown's share of total employment.

Public input has been overwhelmingly in support of adopting the higher transit mode share target of 6%. This reflects the increased interest in sustainable forms of transportation. It also reflects the belief by some that "more transit" means "fewer roads". While this is certainly conceivable for large urban centers (e.g., City of Toronto) where transit comprises a relatively larger percentage of the travel market, it is not the case for smaller urban centers such as Peterborough. A more appropriate expectation is that "more transit" means "less congestion". Achieving a high transit mode share target will translate to less vehicles across the road network and less congestion, but will not likely result in avoiding a road widening or a new river crossing.

Given that the budget implications are deemed to be acceptable and within the City's affordability envelope, the 6% mode share target was adopted. The adoption of this ambitious target has the added benefit of reducing the risk of overstating network deficiencies due to the decision not to adjust the vehicular travel demand forecasts downwards to account for trends in population aging and fuel prices.

4.2.2 ACTIVE TRANSPORTATION

A review of the transportation master plans for cities comparable in size to the City of Peterborough reveals that no mode share targets are set for active transportation modes (i.e., cycling and walking). This was the case for the cities of Brantford. Kingston, and Guelph – all of which are considered to be comparable to Peterborough and are grouped under "Category D" cities according to the Transportation Association of Canada's Urban Transportation Indicators Survey.

In contrast to the above, transportation master plans for many medium to large urban areas call for the number of walking trips to grow close to the rate of growth in total trips resulting in the walking mode holding its market share of total trips. The number of cycling trips is expected to grow at a higher rate than the growth in total trips resulting in a substantial increase in its market share of total trips. For example, the City of Ottawa's Transportation Master Plan calls for walking and cycling modes to carry 10% and 3% of all morning peak person trips in 2031, up from 9.3% and 1.7% in 2005.

Given the City's plans for increased population density and tighter distribution of growth activities, coupled with the expectation that persons in lower age groups who have a propensity to walk or cycle will tend to continue to do so as they age, there is grounds to set ambitious mode share targets for walking and cycling for the City of Peterborough.

Table 15 presents recommended mode share targets to measure future progress towards a more balanced system, and may be adjusted over time in response to the progress.

Table 15 Mode Share Targets

Daily Mode	Actual (2006)	Target (2031)
Auto Driver/Passenger	87%	83%
Transit	4%	6%
Cycling/Walking	6%	8%
Other	3%	3%

Given that travel surveys are typically conducted during the fall season, the proposed walking and cycling mode share targets represent fall conditions. Summer modal shares will be higher, and winter modal shares will be lower.

4.3 ALTERNATIVES GENERATION PROCESS

Despite the aggressive increases targeted for transit, cycling, and walking mode shares, the road network will continue to exhibit deficiencies requiring network-wide improvements.

The process used to formulate road network alternatives entailed the generation of individual road improvement options, the screening of these options to arrive at viable options, and then the grouping of these options into network scenarios for further evaluation. The following provides a brief description of each of these steps.

1. Generate individual road improvement options with due consideration to:
    - Future screenline deficiencies (e.g., Otonabee River).
    - Strategic goals (e.g., conversion of selected streets downtown from 1-way to 2-way operation to increase downtown vitality; and provision of high level of accessibility to the Peterborough Regional Health Centre).

- Contemplated but unapproved transportation corridors of significance (e.g., The Parkway). A range of options was considered including the entire corridor as envisioned; portions of the corridor with the potential to provide the greatest relief to the road network; and an altered corridor form with reduced capacity.

2. Screen out options deemed to be infeasible; hold limited merit; or result in unacceptable impacts based on discussions with City staff. Options considered but screened out include the following:

    - Conversion of the abandoned CN rail corridor from Water Street to Whitaker Street (Armour Road) to a new roadway crossing of the Otonabee River. Option was discounted due to property impacts.

    - Addition of new crossing of the Otonabee River north of the Parkhill Road Crossing, connecting Hilliard Street/Water Street to Dunlop Street (Armour Road). Option was discounted due to incompatible land use on Dunlop Street and limited operational capacity at one of the approaches to the crossing.

    - Expansion of the Hunter Street Crossing of the Otonabee River by widening, replacing or twining existing 2-lane bridge. Option was discounted as the Hunter Bridge structure has heritage designation and has been subject to a multi-million dollar rehabilitation. Also, the approach roadway offers limited opportunity for widening.

    - Addition of new crossing of the Otonabee River South of Hunter Road Crossing, connecting Sherbrooke Street to Marie Street. Option was discounted as the benefit of promoting Marie St. through the introduction of a new river crossing would be limited by the capacity of the Swing Bridge which provides the connection over the Trent Waterway to Ashburnham Drive and Television Road.

    - Provision of a direct connection of University Road and Television Road using an S-shaped alignment. Option was discounted as it was considered to have a higher cost, and potentially higher environmental impacts, and yet comparable network benefits to an indirect connection of University Road and Television Road using Warsaw Road.

    - Widening of Fairbairn Street from the Parkway alignment to Towerhill Road. Option was discounted due to incompatible land use, and potential impact on Towerhill Road east of Chemong Road which can't be upgraded to Arterial Road.

    - Introduction of a new north-south roadway west of Fairbairn Street, connecting Parkhill Road to Lilly Lake Road. Option was discounted as it would extend beyond the city limits, and cross the Jackson Creek. Also, there is limited

opportunity for an extension south of Parkhill Road to serve employment destinations in the southwest sector of the City.

- Widening of Monaghan Road from 2 to 4 lanes, from Charlotte Street to Parkhill Road. Option was discounted due to concerns with its feasibility/acceptability, as well as the potential to compromise existing on-road cycling lanes and road character.

- Widening or upgrading of Reid Street from Chemong Road to McDonnel Street. Option was discounted due to property impacts.

3. Develop network alternatives, or network scenarios, that group the various individual road improvement options in a meaningful way to ensure that improvement projects reinforce each other and network efficiency is maximized.

4. Refine network alternatives based on findings and recommendations arising from the Cycling Network Plan, to ensure that the road network plan doesn't compromise a corridor's potential for accommodating cycling needs, and that opportunities to integrate cycling are considered.

The final list of "screened" projects is presented in Table 16 below and illustrated graphically in Figure 33.

Table 16 Final List of Screened Projects

ID	Project Description
2	Nassau Mills Widening – Replace the existing 2-lane Nassau Mills bridge (between Water & Armour) with twin 2-lane structures – Replace the 2-lane Nassau Mills Trent Canal bridge with a 4-lane structure – Widen Nassau Mills from Water to University
3	Upgrade Pioneer/Nassau to a higher order facility
4	Introduce new 2-lane road from Fairbairn to Cumberland Introduce modern roundabouts at: – Cumberland / Carnegie / Water – New road alignment and Cumberland – New road alignment and Fairbairn Introduce signalized intersections at: – New road alignment and Chemong – New road alignment and Hilliard
5a	Widen Fairbairn from 2 to 4 lanes from Parkhill to the new road alignment Introduce a modern roundabout at Fairbairn and Parkhill
5b	Extend the Fairbairn widening from the new Parkway alignment to Third Line

ID	Project Description
6	<u>Chemong/Reid</u> – Widen Chemong from a 4 to 5 lane high capacity arterial from Reid to Sunset – Undertake intersection modifications on Reid from Chemong to Parkhill
7a	Transform Charlotte from 2 to 3 lanes from Clonsilla to Rubidge by replacing parking on the north side by a second westbound lane
7b	Widen Sherbrooke from 2 to 3 lanes from Monaghan to Rubidge by providing a second eastbound lane
8	Widen Parkhill West from Armour to Park (including the bridge over the Otonabee River) from a 2 to 4 lane low/medium capacity arterial
9	Widen Parkhill East from 2 to 4 lanes from Armour to the Warsaw/Division junction (including the swing bridge over the Trent Canal)
10	Upgrade University from a medium to high capacity arterial from Warsaw to Nassau Mills
11	<u>Television Road</u> a) Extend Television as a 2 lane high capacity arterial from Warsaw to the current Television alignment b) Widen Television to a 4 lane high capacity arterial from the new Television Extension to Lansdowne East
14	Convert George and Water to two-way operation from Sherbrooke to Parkhill
15	<u>Bethune/Aylmer/McDonnel Improvements</u> a) Convert Bethune and Aylmer to one-way operation from Sherbrooke to McDonnel b) Upgrade McDonnel from a low to medium capacity arterial (through the provision of a two-way left turn lane or left turn lanes at key intersections) from Water to Reid
16	<u>Partial Parkway</u> a) Construct new 4 lane high capacity urban arterial from Clonsilla / The Parkway to Sherbrooke b) Widen the Hospital Access Road Extension from a 2 to 4 lane high capacity urban arterial from Sherbrooke to Parkhill c) Widen Parkhill (including the bridge over Jackson Creek) from a 4 to 6 lane medium capacity urban arterial from the Hospital Access Road Extension to Fairbairn d) Widen Fairbairn from a 2 to 4 lane medium capacity urban arterial from Parkhill to the new Parkway Extension (north of Highland) e) Construct new 2 lane high capacity urban arterial from Fairbairn to Cumberland f) Upgrade Cumberland from a medium to high capacity urban arterial from the new Parkway Extension to Carnegie. Extend Cumberland as a high capacity arterial from Carnegie to Water

Candidate Road Projects for Evaluation

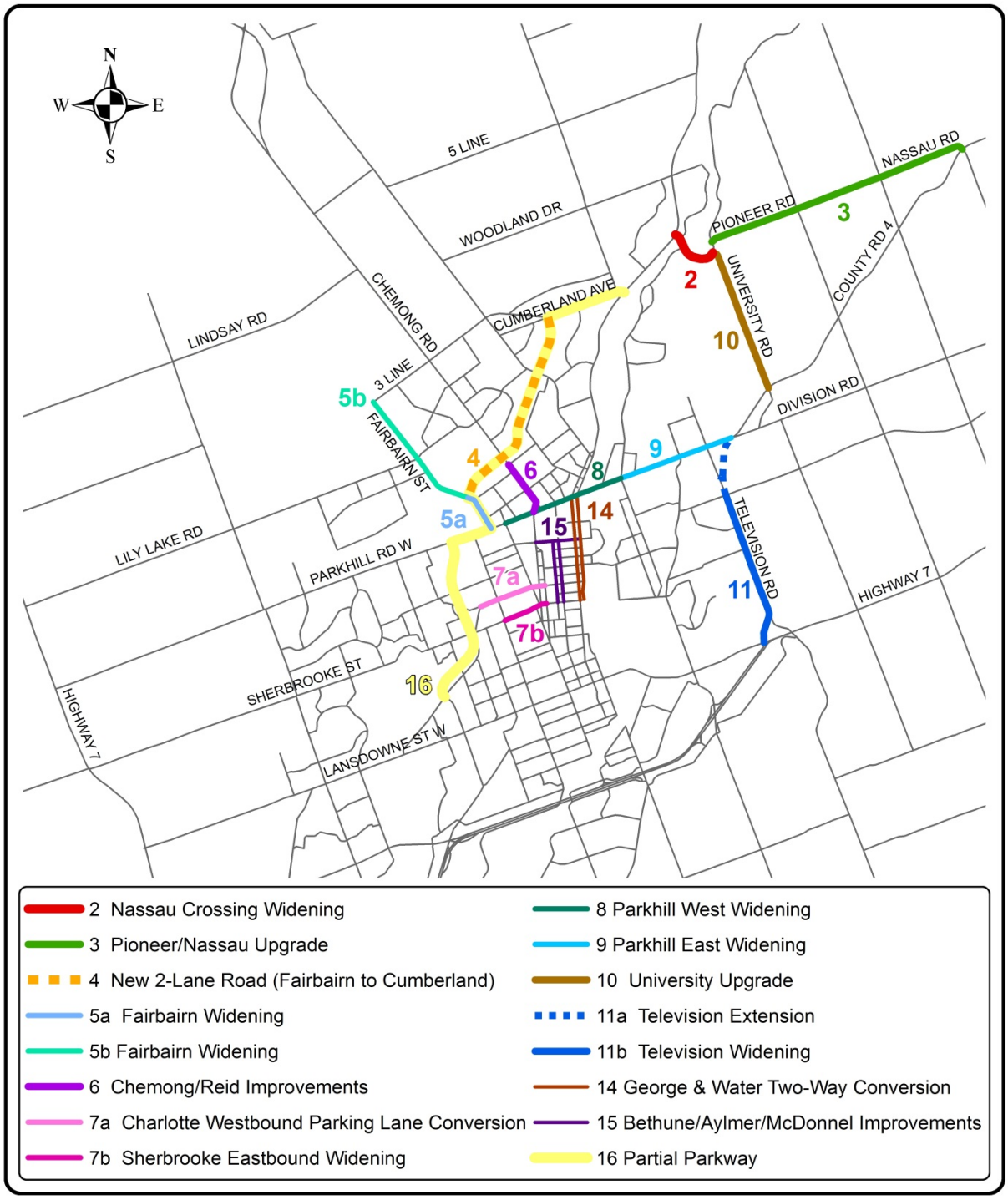


Figure 33 Screened Road Network Improvements

4.4 THE "DO NOTHING" ALTERNATIVE

When evaluating different road network scenarios, it is important to define a "Do Nothing" alternative, in which no new road projects are constructed other than those which have previously been approved. This "Base" scenario provides a benchmark for assessing the relative merit of each alternative, and also provides a basis for justifying the need for additional road improvements.

In developing the Do Nothing alternative, it is important to consider what road projects have already been approved for construction. These "committed" projects should be included in the Do Nothing alternative since the expectation is that these projects would be constructed regardless of any newly emerging network needs. Thus, Do Nothing should not be interpreted literally as "don't do anything at all", but rather as "do nothing further beyond what has already been committed to".

In general, the committed projects included in the Base scenario are those that have been approved in the City of Peterborough's 5-year capital plan. Also included are projects that the County of Peterborough and Ontario Ministry of Transportation have committed to building within the planning horizon. A summary of these projects is provided in Section 3.2.3, including an illustration which shows the Base scenario graphically for a horizon year of 2031.

For the purposes of evaluating road network alternatives, the Base scenario also incorporates anticipated changes in the transit modal share as described in Section 4.2

In the evaluation of network scenarios described in Section 4.7, the Base scenario is not referenced directly. This does not imply that the Base scenario was ignored in the evaluation. Rather, the evaluation results are all expressed in terms relative to the Base scenario. For example, when assessing how well each scenario performs in terms of network-wide fuel consumption, the impact is expressed as the fuel savings relative to the Base case (i.e. the fuel consumption for the Base scenario minus the fuel consumption for the network scenario in question).

4.5 DEVELOPMENT OF ROAD NETWORK SCENARIOS

Once a short-list of potential road network improvements was identified, these improvements were combined into various packages or scenarios.

For each scenario, a set of projects was selected to address the identified capacity deficiencies. Since there are often multiple ways to solve the same problem, the scenarios were structured in a way that would allow the effectiveness of different alternatives to be explored. In developing the scenarios, an effort was made to group projects that would be mutually supportive.

The main intent of the evaluation exercise was to examine how different groups of projects would function in combination in order to determine the preferred network scenario. In general, it is not appropriate to explore the impacts of each project in isolation, since road network improvements often exhibit interdependence or a high level of interaction, influencing travel patterns.

The development of the road network scenarios followed an iterative process. Findings from the initial set of scenarios were used to refine and develop new scenarios for testing. The final set of network scenarios carried forward for detailed evaluation is shown in Table 17. A graphical representation of these scenarios can be found in Appendix B, while Appendix C shows the corresponding network performance as predicted by the TransCAD model.

Table 17 Scenario Descriptions

Proposed Projects		Scenario						
		Base	AD	B	C2	E	F	H
1	Highway 7 Widening	X	X	X	X	X	X	X
2	Nassau Crossing Widening		X			X	X	X
3	Pioneer/Nassau Upgrade		X			X	X	X
4	New 2-lane road between Fairbairn & Cumberland		X	X		X		
5a	Fairbairn Widening (Parkhill to the new 2-lane road)		X	X	X	X		X
5b	Fairbairn Widening (new 2-lane road to Third Line)				X			X
6	Chemong/Reid Improvements		X	X	X	X	X	X
7a	Charlotte Westbound Parking Lane Conversion		X	X	X		X	X
7b	Sherbrooke Eastbound Widening		X	X			X	
8	Parkhill West Widening and Bridge Twinning			X	X			
9	Parkhill East Widening			X	X			
10	University Upgrade		X					X
11	Television Extension & Widening		X					X
12	County Road 18 Widening	X	X	X	X	X	X	X
13	Bridgenorth Bypass	X	X	X	X	X	X	X
14	George/Water Conversion to Two-Way Operation					X		
15	Bethune/Aylmer Conversion to One-Way Operation & McDonnel Upgrade					X		
16	Partial Parkway						X	
17	Lansdowne Widening	X	X	X	X	X	X	X
18	Hospital Access Road Extension	X	X	X	X	X	X	X

4.6 EVALUATION FRAMEWORK

The evaluation framework defines how the network scenarios will be evaluated. In the case of the Transportation Plan Update, nine evaluation criteria were applied. These evaluation criteria are also known as Measures of Effectiveness (MOE) since they measure how well a given alternative achieves key mobility, economic, and environmental objectives for the transportation system. For each MOE, a methodology was developed for measuring impacts, allowing the performance of each alternative to be compared.

Once the network scenarios have been evaluated against each of the Measures of Effectiveness, an approach is needed for determining the "best" scenario. Some scenarios will outperform others based on one or two criteria, but it is extremely rare that one scenario will score highest on all of the criteria. For example, the scenario which achieves the greatest benefit in terms of traffic congestion may also be the most expensive, or produce the greatest environmental impacts. How then is the "best" scenario determined? The answer to this question depends on the relative importance placed on the various evaluation criteria. To develop a "combined" score, the MOE's can be weighted in a way that reflects the objectives and viewpoints of the community. In the case of the Transportation Plan Update, the Study Team was directed not to weight the MOE's or develop a combined score. Under this approach, decision-makers have the flexibility of applying their own judgment regarding the importance of the different evaluation criteria.

The evaluation framework as described above was approved by City Council at the Committee-of-the-Whole meeting on April 6, 2010. An overview of the framework is provided in Table 18, including a description of each MOE and the basis used for measuring impacts.

In the case of qualitative measures (such as support for transit, support for walking and cycling, or support for business activity), a scoring methodology was developed for evaluating each road project included in a given scenario (refer to Appendix D). These scores were then added together to determine the overall scenario score. To facilitate the comparison of different scenarios, the scores were then adjusted to fall on a scale between 0 and 10 (with the highest unadjusted score receiving a 10, and the lowest unadjusted score receiving a 0).

Impacts to environmentally sensitive areas were likewise evaluated by considering each project in isolation. To quantify the impacts, an estimate was made of the total area of environmentally significant land falling within a 100 m buffer of the project, weighted based on the significance of the land (refer to Table 18). An overall scenario score was then computed by combining the results for each of the projects comprising the scenario. A discussion of the various natural areas impacted by each proposed project can be found in Appendix E.

Table 18 Evaluation Framework

Measure of Effectiveness (MOE)		Rationale	Description of Impact Measurement
1	Impact on environmentally sensitive areas	Ensures that impacts on the environment are given due consideration. Potential for negative impact is measured in terms of the proximity to designated Ecological Policy Areas and/or Natural Areas.	Acres of "affected" land within a 100 m buffer of project, weighted by the significance of the land as follows: • Level 1 Significance (60% weight): Provincially Significant Wetlands, Environmentally Significant Areas, and Watercourses (fish habitat) • Level 2 Significance (30% weight): Local ecological policy areas (Natural Areas, parks, open space/EP lands) • Level 3 Significance (10% weight): Other natural features (small woodlands, hedgerows, unprotected features)
2	Fuel consumption by passenger vehicles	Provides due sensitivity to depletion of natural resources. Also serves as a surrogate measure of air quality, as fuel consumption is closely related to the average operating speed and vehicular emissions.	Reduction in fuel consumption during the afternoon peak hour in 2031 in relation to the "Base Scenario" (litres)
3	Vehicle hours of delay by passenger vehicles	Considers unnecessary delays related to congestion, which affects productivity of workers and/or amount of family/leisure time available.	Reduction in in-vehicle travel time on the road network, as defined in the Travel Demand Model, during the afternoon peak hour in 2031 in relation to the "Base Scenario" (hours)
4	Monetary value of user benefits	Provides a monetary estimate of user costs that can be reliably established at this level of study. The primary cost elements that will be considered include fuel consumption and travel time.	Benefits reflect those occurring in the year 2031 based on a travel time value of $10/hr and a fuel price of $0.75/litre (net of taxes) and a daily-to-annual expansion factor of 1,000 (4 hours of congestion/day * 250 days/year). Benefits are expressed in 2011 dollars ($ 000's)
5	Construction cost	Recognizes the limited public budgets available for capital expenditures – be it for the implementation of new roadways; widening/upgrades of existing roadways; acquisition of new buses to expand service coverage and increase service frequency; or addition of cycling and pedestrian facilities.	Expressed in 2011 dollars ($ millions)
6	Supports mobility and performance goals for the road network	Minimizes the share of vehicular travel activity on higher order facilities (i.e., Arterials and Collectors) that is experiencing unacceptable level of service.	Reduction in percent of vehicle-kilometers travelled on arterial and collector roads, as defined in the Travel Demand Model, experiencing Levels of Service "E" or "F" during the afternoon peak hour in 2031 (%)

Measure of Effectiveness (MOE)		Rationale	Description of Impact Measurement
7	Supports transit service	Ensures that roadway expansions/improvements that relieve congestion on primary transit routes, resulting in improved transit service reliability, would be favoured over other roadway expansions/improvements.	Consideration is given to the number of bus routes impacted and extent of impact. All scores have been adjusted between 0 and 10
8	Supports active modes of transportation (e.g., walking and cycling)	Ensures that roadway expansions/improvements that make it possible to add bike lanes and/or sidewalks, where none existed before and current plans call for such additions, would be favoured over other roadway expansions/improvements.	Consideration is given to whether the project supports the planned implementation of sidewalks; whether the project supports or competes with the planned implementation of cycling infrastructure; and how the project impacts the walking/cycling environment. All scores have been adjusted between 0 and 10
9	Supports business activity	Ensures that the needs/interests of Peterborough businesses are considered. Relevant impacts include: downtown accessibility, access to Highway 115/Highway 7, traffic congestion which may impact commercial operations, on-street parking regulations, and loading/unloading provisions.	Consideration is given to whether the project improves downtown vitality; impacts commercial loading/unloading, involves a reduction in commercial parking; supports commercial traffic by reducing congestion; improves access to the downtown; and improves access to Highway 115/Highway 7. All scores have been adjusted between 0 and 10

4.7 EVALUATION RESULTS

The results of the evaluation process are presented in Table 19. From this table, the following conclusions can be drawn.

- Scenarios AD and F achieve the best improvement in road network performance, as measured by vehicle hours of delay and amount of travel at Level of Service “E” or “F”. In addition, these scenarios achieve the greatest monetary savings in travel time and fuel consumption, and are also preferred from a transit service perspective.

- Scenario AD also distinguishes itself on other fronts. It is rated the best for supporting business activity, and received the second highest score for supporting walking and cycling, behind Scenario H.

- Scenario C2 has the lowest construction cost, and affects the least amount of environmentally sensitive land. Conversely, Scenarios AD and F have the highest construction costs, and Scenario AD also impacts the greatest amount of environmentally sensitive land.

The final row in Table 19 provides an overall performance measure for each scenario, assuming that each evaluation criteria is given equal weight. While this measure was not used as a definitive basis for decision-making, it does provide additional insight into which scenario would be preferred if all criteria were weighted equally. Under this weighting scheme, Scenario AD receives the best overall performance score, followed closely by Scenario F.

Since no one scenario is preferred in every category, a trade-off is necessary. **After considering both the benefits and drawbacks of each alternative, Scenario AD was selected as preferred**. Scenario AD scores highest or second highest in 7 of the 9 criteria used in the evaluation process, and is considered the preferred choice for improving road network performance and supporting transit, active transportation, and businesses. However, there is a trade-off in terms of environmental impacts and cost, with Scenario AD scoring lowest and second lowest in these areas respectively.

While Scenario F also scores highly in several areas, it includes the full Peterborough Parkway, which is strongly opposed by a significant portion of the community. In this regard, Scenario AD was considered to offer a reasonable compromise, since it only includes a new two-lane road on a portion of the parkway right-of-way (between Fairbairn Street and Cumberland Avenue), yet still achieves a substantial improvement in mobility. Scenario AD is also less expensive to construct, and received broader public support than Scenario F.

Scenario C2 was also considered a strong candidate – it has the lowest construction cost, lowest environmental impacts, and also achieves a relatively high reduction in the amount of travel at Level of Service “E” or “F”. However, this scenario does not fare nearly so well in terms of reducing fuel consumption or delay, and was not ranked highly from a transit, active transportation, or business perspective.

While Scenario AD was primarily selected based on its technical merit, it is also important to consider the views and opinions of the Peterborough community. At the second Public Involvement Centre, the various network scenarios were presented to the public, along with evaluation matrix in Table 19. On the comment sheet, people were asked to indicate which network scenario they preferred. Table 20 presents the results. While the sample size is admittedly small, it would appear that public opinion is roughly evenly divided between Scenario AD / F, and Scenario C2, the major difference between these scenarios being the inclusion, or not, of the new two-lane road between Fairbairn Street and Cumberland Avenue, and the location of the road widening over the Otonabee River. Included in these results is a letter from Trent University endorsing Scenario AD and H.

With no strong consensus emerging from the community, Scenario AD is recommended as the preferred alternative. On a technical basis, it performs the strongest, and also has a reasonable level of support among Peterborough residents.

Table 19 Evaluation Matrix for Alternative Road Network Scenarios

Measure of Effectiveness (MOE)	Description of Impact Measurement	Impact Assessment						Relative Performance of Alternative Scenarios					
		AD	B	C2	E	F	H	AD	B	C2	E	F	H
1. Impact on environmental sensitive areas	Total acres of "affected" land within 100 m buffer of project	14,424	5,256	1,710	8,076	6,030	11,314						
	• Level 1 Significance – Weight = 60%	13,931	4,914	1,341	7,524	5,706	10,358						
	• Level 2 Significance – Weight = 30%	486	192	184	289	208	478						
	• Level 3 Significance – Weight = 10%	8	150	184	263	115	478						
	"Affected" land weighted by level of significance	8,505	3,021	879	4,628	3,498	6,406	○	◉	●	◉	◉	⊙
2. Fuel consumption[1]	Reduction in fuel consumption during the afternoon peak hour in 2031 in relation to the "Base Scenario" **(litres)**	67	58	11	42	171	7	⊙	⊙	○	⊙	●	○
3. Vehicle hours of delay[1]	Reduction in in-vehicle travel time on the road network during the afternoon peak hour in 2031 in relation to the "Base Scenario" **(hours)**	85	65	49	40	84	52	●	◉	⊙	○	●	⊙
4. Monetary value of user benefits[2]	Benefits include both travel time and fuel savings for the year 2031, expressed in 2011 dollars **($ 000's)**	$900	$694	$498	$432	$968	$525	●	⊙	○	○	●	⊙
5. Construction cost	Expressed in 2011 dollars **($ millions)**	$52.3	$40.6	$32.5	$43.6	$59.3	$44.2	⊙	◉	●	◉	○	◉
6. Supports mobility and performance goals for the road network	Reduction in the percent of travel on arterial and collector roads experiencing Levels of Service "E" or "F" during the afternoon peak hour in 2031 **(%)**	5.6	4.6	5.2	2.6	5.6	2.7	●	◉	●	○	●	○
7. Supports transit service	Considers the number of bus routes impacted and extent of impact. All scores adjusted between 0 and 10	9	8	3	0	10	4	●	◉	⊙	○	●	⊙

Measure of Effectiveness (MOE)	Description of Impact Measurement	Impact Assessment						Relative Performance of Alternative Scenarios					
		AD	B	C2	E	F	H	AD	B	C2	E	F	H
8. Supports active modes	Considers impacts to planned walking & cycling facilities, as well as impacts to the walking/cycling environment. All scores adjusted between 0 and 10	8	0	2	1	1	10	◉	○	⊙	○	○	●
9. Supports business activity	Considers downtown vitality, parking, loading/unloading zones, congestion (as it affects goods movement), and access. All scores adjusted between 0 and 10	10	6	4	6	0	8	●	◉	⊙	◉	○	◉
Overall Performance	Overall performance based on a 4-point scale system and assigning equal weights to all criteria[3]	1.9	2.4	2.6	3.3	2.1	2.8	◉	◉	⊙	⊙	◉	⊙

[1] Includes passenger vehicles only
[2] Benefits based on an assumed value of travel time of $10/hr and a fuel price of $0.75/litre (net of taxes). For expanding from peak hour savings to annual savings, an expansion factor of 1,000 was applied (4 hours of congestion/day * 250 days/year)
[3] Lower scores are preferred

Table 20 Feedback on the Preferred Road Network Scenario

Scenario	1st Choice	2nd Choice
Scenario AD	5	0
Scenario B	0	2
Scenario C2	7	1
Scenario E	0	0
Scenario F	1	0
Scenario H	0	5
Scenario AD / F	2	0
Total Respondents	**15**	**8**

4.8 REFINEMENT BASED ON PUBLIC FEEDBACK

During the public consultation process, two of the proposed projects generated significant discussion:

- The new two-lane road between Fairbairn Street and Cumberland Avenue
- The widening of Sherbrooke Street

The following sections describe the issues that were raised and any recommended changes to the preferred road network scenario (Scenario AD).

4.8.1 NEW TWO-LANE ROAD

In October 2002, the Comprehensive Transportation Plan and its associated Long Term Roadway Network Development Plan was adopted by Council, with the exception of the "West Side Corridor" commonly referred to as "The Parkway". This facility was the subject of much debate and discussion, and was therefore deemed by City Council to require further analysis and justification.

In February 2003, City Council approved a work plan for further investigation of the West Side Corridor. The work plan called for the evaluation of four road corridors using two distinct evaluation approaches. The first approach called for the application of Multi-criteria Analysis (MCA), and the second approach called for the application of Cost Benefit Analysis (CBA). The four corridor alternatives investigated were known as Partial Parkway, West Bypass, Chemong Hybrid, and Fairbairn Hybrid. All of which are depicted in Figure 34. The Partial Parkway alternative was confirmed as the preferred alternative in comparison to the

other alternatives. However, none of the parkway options, as envisioned, were found to be economically justified.

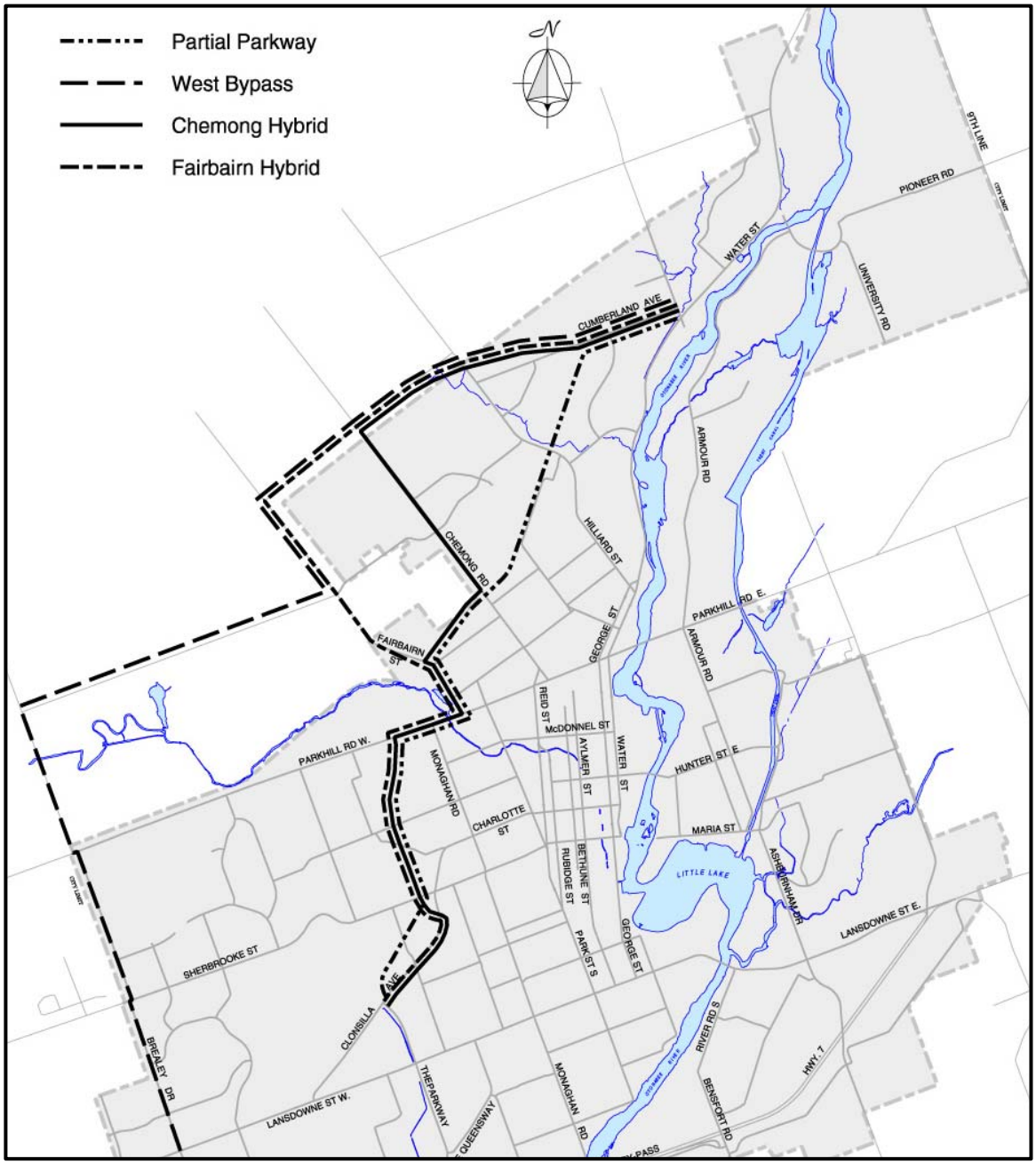


Figure 34 West Side Corridor Alternatives

Prompted by the sheer size of the Parkway project and the level of debate it stirred, the City of Peterborough elected to hold a referendum as part of the November 2003 municipal election. In the referendum, residents voted 55% against the Parkway, although the results are not considered binding under the referendum rules (since less than 50% of eligible voters

participated). In light of this result, the City decided not to undertake the environmental assessment studies required for the project to proceed. However, in June 2007, the environmental assessment for the Peterborough Regional Health Centre (PRHC) road network improvements was completed, which recommended the construction of a new Hospital access road between Parkhill Road and Clonsilla Avenue within the Parkway right-of-way. In 2011, the section of the Hospital access road between Parkhill Road and Sherbrooke Street was completed, with the section south of Sherbrooke Street under review.

Given the history of the Parkway initiative in Peterborough, it is not surprising that the proposal to construct a new two-lane road between Fairbairn Street and Cumberland Avenue along the right-of-way previously set aside for a portion of the Peterborough Parkway would generate controversy. However, the purpose and form of this roadway segment differs from the previous vision put forward in the 2002 Transportation Plan, as follows:

- As its name implies, this new 2-lane roadway offers 1 traffic lane per direction. As such, it differs from previous visions for this portion of the Parkway. In the 2002 Transportation Plan, this portion of the parkway was envisioned as 4-lane urban arterial corridor.

- The proposed 2-lane roadway is intended to primarily address the east-west capacity deficiency north of Parkhill Road, whereas the intent of the grand vision for the original Parkway corridor was to primarily address the north-south capacity deficiency west of the Otonabee River.

In evaluating the various road network scenarios, the scenarios which included the new two-lane road generally had the greatest reduction in delay compared to the base scenario (as measured by the total network travel time) and the greatest improvement in mobility (as measured by the amount of travel experiencing a poor Level of Service).

In addition, the new 2-lane road between Fairbairn Street and Cumberland Avenue offers the following benefits:

- Serves both existing and new development, including the Carnegie and Chemong growth areas.

- Improves network distribution by introducing an arterial road to break the large spacing between Parkhill Road and Cumberland Avenue/Third Line. The current spacing is roughly 3 kilometers, which exceeds the desired spacing of 2 kilometers.

- Relieves Towerhill Road east of Chemong Road, which would otherwise carry more traffic than is intended by its current road classification.

As an alternative to the project, some residents proposed the construction of a new ring road around the City of Peterborough. However, the introduction of a ring road is not supported by future network deficiencies. The unnecessary construction of such a road places a financial

burden on city residents and employers, and could encourage urban sprawl and negatively affect the vitality of the downtown.

At the second Public Involvement Centre, people were asked to indicate their preferred road network scenario. Of the 15 respondents who indicated a preference, 53% chose a scenario which included the new two-lane road, suggesting that support for the project is roughly evenly divided within the community.

The majority of respondents who opposed the two-lane road were primarily concerned with impacts on green space, wildlife habitat and recreational quality of the corridor. In this regard, it should be noted that each recommended project will be subject to a future environmental assessment study. During this subsequent study, environmental impacts will be examined in detail. As consultation is a key part of the environmental assessment process, the public will have additional opportunity to comment on specific issues as the design proceeds.

There was also a general misunderstanding regarding the fate of the existing trail between Fairbairn Street and Cumberland Avenue, with many people believing that this trail would be lost, or converted to on-road cycling lanes. However, under the proposed plan, the trail will be maintained. It is envisioned that a boulevard would be provided between the trail and the roadway so that people would not be required to cycle immediately adjacent to traffic. Nonetheless, it is acknowledged that the quality of the walking/cycling environment will deteriorate with the construction of the road.

4.8.2 CHARLOTTE / SHERBROOKE IMPROVEMENTS

As originally defined, the recommended road network (i.e. Scenario “AD”) included changes to both Charlotte Street and Sherbrooke Street, as follows:

- Widening Sherbrooke from 2 to 3 lanes from Monaghan to Rubidge by providing a second eastbound lane

- Transforming Charlotte from 2 to 3 lanes from Clonsilla to Rubidge by replacing parking on the north side by a second westbound lane (Note that between Clonsilla and Monaghan, there is no parking lane and road widening would be required to provide the second westbound lane. Since this section already has two lanes in the eastbound direction, one through lane and one left-turn lane, the result would be a 4 lane cross-section in this area)

Although the proposed widening of Sherbrooke Street was presented at the second Public Involvement Centre, it was not until the third Public Involvement Centre that opposition to this project was raised. In total, 52 comments were received from individuals opposed to the widening. It was felt that the project would destroy a beautiful tree-lined neighbourhood and reduce property values. It was further felt that traffic volumes are currently not high enough to warrant a third lane, and that the widening will only serve to attract vehicles from other east-

west routes, thus promoting higher traffic volumes and speed. Such impacts were not considered desirable given the residential nature of the street, which includes a school zone and neighbourhood park.

In light of the comments received, the value of including the Sherbrooke Street widening in the recommended plan was re-evaluated. Since the Sherbrooke and Charlotte projects essentially work as a pair, the merit of the Charlotte Street parking lane conversion was also re-assessed. As part of this analysis, a number of alternatives for the Sherbrooke and Charlotte undertakings were explored. These alternatives included:

1. Full widening on Sherbrooke Street & lane conversion/widening on Charlotte Street, to be implemented between 2011 and 2016 (i.e. the original recommended road configuration)

2. Full widening on Sherbrooke Street & lane conversion/widening on Charlotte Street, deferred until a later time horizon (i.e. the original recommended road configuration with delayed implementation)

3. Widen Charlotte Street between Clonsilla Avenue and Monaghan Road only (with no changes east of Monaghan Road except the provision of cycling lanes). No modifications to Sherbrooke Street

4. Maintain both Charlotte Street and Sherbrooke Street “as is”, and drop all proposed changes from the recommended road network

In evaluating these alternatives, particular consideration was given to the multi-modal function of the corridors. As discussed in Section 5.3.4, cycling facilities are recommended on Charlotte Street from Clonsilla Avenue into the downtown, creating competition for limited road space.

From a review of the pros and cons associated with each alternative, **Option 3 was selected as preferred**. This option includes:

- Dropping the Sherbrooke Street widening from the recommended road network

- Widening Charlotte Street from 3 to 4 lanes between Clonsilla Avenue and Monaghan Road. As cycling lanes are also called for along this section, the extent of widening will be even greater. In the event that insufficient road width is available, it is recommended that preference be given to the provision of cycling lanes, since this route serves as a key entry point into the downtown for cyclists, whereas drivers have a number of alternatives available.

- On Charlotte Street east of Monaghan Road, the two existing traffic lanes would be retained, as well as the existing parking lane, however, some widening may be required to accommodate the addition of cycling lanes. Under this proposal, the

extent of widening on Charlotte Street east of Monaghan Road is expected to be marginal (in the order of 1.0 to 1.5 m).

Option 3 concentrates the benefits on Charlotte Street to the area where they will bring the greatest benefit (i.e. where congestion is expected to be most severe). This option also supports the provision of cycling facilities on Charlotte Street, and is less expensive than the original proposal. Moreover, since this option does not involve any changes to Sherbrooke Street, there will be no impacts to the beautiful treed boulevards which currently line the street. However, it will not address localized capacity deficiencies on Charlotte Street east of Monaghan Road, and Sherbrooke Street will not be able to function as a “release valve” for the anticipated deficiencies on Charlotte Street in the eastbound direction.

Additional details on the Charlotte / Sherbrooke assessment can be found in Appendix F.

4.9 RECOMMENDED PROJECTS

Figure 35 presents the recommended road network scenario for the ultimate (2031) time horizon. This scenario reflects the results of the evaluation process, refined based on input from the public as described in Section 4.8 above. An implementation plan for the recommended network is presented in Section 5.5.4.

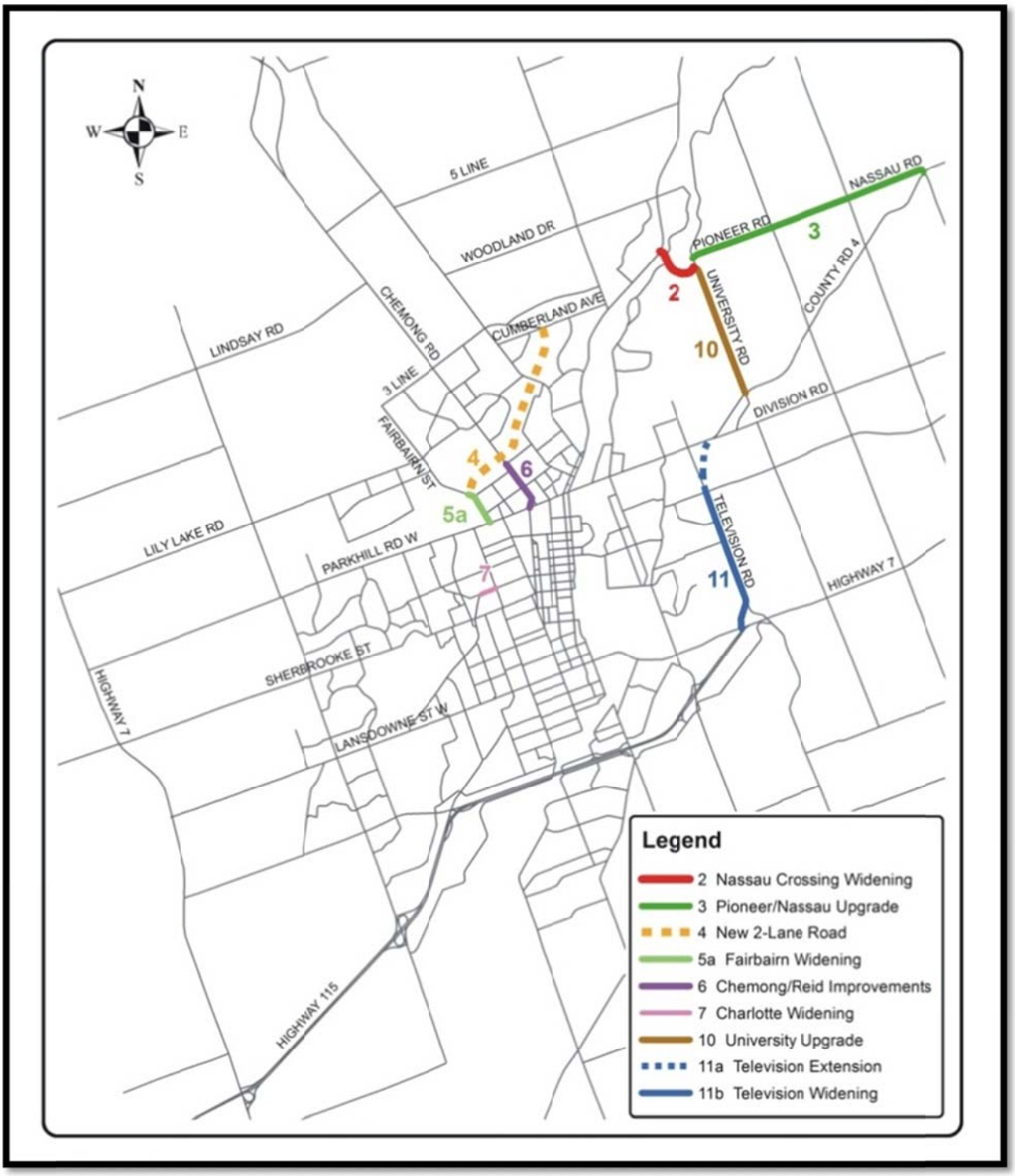


Figure 35 Recommended Road Network (2031)

4.10 COMPARISON WITH THE 2002 PLAN

The recommended road network improvements presented in Figure 35 for the 2031 horizon are generally less extensive than those proposed in the previous 2002 Transportation Plan for an ultimate horizon of "beyond 2021". At the same time, the level of traffic congestion under the recommended network is less, implying that less investment is needed to achieve a similar or better level of network performance (refer to Figure 36[4]). The reason for this difference relates primarily to the population and employment growth projections, which are substantially lower than previously assumed in 2002 Plan, before the introduction of the Places to Grow legislation.

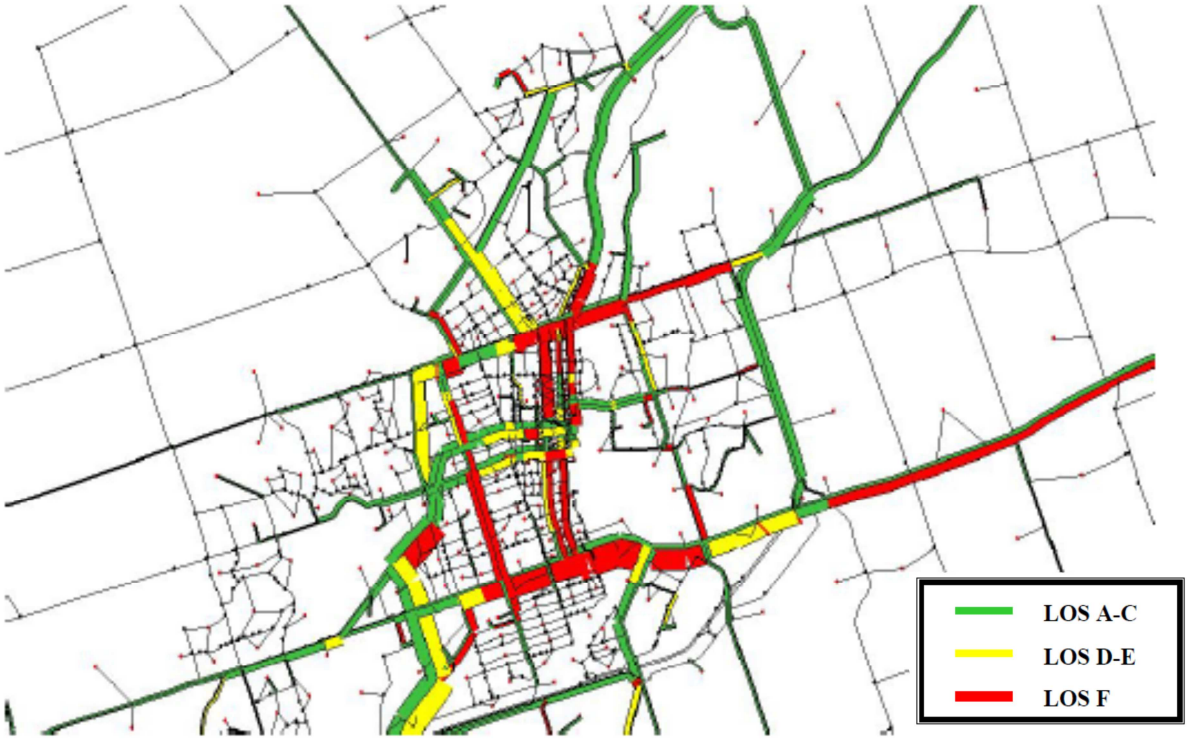
Projects carried forward from the 2002 Transportation Plan include the following:

- Widening of Nassau Mills Road between Water Street and Armour Road
- New 2-lane road between Fairbairn Street and Cumberland Avenue (however, the new plan only calls for a 2-lane facility, whereas the 2002 plan anticipated a 4-lane facility)
- Improvements to Chemong Road (however, the limits of the project have been reduced, and improvements to Reid Street have been added)
- Upgrading of University Road
- Extension & Widening of Television Road
- Widening of Charlotte Street (however, the extent of the widening has been substantially reduced in the new plan, and the widening of Sherbrooke Street has been dropped)

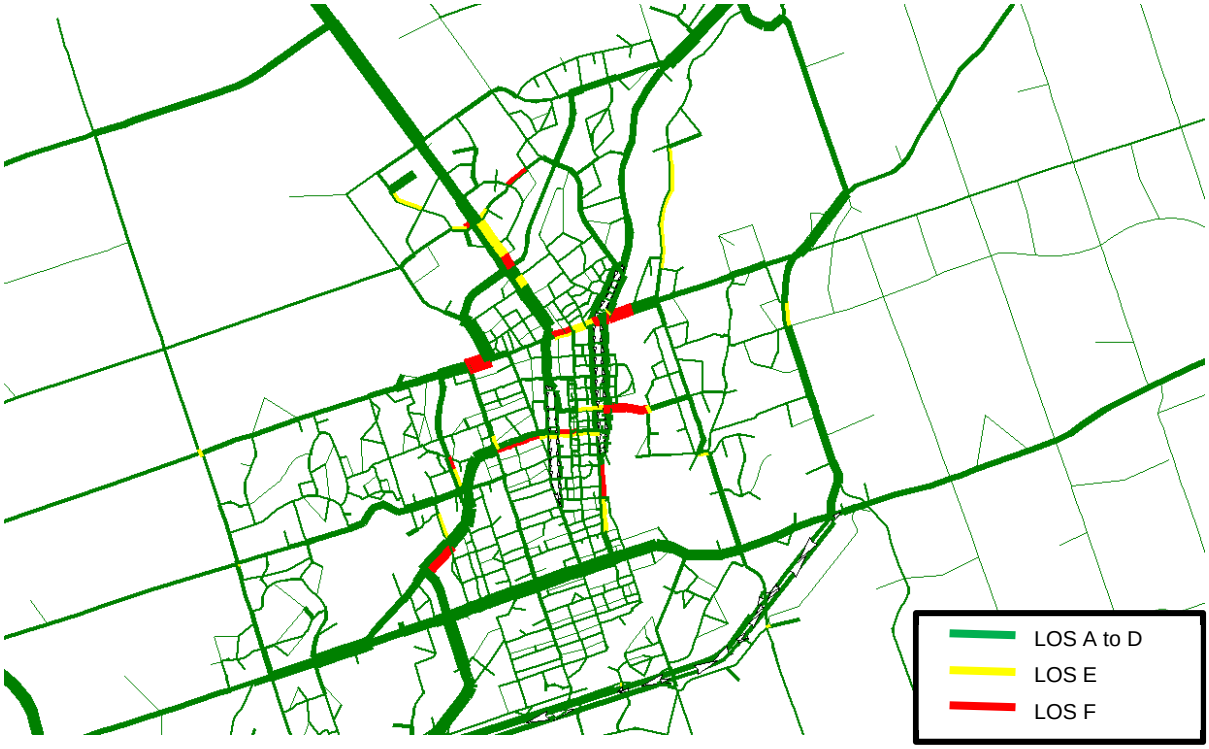
Projects not included in the 2002 Plan but recommended in the current plan include:

- Widening of Nassau Mills Road between Armour Road and University Road (although upgrades to this section of road are shown in the 2002 Plan)
- Upgrading of Pioneer Road / Nassau Road
- Widening of Fairbairn Street (however, this area was flagged for "major optional improvements" in the 2002 Plan and was recommended for further detailed study to determine the alignment of the proposed Parkway between Fairbairn Street and Parkhill Road)

[4] Although both of the images in Figure 36 illustrate the volume of traffic in the network by varying the line thickness, the scale of the two images is different. As a result, it is only meaningful to compare the Level of Service predictions as indicated by the link colour. In doing so, it should be noted that Level of Service D is denoted by yellow in the upper image and green in the lower image.



Road Network Performance for Combined Network "D" in the 2002 Transportation Plan (i.e. the previously recommended road network)



Road Network Performance Under Scenario "AD" of the Current Transportation Plan (i.e. the new recommended network, but without the refinements at Charlotte/Sherbrooke)

Figure 36 Comparison of Network Performance Under the Previous & New Plan

5 TRANSPORTATION MASTER PLAN

5.1 GUIDING TRANSPORTATION PLANNING PRINCIPLES

As part of the 2002 Transportation Plan Update, transportation planning principles were developed to guide future planning and decision-making. These principles were intended as an expansion of the transportation vision set in the 1996 GPA 2020 – A Vision for Our Future exercise, which provided a very general direction to a wide range of transportation and related stakeholders to achieve their goals in the community. As part of this update, the planning principles were reviewed. Given their applicability to the current update, the principles were retained for use.

The purpose of the transportation planning principles is to refine the transportation vision into specific goals and supporting principles specifically for community transportation in the Peterborough area.

Following the format of the transportation vision, the principles are described by four elements of community transportation:

MOBILITY

Goal: To provide safe, efficient and accessible modes of local transportation for all residents, businesses and visitors.

Planning Principles:

- Although the private automobile will remain the primary mode of transportation, it will become less dominant as the City moves towards a more balanced transportation system with increased transit, cycling use, walking and average auto occupancy. The targets put forward in Section 4.2 will be used to measure progress towards this more balanced system, and may be adjusted over time in response to this progress.
- Residents should be able to travel safely and independently across the City, regardless of age, income, or physical ability.
- To move people and goods efficiently, the Level-Of-Service (LOS) on the major roadway network will not exceed LOS “D”, defined as being at 90% of a roadway or intersection’s planning capacity. Once traffic conditions exceed LOS “D”, action will be taken to improve the conditions back to LOS “D” or better.
- Provide and fund public transit as an essential element of the transportation system to maintain existing ridership levels, and add new passengers from the general public and targeted markets (i.e. major employer nodes, enhanced peak period services).
- Transportation plans will be reasonable and achievable, and not rely on major changes to local travel characteristics beyond established trends.

- Current and short-term transportation improvements will emphasize ongoing traffic operations improvements to optimize the use of the system.
- The transportation system will provide alternative routes for both local and through traffic to reduce through traffic impacts on the City.
- In order for transportation infrastructure to be made available to serve City of Peterborough needs, this infrastructure must either be located within the City's jurisdiction, or shared with Peterborough County through formal partnership agreements.

ENVIRONMENT

Goal: Promote the achievement of a transportation system that balances the needs of the natural, social, and economic environments within the community.

Planning Principles:

- Transportation system improvements should be compatible with the "small city" character of Peterborough.
- Transportation system improvements must be compatible with established land use and environmental protection policies of the City and/or County.
- Integrate transportation planning with land use planning to minimize policy conflicts, resulting in integrated planning policies (i.e. transit-supportive planning, suburban growth).
- Maintain an efficient transportation system that will contribute to the positive air quality, noise and public safety goals of the community.
- Transportation planning will include public education and marketing programs on the true costs and impacts of urban travel.

ECONOMIC VITALITY

Goal: Provide a transportation system that serves the needs of area business, and supports the attraction and retention of new business.

Planning Principles:

- Core area traffic conditions (volumes, speeds, LOS, parking, loading/unloading, vehicle types, pedestrian movement, and alternative modes) must be conducive to a vibrant, successful downtown.
- Provide goods movement routes that minimize impacts on incompatible areas of the City, while providing adequate truck routes to serve local area business needs.
- Inter-regional transportation links will continue to be provided by Provincial highways.
- Roadway network expansion should be planned, in part, to serve approved business expansions in the Peterborough area.

AFFORDABILITY

Goal: Maintain, operate and add transportation infrastructure over time, in direct response to City growth, mobility needs and local financial capabilities.

Planning Principles:

- Re-direct fees and revenues generated by the transportation system back into the transportation system based on municipal, provincial and federal legislation.
- Institute infrastructure funding and development charge policies that can encourage development forms that reduce transportation infrastructure costs.
- Implementation of new transportation infrastructure should not be dependent on major land redevelopment, or require acquisition of currently active rail lines. Abandoned rail corridors of inadequate width for reuse as roadways should also be avoided.
- Ensure that a range of transportation options are available to local citizens, some of whom cannot afford a vehicle or cannot obtain a license to drive a vehicle.
- Consider and investigate possible public/private sector partnerships in the provision of transportation infrastructure and services (i.e. cycling facilities, transit operations).

5.2 TRANSPORTATION DEMAND MANAGEMENT

Transportation demand management (TDM), or mobility management, aims to create a more efficient transportation system which improves community health, equity and access to transportation by promoting active and sustainable modes and introducing land use policies which are conducive to these modes (i.e. Smart Growth, Transit Oriented Development, intensification etc.)

TDM makes use of the following strategies:

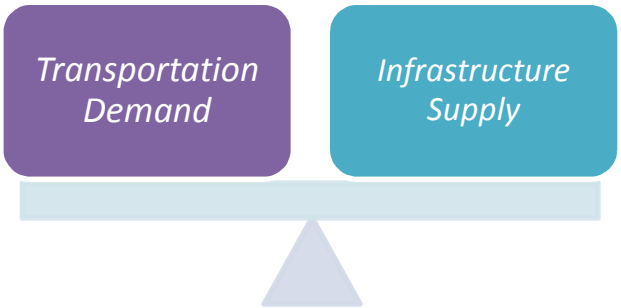
- **Shifting trips away from single occupancy vehicles** to alternative options including walking, cycling, transit, carpooling, and telecommuting
- **Shifting the time of travel** to when the network is less congested
- **Reducing the number and length of trips** by changing the trip destination, combining trips, or substituting telework for physical travel
- **Incorporating innovation and ingenuity** into transportation planning and projects to achieve transportation network goals with minimal footprint on the community and environment

In any city, there is a limited amount of space available for transportation infrastructure so it is not always viable or desirable to provide capacity for an ever-growing number of vehicle trips. Transportation Demand Management attempts to address the demand for vehicle travel and is

an important element in the larger transportation strategy to provide an efficient and effective transportation system.

TDM complements physical changes to the road network by affecting change in the choices made by users. The two elements, network infrastructure and demand management must work in a complementary fashion to reduce the use of single occupancy vehicles, particularly at peak times.

Since TDM does not rely on building more road capacity, most TDM measures are much less expensive to implement than road expansion projects. TDM has the potential to influence travel behaviour and will aid in reaching the goals laid out in the Comprehensive Transportation Plan for walking, cycling and transit.



VISION FOR TDM IN PETERBOROUGH

Transportation Demand Management initiatives support more efficient use of the road network, complement improvements in the active transportation network and transit system through promotion and education, and influence the built form of the City to effect change in transportation mode choice.

5.2.1 ROLE OF TDM IN PETERBOROUGH

The role of TDM in a smaller community such as Peterborough is quite different than in a large metropolitan area due to a number of factors such as traffic conditions, demographics, population density and public awareness, as discussed in Section 4.1.1. Behaviour-based measures that involve any type of travel restriction are extremely difficult to initiate in smaller communities where the need for such restrictions is not as readily apparent, compared to larger, more congested communities. With the possible exception of bridges, any additional user cost for driving, for example to pay for private sector infrastructure investment, may not be economically viable in smaller communities.

The main goal of TDM in Peterborough is to maximize the efficient use of existing transportation system capacity. TDM is not expected to obviate the need for new roads but is intended to achieve a better balance with alternatives to the drive-alone auto trip. The expectation for TDM in Peterborough is to reduce the rate of growth in single occupant vehicle trips by shifting some

of this trip-making to other modes and/or off-peak time periods. This recognizes that the actual volume of this trip-making will increase in response to overall city and area population and employment growth, but at a slower rate than would otherwise be the case.

Barriers to TDM

There are a wide range of barriers which may challenge elements of TDM implementation. These include:

- **Regulatory Barriers** – Can stem from all levels of government and can include a lack of tax incentives at the federal level to support transit or ride-sharing, through to limited provincial support for municipal transit etc.

- **Social Barriers** – Caused by a general lack of understanding of the benefits of TDM to the community and individual, and prioritization of immediate personal needs as opposed to longer term community needs. Protection of property and community interests (NIMBY) also prevent the implementation of some potentially effective TDM measures, especially dealing with urban form, intensification and community redevelopment.

- **Practical Barriers** – In a smaller community such as Peterborough, practical barriers are created by the real or perceived lack of transportation problems, measured in terms of travel cost, time, delay and flexibility. Without problems, there is often no incentive for solutions.

Existing TDM Program

The City of Peterborough has an existing TDM program which coordinates a number of initiatives in support of TDM goals. Many of these are joint ventures with local community organizations focused on promoting sustainable transportation choices within the city. Some of these initiatives include:

- **Active & Safe Routes to School –** programming in partnership with Peterborough County/City Health Unit, Peterborough Green-Up, Peterborough Lakefield Community Police, Student Transportation Services of Central Ontario and the Kawartha Pineridge District School Board. Current programs include:

    a) Car Free School Days – the first Wednesday is designated as a Car Free School Day
    b) High School Shifting Gears – two weeks where students and teachers track their travel to school to win prizes by increasing their walking cycling and business
    c) On the Bus Workshops – Grade 3 students get a workshop on how to ride the bus including a transit ride to important landmarks in the city
    d) Grade 8 Transit Quest – all grade 8 students in the city receive a free transit pass for March Break

e) School Travel Planning Maps – student-friendly maps of walking, cycling and transit access to several schools around the city have been created and distributed

- **Smart Cycling Skills** – Classes offered by the City with assistance from Peterborough Green-Up

- **Peterborough Moves Website** – This site provides all local information on alternative modes and TDM programs and events, including the on-line tracking for the Workplace Shifting Gears and Neighbourhood Shifting Gears programs

- **Shifting Gears Workplace Transportation Challenge** – Delivered through a partnership with the City, Peterborough Green-Up and the Peterborough County-City Health Unit, this month-long workplace challenge promotes the use of alternative travel with incentive kits for employees and a guaranteed ride home program. The Shifting Gears Ambassador is the face for the program and plays a direct a role in contacting employers and encouraging participation. Leading by example, the program has a signed bike trailer and all transportation for the program is conducted by bicycle, on foot, or by transit

- **Key Destination Planning Maps** – Convenient maps of walking, cycling and transit access to various destinations around the city including major employers and attractions, along with attached transit schedules were created as part of the Shifting Gears program

- **Neighbourhood Shifting Gears** – This program was piloted at 800 households in two neighbourhoods in 2011 and facilitates and encourages reduced auto trips through individualized social marketing

- **On-line Carpool Partner Matching** – Through the website carpoolzone.ca. Promoted with billboard at entrances/exits to the city and through programs and transportation websites

- **Peterborough Trail & Bikeways Map** – Illustrates all facilities for cycling around the city with suggested routes for connecting links

- **Bike Parking** – Provides bike racks in public spaces, at municipal facilities and information on best practices in bike parking installation and design. The City has partnered with a local welding manufacturer to produce bike racks locally that were previously only available through import

Innovation in TDM

Source: BEST

Bike Valet in Vancouver, BC

To encourage the use of alternative modes to community events such as summer festivals, concerts and sporting events, Better Environmentally Sound Transportation (BEST) offers a valet bicycle parking service to raise the profile of cycling and to promote cycling as a convenient mode choice.

Source: Transport Canada

'Lunch Express' in Markham, ON

This unique transit service offers free, frequent shuttles between major employers and local restaurants on Fridays between 11:30 AM and 2:30 PM. The program supports local businesses and eases lunchtime congestion, with the added benefit of introducing transit to many people who have never ridden before.

'Class Rides Free' Program in Kelowna, BC

This program allows teachers to bring their entire class on a city bus for free, up to twice a year, facilitating field trips to Museums, Parks and other community destinations, and helping promote transit use to children.

Source: Transport Canada

'You Can Clean the Air' in Waterloo, ON

In Waterloo, ON, a special partnership between city staff, program coordinators from two school boards, Grand River Transit staff and an environmental education consultant developed a Grade 3 Curriculum Supplement which teaches students about their travel choices.

PASSPORT to HAMILTON

Source: Environment Hamilton

Passport to Hamilton- Hamilton, ON

The 'Passport Hamilton' program was built on advertising a pre-existing transit discount program offering families a $9 all-day HSR Bus Pass for up to two adults and six children. To encourage families to explore their community, organizations such as the Art Gallery of Hamilton and the Hamilton Children's Museum offer discounts to visitors with validated day passes.

5.2.2 RECOMMENDED TDM PROGRAMS

TDM will play a key role in supporting the vision for active transportation and transit in Peterborough, as articulated in the following sections. In striving towards these visions, it will be important to raise awareness about the options which have been implemented in terms of pedestrian, cycling and transit infrastructure and service, and facilitate community engagement in discussions about efficient and sustainable transportation choices. With a strong TDM program already in place, Peterborough can look to expand upon and enhance their TDM Program with continued strategic application of resources.

Existing TDM programs should be maintained and expanded wherever possible, including:

- Continue to support **Active & Safe Routes to School**, and develop complementary school outreach programs which encourage children to be active and think about their transportation choices
- Continue to provide **support to employers** in encouraging employees to use alternative transportation modes (with programs such as Shifting Gears) and consider the development of a TDM Toolkit for employers
- Continue to support public events which engage the community and create a better understanding of TDM measures, including **public lectures, debates and workshops** which encourage people to think about how transportation influences the community (i.e. Community Action Plan)

The following are additional programs and initiatives which should be considered for implementation.

Incorporating TDM into Traffic Impact Study Requirements

Where developments are required to provide traffic impact studies, a requirement should be added to produce a TDM plan. For example, in the City of Ottawa, traffic impact assessments must include a TDM plan which identifies opportunities to incorporate and support City TDM initiatives.[5] This is a cost-effective way of ensuring that new development has addressed alternative and sustainable modes in site planning and design.

City Staff Ambassador Program

Particularly in smaller municipalities, it can be effective for city staff to take an ambassador role in active transportation, leading by example. This has great potential in Peterborough, as the City of Peterborough office is located downtown, which has been identified as a desirable destination for travel by alternative modes. The ambassador program should combine elements

[5] City of Ottawa Transportation Impact Assessment Guidelines. Available online: http://www.ottawa.ca/residents/planning/dev_review_process/guide/tia/index_en-08.html

of leadership for both achieving increased travel by alternate modes and for promoting and engaging the community.

- *Leadership by Example*
  City staff can provide an excellent example for the rest of the city. An audit of public buildings & facilities should be conducted to identify where upgrades are needed in terms of cyclist and pedestrian amenities (e.g. end-of-trip facilities, sidewalks, cycling access points and benches). Staff buy-in should be encouraged through contests, supporting policies such as flexible work hours, and other strategies.

- *Leadership by Promotion*
  While establishing a strong TDM program of its own, the city should promote these initiatives to other community members and businesses through advertising and marketing programs. These programs could take many forms including continued support for commuter challenge programs, employee incentives, flexible office hours and provisions for end-of-trip facilities.

Develop a TDM Toolkit for Employers

Peterborough currently has several TDM strategies in place which target the workplace. For example, the Shifting Gears Workplace Challenge encourages employers to run a month-long contest with prizes and incentives for employees to try using alternative modes of transportation. Building upon these initiatives, the City of Peterborough should develop a TDM toolkit for employers, which helps organizations to provide options for employees. Items which may be appropriate for these toolkits include parking management strategies, guidelines for end-of-trip facilities, transit incentives, and supporting outreach from the city such as in-office 'lunch and learns'. While transit incentives could take several forms, the most effective option would be for the City to offer discounted transit passes for bulk purchases, since this avoids the tax disincentive associated with employer-provided subsidized transit passes (in which case the subsidy must be claimed as a taxable benefit).

Parking Management

One important transportation characteristic that influences how trips are made involves the availability and cost of parking, especially in the downtown core.

- In terms of **parking pricing**, recent studies have shown that trip reduction in the order of 0.20 to 0.32 percent for each 1.0 percent increase in parking pricing can be expected.[6]

[6] Morrison Hershfield, "A Regional Analysis of the Environmental and Socio-Economic Consequences of Adopting the National Climate Change Transportation Table's Measures in Ontario", prepared for the Ministry of Transportation of Ontario, July 2002.

- In terms of **parking supply**, Figure 37 shows that a relationship exists between higher than average transit ridership to the downtown, and the amount of long-term downtown parking supplied for employees.[7]

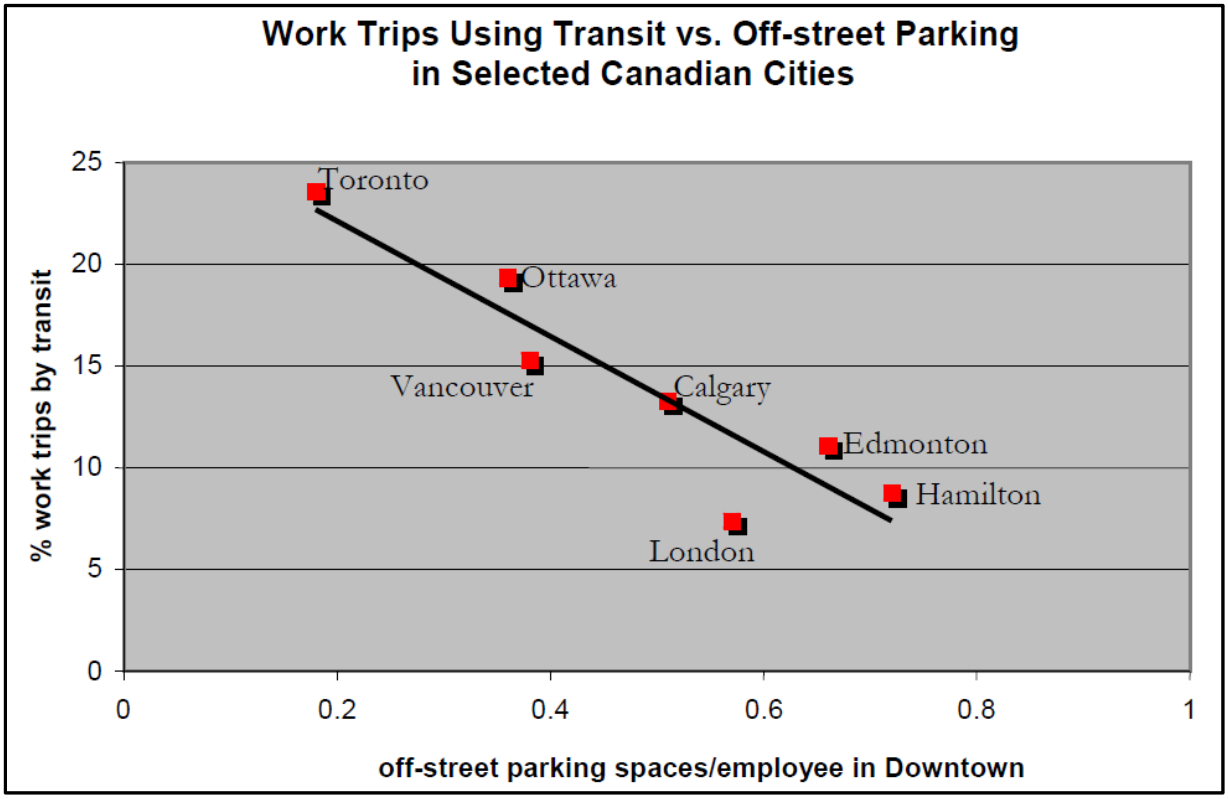


Figure 37 Relationship between Transit Ridership & Parking Supply

Outside the downtown, parking supply and cost can also influence trip-making, making it a major consideration in suburban retail and office development. As a result, the provision and pricing of parking can influence the use of public transit and other auto alternatives.

The *Strategic Downtown Parking Master Plan* was prepared for the City of Peterborough in 2007, and provides an analysis of short and long-term surface and underground parking needs as well as strategies for leveraging parking fees to increase transit ridership. Of particular importance for TDM are the following strategies:

- Application of increased long-term parking fees – Increasing the cost of monthly parking passes will help to encourage the use of transit to travel to the downtown as long as the cost of a monthly bus pass is significantly less than a parking pass

[7] *Statistics Canada 1996 Place of Work Survey, CUTA 1996 Canadian Transit Fact Book,* Transportation Association of Canada Urban Transportation Indicators.

- Development of maximum parking requirement guidelines which may eventually be incorporated into the zoning by-law – This will help to reduce the amount of excess parking which is provided while ensuring that reasonable quantities are available to accommodate demand, improving downtown atmosphere and making the area more liveable & walkable

The City of Peterborough should continue to seek ways to leverage parking supply to generate modal shift. Some additional considerations for practice in Peterborough may include the following:

- Reducing the minimum parking requirements to help create development more in line with the heritage feel of Peterborough's downtown. Care must be taken when reducing the minimum parking requirement to ensure that there is not an excess of demand placed on the existing system.

- Adopt regulations that require a minimum proportion of parking spaces be reserved for carpools and vanpools.

- Modify the cash-in-lieu provision format. The City of Peterborough currently allows developers to forego part of the by-law requirements to provide parking spaces for their clients by paying a certain amount per parking space to the City. These funds are currently redirected to funding for development and maintenance of municipal parking. However, redirecting the funds towards active and sustainable travel modes, for example bike parking, subsidized transit passes, or building trails, would leverage the cash-in-lieu provision in support of TDM initiatives, where appropriate.

- Consider trading-off parking requirements with TDM-related commitments by developers to promote the implementation of TDM programs. The Region of Waterloo has recently introduced this approach

- Introduce/update bicycle parking requirements.

CarShare Program

Car share programs provide a fleet of vehicles which are available for pick-up at a number of destinations and can be used by members of the car-share. In most car share schemes, members pay an annual membership fee for access to the service and then pay a certain unit cost (based on mileage or time) for each trip.

Since car ownership is highly correlated with the number of trips made by a given household, car share programs reduce the overall demand on the system. By associating a cost with each trip, the number of discretionary trips by automobile is reduced. Car share programs allow individuals and families to live 'car-free' since they can still make trips to the grocery store, day

trips and out of town trips. The program also provides viable options for low-income individuals since the overall cost is significantly lower than renting vehicles in the traditional way. Car share can also be used by businesses to reduce corporate fleet requirements.

The City of Peterborough should explore the feasibility of developing a car share program in the City/County of Peterborough. These programs have been fairly successful in other mid-sized communities when operated by a non-profit organization such as Grand River CarShare in Kitchener-Waterloo. One option is to explore the relative cost of employees using a car share vehicle rather than their personal vehicle for work related trips. The corporate use of the car share program could provide a strong customer base for the car share.

Ride-Sharing Program

Ride sharing or car-pooling increases the efficiency of the existing road network by increasing automobile occupancy so that there are fewer vehicles on the road. The city should encourage **ride-sharing** through continued advertising of programs such as Carpool Zone (www.carpoolzone.ca), by providing preferential carpool parking at municipal properties, and by supporting carpool parking lots, such as the Crawford Drive GoTransit Carpool lot.

Individual Trip Planning

Individual, or personalized, trip-planning is a strategy aimed at promoting change by providing households and individuals who have expressed interest in changing their mode choice with personalized training, support and incentives. Examples of target market shares may include senior centers, college students or families with school-age children. Individual trip-planning has seen highly favourable results in cities within Canada, including Vancouver, BC which launched a TravelSmart program that saw significant mode share changes in targeted neighbourhoods. Peterborough implemented a similar program targeting 800 households in 2011, and is planning to target an additional 800 in 2012. It is recommended that Peterborough assess the effectiveness of this initiative and seek long-term funding for this program should the results prove positive.

In addition to this, the City of Peterborough should utilize technologies which allow residents to easily access their own individualized trip planning system. Providing transit system information to Google trip planner for development of a transit trip planning tool will provide a high degree of accessibility and exposure for the transit system. Peterborough has already integrated their cycling network with Google trip planner, and adding the transit option will improve the overall service provided to residents, as well as tourists.

Special Event TDM

Special events often attract large numbers of tourists and residents to a central area. Working with event organizers and community partnerships, the City of Peterborough should encourage the use of alternative transportation to concerts, festivals and other events within the community. To facilitate alternative modes, the city should consider offering incentives such as

bike valet, prime carpool parking spots, and free transit shuttles. Booths showcasing TDM strategies, or providing alternative commuting advice should also be encouraged at these events, where appropriate, to capitalize on access to a larger audience of community members.

Innovation

The City of Peterborough TDM Program should continue to seek the use of innovative for reaching new audiences and exposing them to alternative travel options. Innovative ideas which come from other municipalities and regions can provide excellent starting points for planning. Staff should be encouraged to attend conferences & training to facilitate knowledge transfer.

Integration with Land-Use Planning

Land-use planning and transportation are inexorably linked; in order to encourage long term changes to the way people travel, TDM measures must be integrated into land-use planning. Land-Use Based TDM Strategies affect the functional relationship and proximity between major travel origins and destinations, most notably the home/work trip. It is recommended that the City of Peterborough take a firm approach to the inclusion of the following strategies in new developments and retrofits:

- **Intensification** – By increasing the density of a community, it becomes easier (and more affordable) to provide high quality transit service. Intensification can be carried out in Peterborough in a way that maintains the small town charm of the city. The City of Peterborough should continue to provide Official Plan policies and Zoning By-Law provisions with opportunities and incentives for more mixed use development forms, higher residential densities and infilling/redevelopment of land in appropriate locations within the City, as determined by planning staff and community input.

- **Compact Development** – Compact development refers to development with short blocks of closely spaced dwelling units or buildings to promote active transportation within a community. Although there may be opposition to the idea of compact development in Peterborough, well thought-out designs can increase a sense of community.

- **Transit-Oriented Development (TOD)** – a walkable, mixed use form of development focused around a transit station. Concentrating higher density development near the station makes transit convenient and encourages ridership.

- **Mixed-Use Developments** – Mixed-used developments help to create sustainable sites where people can live, work and play within one immediate area. This shortens trip lengths and reduces the need for trips across neighbourhoods and cities, but maintains a high degree of liveability for inhabitants.

- **Sustainable Site Design** – Developments should be designed in accordance with up to date standards and best practices for site design such as the ITE Proposed

Recommended Practice – Promoting Sustainable Transportation through Site Design Guidelines which provides detailed information on elements such as access management, parking supply and placement, bicycle and pedestrian facilities, and site layout.

Incorporating the above land-use strategies into official documents such as Official Plans, Secondary Plans, Zoning By-Laws, Area-Specific Policies and Guidelines and Parking & Loading Standards will help to ensure their place in decision making and planning practices.

The existing City of Peterborough Official Plan has identified a number of land-use strategies to support the use of sustainable modes. A number of intensification corridors were defined in the City along which transit supportive density targets have been identified. In addition, these corridors will be developed to contain mixed use development, and affordable, accessible housing. These intensification areas are illustrated in Figure 38.

The recommended TDM strategies discussed are summarized in Table 21.

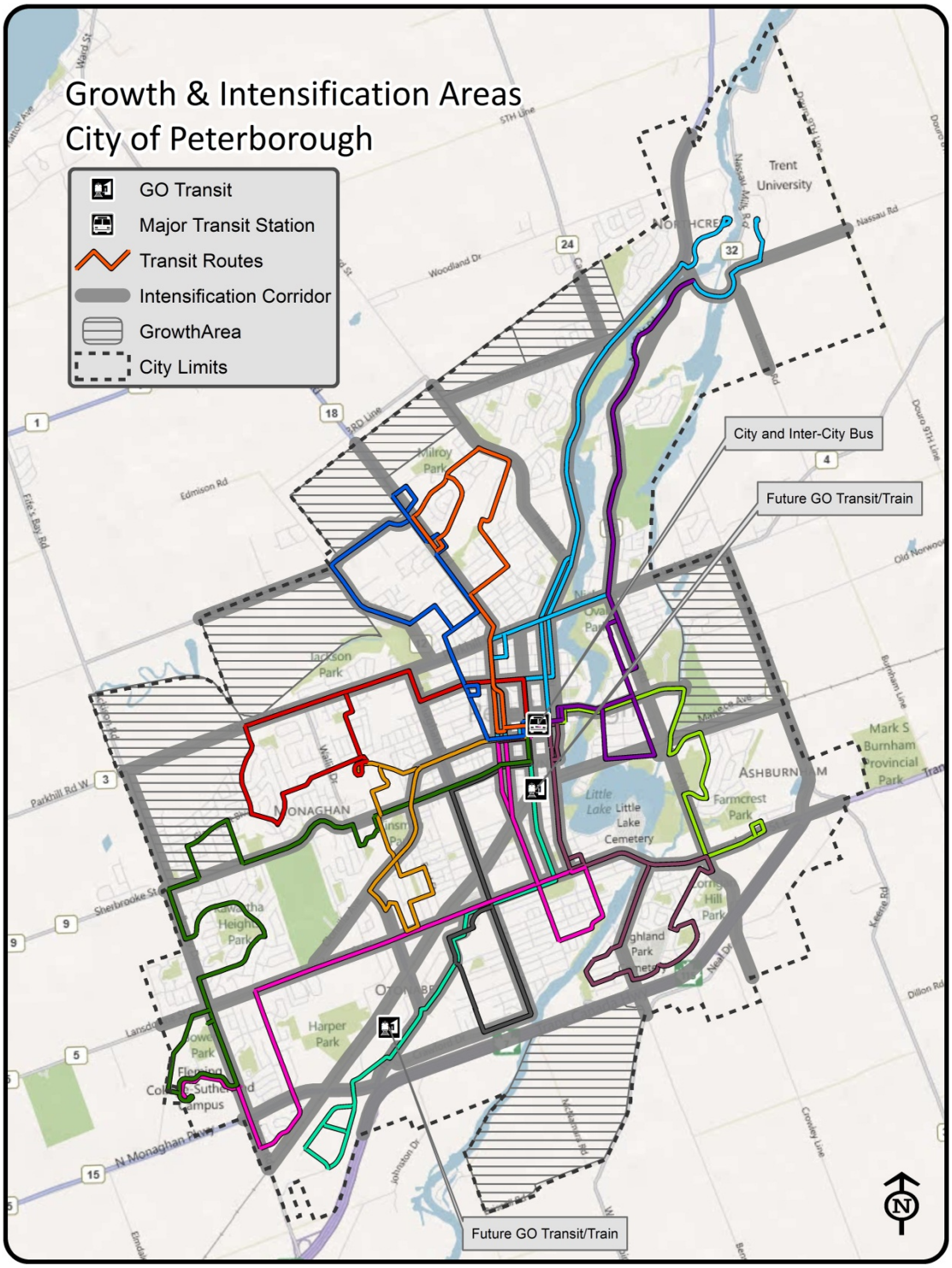


Figure 38 Intensification Corridors

Table 21 Recommended TDM Strategies

Initiative	Strategy	Time Frame	Cost to Implement	Effective-ness	Priority
TDM Initiatives & Tools	Develop & launch innovative TDM initiatives to promote use of alternative modes	Medium	Variable	Medium	High
Support to Employers	Continue to provide support to employers in encouraging TDM (with programs such as Shifting Gears Workplace Challenge) and develop a TDM Toolkit for employers	Short	Medium	Medium	High
	Encourage employers to allow telework and flexible working hours	Short	Medium	Medium	High
City Ambassador Program	Encourage city staff to play an ambassadorial role in TDM in two ways: leading by example and promoting TDM to the community	Short	Low	Medium	High
Parking Management	Implement recommendations of the Strategic Downtown Parking Master Plan	On-going	None (self-funding)	Medium	High
	Explore further opportunities to implement parking strategies which encourage modal shift (i.e. parking fees, maximum parking requirements for new developments etc.)	On-going	None (self-funding)	Medium	High
New Development	Have TDM staff involved in planning decisions for major developments & revise Traffic Impact Study requirements to include consideration of TDM	On-going	Low	High	High
Individual Trip Planning	Continue to implement and secure funding for household + individual trip planning services with incentives & tools	Medium	High	High	Medium
	Provide trip information to Google trip planner for transit trip planning tool	Short	Low	Medium	High
Car Sharing	Explore feasibility of introducing a car share program in Peterborough	Long Term	Variable (depends on user fees etc.)	Medium	Medium

Initiative	Strategy	Time Frame	Cost to Implement	Effective -ness	Priority
Ride Sharing	Continue to advertise carpool programs such as Carpool Zone	On-going	Low	Medium	High
	Provide preferential carpool parking spaces at municipal buildings and offices	Short	Low	Medium	Medium
Integration with Land-Use Planning	Encourage land use planning which supports TDM objectives (i.e. intensification corridors, mixed use development)	Medium	Low	High	High
Education & Outreach	Continue to support Active & Safe Routes to School	On-going	Low	High	High
	Develop complementary school outreach programs which help to support efforts to encourage children to be active and think about their transportation choices	Medium	Medium	Medium	Medium
Community Events	Working with organizers and community partnerships, encourage the use of alternative transportation to concerts, festivals and other events by providing preferential treatment such as preferential carpool parking and bike valet services	On-going	Medium	Medium	Medium

5.3 ACTIVE TRANSPORTATION

Active transportation is a general term for the use of human-powered, non-motorized modes for transportation such as walking, running, cycling, and rollerblading.

Active transportation plays an important role in creating vibrant communities. Transportation systems which are focused on the safety and accommodation of the most vulnerable users add to the value of the community, providing accessibility for all. In planning and designing for active transportation, liveability can be integrated with the need for mobility and access.

Active transportation has numerous benefits for both individuals and the larger community. It helps to improve air quality and reduce emissions by decreasing reliance on motor vehicles. On an individual scale, active transportation increases physical activity, resulting in a healthier community with less strain on the health care system. For example, every hour spent in a car per day is associated with a 6% increase in the likelihood of obesity, while each kilometre walked per day is associated with a 4.8% reduction in the likelihood of obesity.[8] A study of the interconnected trail network of Portland, Oregon estimated $155M dollars in saved health care costs as a result of reduced obesity from the use of the trail system for active transportation and recreation.[9] Serving all ages and mobility levels, active transportation networks provide equity and enable an aging community to maintain independence and autonomy, without the use of a vehicle. In addition, walking and cycling are affordable and efficient, providing alternatives to motor vehicle use for all residents of the City of Peterborough, no matter their income. Perhaps most importantly, active transportation encourages people to get outside in their community, promoting social interaction and encouraging a sense of pride and ownership.

Cycling and pedestrian infrastructure also provides a strong return on investment. Recent research supports the understanding that active transportation has strong economic benefits. People who commute by active modes of transportation take fewer sick days, resulting in increased productivity.[10] They are also more likely to enjoy their commute, refuting the idea that

[8] Frank L, Andresen M and Schmid T. Obesity Relationships with Community Design, Physical Activity, and Time Spent in Cars. *American Journal of Preventive Medicine*, 27(2): 87–96, August 2004.
[9] Beil L. Physical Activity and the Intertwine: A Public Health Method of Reducing Obesity and Healthcare Costs. A Report to the Intertwine Alliance Partners. January 2011.
[10] TNO. Reduced sickness absence in regular commuter cyclists can save employers 27 million euros. 2009.

active transportation is a less desirable option than driving.[11] Within commercial districts, cyclists generate significantly more expenditure per square metre ($31) of space allocated for parking than drivers do ($6).[12] Active transportation infrastructure is also significantly more efficient than auto-based infrastructure. For example, one vehicle parking space can accommodate up to twenty bicycles.[13] In addition, a strong active transportation network can relieve demand on existing road infrastructure, easing congestion and reducing the need for new roads, which in turn can result in vast savings in infrastructure expenditure.

Research shows that an individual's decision to walk or cycle is influenced by five main factors:[14]

- **Personal Considerations** - Attitudes, values, and perceptions of individuals and society affect the initial consideration of whether to bicycle or walk, or not. Time and distance are often cited as reasons not to bicycle or walk. There are also situational constraints such as needing a car for work, transporting bulky items or dropping off passengers. A proportion of the population may also not have the physical capability to ride a bicycle or walk, and this is especially relevant in Peterborough with its undulating terrain and steep roadway slopes.

- **Trip Barriers** - If personal considerations are favourable, physical trip barriers are then considered, including fear of traffic (real or perceived), the weather, and the terrain. Once again, the Peterborough terrain and winter conditions represent such barriers. Providing bikeways, walkways and trails can help to overcome some of the safety issues, along with education and enforcement programs, and safety campaigns. Trail and roadway maintenance is needed to ensure maximum winter usability.

- **Destination Barriers** - Destination barriers include a lack of adequate infrastructure at the trip end such as pedestrian building access, secure parking for bicycles, change and shower facilities. Less tangible destination barriers can include the lack of support from co-workers and employees, or a formal dress code that does not lend itself to cycling or walking to work.

- **Availability of Appropriate Surfaces and Crossings** - In terms of walking, the main limitation to this most basic mode of transportation can be a lack of suitable walking surfaces and trail linkages. Without sidewalks, pedestrians are forced onto roadways or shoulders. Also, pedestrians and those using mobility aids can be hindered by a lack of curb-cuts and ramps at appropriate locations, lack of adequate sidewalks along busy

[11] Turcotte, M. *Like commuting? Workers' perceptions of their daily commute***.** Canadian Social Trends, Statistics Canada. 2006.
[12] Lee, A & March, A. *Recognising the economic role of bikes: sharing parking in Lygon Street, Carlton*. Australian Planner, 47: 2, 85 — 93. 2010
[13] Litman, T. *Quantifying the Benefits of Nonmotorized Transportation For Achieving Mobility Management Objectives.* Victoria Transport Policy Institute. 2005.
[14] FHWA. *The National Bicycling and Walking Study – Final Report.* 1994

roads, vehicular barriers that also restrict those with mobility aids, limited crosswalk locations and signal timing that favours vehicles over pedestrians.

Peterborough has a combined walking and cycling mode share of about 10% in the morning peak period and about 8.4% in the afternoon peak period, according to the 2006 Transportation Tomorrow Survey. A study out of Montreal concluded that the average commute distance for those who walk to work is 1 km and the average distance for those who cycle is 3.9 km.[15] With a median commute distance of 5.1 km within Peterborough, there is significant opportunity to shift a number of these trips to active transportation.

Despite the potential for cycling and walking trips, there are also deterrents for residents considering active transportation modes.

Challenges to active transportation in Peterborough include:

- Hilly terrain, with steep slopes on many main corridors
- Lack of corridor options for direct east-west travel across the city
- An aging community with 28.6% of Peterborough residents expected to be 65 years or older by 2030[16]
- Two major water bodies which create access barriers across the city

Capitalizing on the opportunities and overcoming the obstacles to active transportation must be an important focus for the City of Peterborough moving forward to 2031 in order to enhance the vitality and efficiency of the transportation network.

[15] Larsen, J., El-Geneidy, A., & Yasmin, F. *Beyond the quarter mile: Re-examining travel distances by active transportation.* Canadian Journal of Urban Research: Canadian Planning and Policy (supplement), 19(1), 70-88. 2010.

[16] Peterborough County-City Health Unit. *Community Assessment Report 2010: Prepared for the purposes of Healthy Communities*. 2010.

VISION FOR ACTIVE TRANSPORTATION IN PETERBOROUGH

The City of Peterborough prioritizes active modes of transportation through policies, infrastructure and programs that foster a cycling and pedestrian network with a high degree of connectivity, safety and local context sensitivity.

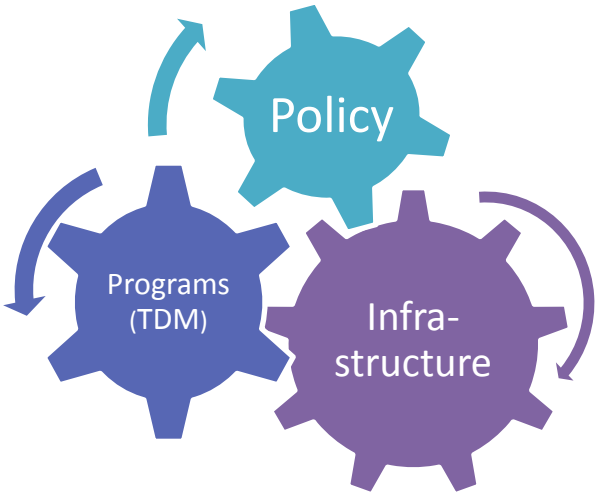
In keeping with this vision, the following objectives will help to realize the desired active transportation system:

- Support increased recreational and utilitarian active transportation among all City of Peterborough residents, recognizing that both types of trips can be served by a network where a variety of users of varying ability and skill feel comfortable and confident
- Provide affordable, safe and easy access to commercial, residential, employment and public facilities
- Complement infrastructure with supporting policies and programs which both legitimatize and encourage active transportation
- Provide strong connections to transit and improve transit compatibility in order to extend the potential reach of trips and encourage intermodal travel
- Encourage feedback from citizens, landowners, pedestrian and cycling advocacy groups, and others to support continuous improvement of the active transportation network
- Promote safety through measures such as educational campaigns for drivers and cyclists, as well as the provision of appropriate infrastructure to reduce conflicts with motorized traffic
- Support year-round, all weather travel by ensuring a systematic approach to maintenance as well as high quality end of trip facilities
- Favour urban design that reduces the distances that people have to travel to get to work, retail areas, schools and recreational/leisure pursuits
- Provide connections to surrounding communities and the County of Peterborough to create a linked, complete network for commuting across and within the Greater Peterborough Area

5.3.1 STRATEGY

The active transportation strategy takes a three-pronged approach to achieving the objectives outlined above.

In particular, the strategy focuses on policy, programs and infrastructure to support active transportation as a viable and attractive mode choice. Enhancements to all three of these elements must be carried out simultaneously and continuously, as the success of one is inexorably linked with the others.



5.3.2 POLICY

To support and enhance active transportation, strong policy measures are required that place an emphasis on non-motorized travel as a priority within the City of Peterborough. The following policies are intended to bolster support and provide a strong foundation for improving the active transportation environment of Peterborough.

Sidewalk Policy

Sidewalks are the most important element of the pedestrian network and studies have shown that streets with no sidewalks have 2.6 times more pedestrian collisions.[17] Sidewalks provide infrastructure for a variety of pedestrian needs, including the utilitarian commuting trip, and are particularly important in high demand areas such as along transit routes, near schools, churches and other public institutions, commercial areas, and parks.

The City of Peterborough has developed a 'Provision of Sidewalks' policy which calls for sidewalks on both sides of all new and existing City streets except for cul-de-sacs with no

[17] ITE Technical Council Committee 5A-5. *Design & Safety of Pedestrian Facilities – A Proposed Recommended Practice of the Institute of Transportation Engineers.* Washington, D.C.: Institute of Transportation Engineers. December 1994.

through pedestrian connections and less than 30 homes. A Sidewalk Strategic Plan was developed to complement the policy by identifying and ranking missing sidewalk links. In establishing priorities, a detailed scoring methodology was applied with consideration given to such factors as:

- Road classification
- Abutting land uses known to be high pedestrian generators
- Proximity to schools, transit stops, parks, and trails

In total, four priority levels were established to address sidewalk needs across the City (refer to Table 22). Current implementation plans call for all Priority 1 and 2 sidewalks to be built by 2022.

Table 22 Missing Sidewalk Priority Levels & Investment Needs

Priority Level	Sidewalks To be Built (m)	Cost in 2011 Dollars
1	5,078	$1,026,000
2	36,301	$7,333,000
3	179,675	$36,294,000
4	172,425	$34,829,000
Total	**393,479**	**$79,482,000**

The Sidewalk Strategic Plan is an important guiding document for the development of a connected pedestrian network, and should be adhered to as investments in pedestrian infrastructure are made.

Complete Streets Policy

A strong policy measure to garner support for active transportation projects is the provision for a Complete Streets policy. Complete Streets is a movement which seeks to design and retrofit streets in a way that provides for all users, in particular designing for the most vulnerable users such as the elderly, those with disabilities, and children. Streets provide a community with mobility and accessibility. By developing streets for all users and ensuring they are liveable, the city can promote a healthy and vibrant community. Complete Streets in Peterborough will provide access and mobility for all modes and users including: transit passengers, cyclists, pedestrians, motorists and commercial vehicle operators, supporting the movement of both people and goods.

An ideal Complete Streets policy must:[18]

- Provide a strong vision,
- Address all users and modes
- Emphasize connectivity
- Apply to all roads
- Apply to both new and retrofit projects
- Provide clear exceptions
- Stress context sensitivity
- Describe or develop design standards
- Provide performance standards
- Provide an implementation plan

A draft Complete Streets Policy for Peterborough is presented in Appendix G.

The main recommendations include:

- Cyclist, pedestrian, motorist and transit needs shall be routinely accommodated in all road reconstruction & new construction projects

- Where this many not be possible, provide alternative corridors of travel

- For operations & maintenance plans, routinely consider the needs of all users in maintenance scheduling, traffic signal timing, etc.

- Exceptions will be clearly stated and must be approved by the Manager of Transportation

- Form a Complete Streets steering committee to oversee the implementation of the policy

Use of Mobility Devices Policy

With an aging population and many seniors suffering from reduced personal mobility, it is inevitable that certain challenges will be placed on the transportation network. In particular, it is important to consider the advent of emerging technologies such as personal mobility devices on the transportation network. Personal mobility devices are relatively new but widely used, and it is important to clarify their place in the hierarchy of users.

Current City of Peterborough by-laws include wheelchair users in the definition of 'pedestrians'. As pedestrians, wheelchair users are not permitted to travel on the road in the direction of travel of vehicles. However, emerging technology sees personal mobility devices which travel faster than manual wheelchairs (with electric or gas motors) and it is necessary to further examine the place of these types of users.

[18] National Complete Streets Coalition. *Complete Street Policy Analysis 2010 – A Story of Growing Strength. Washington, DC.* 2010

A literature review was carried out to investigate current practice and the key issues associated with the case of personal mobility devices operating in bicycle lanes and facilities. The findings from this review are presented in Appendix H.

The Ministry of Transportation of Ontario indicates that the use of personal mobility devices (e.g. wheelchairs and medical scooters) is primarily left to municipal by-laws. They do recommend, however, that these devices should generally be for use on sidewalks as a primary option. There are precedents where mobility devices are permitted to travel in bicycles lanes in the U.S. and UK. Within Canada, there is some ambiguity about the use of mobility devices within municipal by-laws. The City of Toronto is currently undergoing a review of its bylaws regarding e-bikes and alternative emerging vehicle types, which may be helpful in informing Peterborough's policies.

Some research indicates that many mobility device users would choose to use bike lanes over sidewalks for the following reasons: smoother surface than sidewalks, less disruptions in travel, fewer obstructions and less chance of tipping due to curbs. However, detractors from the use of bike lanes cited reasons such as a lack of driver awareness regarding bike lanes and the risk of collisions between scooters and faster moving bicycles, especially as many bike lanes do not have sufficient width to accommodate both scooters and bicycles.[19]

Based on the above findings, the following recommendations are made:

1. Initial assessment indicates that it may be appropriate to allow the operation of mobility devices in bicycle lanes where sidewalks are non-existent, damaged or impassable for some other reason, with the operators of mobility devices behaving as a cyclist, operating in the direction of traffic.

2. Public consultation with user groups (including cyclists, persons with disabilities, health providers and law enforcement agencies) should be conducted to gauge reaction to potential changes to the Traffic By-Law (91-71).

3. If a consensus can be reached, the by-law should be changed to reflect the wishes of the community.

End of Trip Facilities Zoning By-Law Amendment

End of trip facilities include a number of treatments which help to accommodate and facilitate travel by active transportation modes. Examples are provided below in Table 23 which indicates overlap in the types of users who would benefit from various facilities.

[19] Pieter V. Steyn & Adrienne S. Chan. Mobility Scooter Research Project. University of Fraser Valley Centre for Education & Research on Aging, March 2008. Available online: http://www.ufv.ca/Assets/Aging+-+Centre+for+Education+and+Research/Scooter+report.pdf\

Table 23 End of Trip Facility Examples

	Cyclists	Pedestrians	Other Active Modes (e.g. rollerblading, skateboarding etc.)
Long Term – Intended for full day or longer stays such as at workplaces, schools and transit transfer points	Personal Lockers / Storage Facilities		
	Showers		
	Change Rooms		
	Bike Lockers		
	Additional Secure Bike Parking options – e.g. Fenced-in storage areas		
Short Term – Intended for short term stay such as near commercial developments	Bike Racks		
	On-Street Bike Parking in the Downtown, Bike Valet at Events		

End-of Trip Facilities for Cyclists

A lack of end of trip facilities can be a deterrent for even the most enthusiastic and experienced cyclists. Thus, it is vitally important to ensure that high quality, well-placed and accessible bicycle parking is provided at regular spacing near destinations such as businesses, shops and public buildings. Where a particular facility serves a high number of employees or visitors, or long-term parking is required, it is desirable to provide more comprehensive end of trip facilities such as bike cages, showers, change rooms and bike lockers. In particular, transit hubs where cyclists may transfer modes are desirable locations for more secure bicycle parking options such as lockers.

Source : www.pedbikeimages.org / Judi Lawson Wallace

Attractive Bicycle Parking

Bike racks can also be used to provide a sense of local character and add charm, particularly to a downtown setting. In this way, Peterborough can move forward with the vision of prioritizing active transportation with a high degree of local sensitivity.

Provisions for bicycle parking and end of trip facilities in the zoning by-law would provide a consistent way of ensuring that cycling and active transportation amenities are provided. It is recommended that the City of Peterborough implement changes to the zoning by-law that

requires both short-term & long-term facilities be provided in quantities to be determined based on the use of a site.

In conjunction with updating the zoning by-laws, it is desirable to conduct an audit of existing bicycle parking and end of trip facilities, particularly at public buildings. Such information could be used to generate maps providing information on where end-of-trip facilities are located, particularly for new cyclists. Providing a trails and bikeway map which also indicates where bike parking, showers, and lockers are available helps to provide a complete set of information to potential cyclists. An audit would also help the City in identifying locations (particularly in the downtown) where additional public facilities are warranted.

There are opportunities for public-private partnerships in the funding of bicycle racks and facilities which should be explored to reduce costs associated with the upgrade of required or existing facilities. These can include the addition of advertising on panels above bike parking racks, or on the sides of bicycle lockers.

End-of-Trip Facilities for Pedestrians & Other Active Transportation Modes

Facilities such as showers and change rooms which are installed at offices can be used for other active transportation modes such as running or rollerblading. This should be a consideration when developing the zoning by-law standards for end-of-trip facilities. Multi-modal facilities will be important for offices and other places of employment if significant mode shift is to be achieved for the journey to work.

Network Maintenance Policy

In order for active transportation to be a practical option for travel in all seasons, year-round maintenance must be a priority, particularly for high demand facilities.

Facilities must:

- Be free of debris and obstructions
- Provide a relatively smooth surface free of potholes, divots or other deterrents
- Be cleared of snow, and be treated appropriately in icy conditions
- Undergo line re-painting when worn, or signage replacement when damaged
- Ensure supporting facilities such as bicycle racks or benches are in good repair and accessible

It is important to provide a core network of well-maintained routes in order to ensure active transportation is viable in all weather. At present in Peterborough, bike lanes are swept as a priority in the springtime and once monthly thereafter. Off-road trails are maintained year-round including grass cutting along edges, snow and ice removal, and trimming of overhead branches. In the winter, snow clearing of sidewalks is covered under the Winter Service Operations Policy, however road clearing takes first priority.

In order to promote year-round active transportation, it is recommended that that City of Peterborough:

- Consider amending the Winter Service Operations Policy to give equal priority to all transportation modes, rather than considering sidewalks and bus stops as secondary to road operations.

- Use the Strategic Sidewalk Plan to identify high priority pedestrian corridors to be given priority snow clearing treatment (i.e. sidewalks providing access to transit routes, etc.).

- Identify a core network of on-street cycling routes and amend the Winter Service Operations Policy to ensure that these roads take priority in snow clearing.

- Provide some formalized and advertised outlet (e.g. website, phone # or contact) for the public to provide information on damaged, poorly maintained, or obstructed sidewalks, trail systems, and cycling facilities to the City's Public Works Division.

Pedestrian-Supportive Land Use Policy

Efficiency of urban designs for walking is reflected in the nearness of services, the pattern of developments, the density of development and the mix and design of land uses. Building design and street design must be considered together in their influence over the use of public spaces. New and infill land use development should accommodate walking. Successful downtowns, waterfronts and entertainment districts often find a 50:50 ratio of walking space to vehicular space ideal for maximum economic development.

Land use patterns conducive to walking include:

- Greater housing densities allow more residents to live closer to neighbourhood destinations such as stores and schools;
- Mixed-use zoning allows services such as stores and professional buildings to be closer to residential areas, making it easier to access these facilities on foot;
- Multiple-use zoning allows residences and businesses to share the same structure, reducing travel demands;
- Locating buildings close to the street allows easy access by pedestrians, and planning parking areas to minimize walking in vehicle circulation space reduces the potential for vehicle/pedestrian conflicts;
- Neighbourhood street management, including traffic calming techniques, makes streets more inviting to walkers by reducing traffic volumes and speed, and addressing conflicts.

The design of basic transportation and related facilities can also be used to encourage walking. There is a need to consider not only movement and flow, but to look at attractiveness, comfort, convenience, safety, security, system coherence and system continuity from the pedestrian viewpoint. These elements are discussed in more detail in Section 5.3.4.

5.3.3 PROGRAMS

Transportation Demand Management seeks to reduce single occupancy vehicle trips and encourage more sustainable travel choices. It can play an important role in enhancing the active transportation system. Programs in support of active transportation include initiatives which encourage active transportation through a wide variety of approaches including:

- **Educating Users** – Helping both motorists and active transportation users to better understand the demands of operating safely in the same right of way and at crossings, as well as providing mode-specific courses to encourage users in better understanding their responsibilities on the road

- **Encouraging & Promoting** – Offering incentives and support to those wishing to try active transportation; These should include an effort from both the public and private sector such as an 'Ambassador Program' which sees staff at the city leading by example

- **Enforcement**– Ensuring regulations are followed by providing consistent and regular enforcement with fair penalties for infractions, with the primary aim of increasing both actual and perceived safety

- **Adding Legitimacy & Creating Public Support** – Engaging the general public in the conversation about transportation and infrastructure, with the goal of better understanding the important role that active transportation can play in improving the transportation network, as well as the liveability of the city and region

Some of the initiatives which currently occur within the City of Peterborough in support of active transportation were discussed in the TDM Section 5.2 and include:

- **School Travel Planning & Car-Free School Days** – These programs help to encourage safe, active commuting by local elementary school students as part of Active & Safe Routes to school initiatives.

- **Cycling Commuting Skills Course** – A course is currently available through Peterborough Moves which offers training for those wishing to cycle, including tips for cycling in traffic.

- **Shifting Gears Workplace Transportation Challenge** – Peterborough Green Up offers this month long challenge targeting local businesses and employees to try active and sustainable transportation modes.

In supporting increased investment in active transportation, additional initiatives which hold merit for future implementation in Peterborough include:

Car-Free Sundays

Source: www.pedbikeimages.org / Ryan Snyder

Cyclovia Event

Many cities have successfully implemented car-free Sunday events, either on specified dates, or on a continuing schedule throughout the year. Streets are closed to motor vehicles, but remain open to pedestrians, cyclists, and other active transportation users, and are often partnered with festivals or other events. Events like these help to raise the profile of active transportation and to demonstrate to commercial businesses that cyclists and pedestrians contribute positively to both the environment and the economy, even without vehicle access. Events like these also help to validate the presence of cyclists and pedestrians, and their right to operate safely along and across a city's streets. It is possible to maintain some vehicular access to important destinations, for example, by closing all but one or two lanes to vehicular traffic.

Traffic Safety Education

These programs could be implemented in conjunction with current Active and Safe Routes to School initiatives, community events, and through media campaigns. The education would target a better understanding of how cyclists, pedestrians and motorists can safely share the road. If a cyclist is ticketed for an infraction (e.g. riding on a prohibited sidewalk), they could be offered the opportunity to have the fine waived if they attend the education program, which would be the same for a vehicle driving or parking in bicycle lanes.

Cycle Tourism

Cycle tourism is an ideal way to raise support for cycling infrastructure and facilities by capitalizing on economic benefits. With many trails around and into the city, a partnership with the Peterborough DBIA could help provide strong destinations at local businesses, and encourage bicycle presence in the downtown, while partnering with the Greater Peterborough Area Economic Development Corporation could expand the Cycle Tourism campaign to a greater geographic region.

Bicycle Rack Design Competition

An event which asks Peterborough residents to come up with a community driven design for bicycle racks to be used throughout the downtown, perhaps as a kickoff event to the launch of the Downtown Cycling Master Plan. Events which engage the public in thinking about active transportation can be useful for raising the profile of cycling and garnering public enthusiasm. It should be noted that the design and placement guidelines for bicycle parking available on the City's TDM website should be issued as part of the design challenge to ensure any designs are functional and safe for users.

Enforcement Action Plan

In consultation with local authorities, an enforcement plan should be developed to which gives special consideration to improving cooperation of motorists and cyclists/pedestrians with regulations, including identifying opportunities for providing education in lieu of penalties for specific violations (i.e. attending a pedestrian safety course in lieu of paying a jay-walking fine) and identifying positive enforcement approaches which can be utilized in combination with education programs (i.e. 'catching' a driver yielding to a pedestrian in a crosswalk or a cyclist stopping at a stop sign)

Formalized Feedback Program

Some formalized outlet (e.g. phone line, website etc.) should be established which allows feedback from the public to be fed into a maintenance and improvement programs for cycling infrastructure, trails and sidewalks, including intersections. The following intersections were specifically identified as needing improvement or special treatment during consultation for the transportation master plan update, and should be prioritized along with the upgrade required to existing facilities:

- Hilliard St / George St / Rotary Trail
- Water St / Rotary Trail Crossing
- Parkhill /Benson / Parkway Trail Crossing
- Parkway trail / Fairbairn Crossing to Jackson Park
- Rotary Trail / Hunter Street Crossing
- Rail crossing at Whittington Drive
- Clonsilla / Sherbrooke
- Auburn St / Parkhill Crossing

Data Collection & Monitoring

Planners are often hindered in predicting the effectiveness of active transportation strategies by a lack of data. An active transportation data collection and monitoring regime should be developed for the City of Peterborough to track the following:

- Network usage
- Collisions
- Attitudes & perceptions
- User demographics
- Costs (for construction, maintenance etc.)

In particular, it will be essential to conduct counts of pedestrians and cyclists both in advance and post construction of new facilities, to provide a benchmark for analyzing the sensitivity of use to infrastructure investments. Recent innovations in automatic bicycle counters and other technologies will continue to improve the effectiveness of active transportation data collection.

Putting it All Together

Once the various active transportation policies and programs were identified, they were prioritized based on the following characteristics:

Table 24 summarizes the different policies and programs which were developed in support of active transportation. In addition, certain complementary infrastructure recommendations are also provided, which are further elaborated on in Section 5.3.4.

Table 24 Summary of Active Transportation Policies, Programs & Infrastructure Recommendations

Issue	Strategy	Time Frame	Cost to Implement	Effectiveness	Priority
Complete Streets Policy	Implement a Complete Streets Policy & train staff on its use	Short	Medium-High	High	High
	Form a Complete Streets steering committee to oversee implementation	Short	Low	Medium	High
Accessibility & Mobility Devices	Conduct further consultation to determine the appropriateness of permitting wheelchairs & scooters in bicycle lanes & introduce changes to the traffic by-law	Short	Low	Medium	High
Maintenance	Modify existing winter maintenance policy to identify key cycling & pedestrian corridors for priority snow removal	Short	Medium	Medium	Medium
	Implement a phone line or website for the public to report sidewalks & trails requiring maintenance or repairs	Medium	Medium	Medium-Low	Low
Data Collection & Monitoring	Collect data on network usage, collisions, attitudes, characteristics, and costs to assess program effectiveness and identify opportunities for improvement	Ongoing	Medium-Low	Medium	High
Pedestrian Network & Safety	Continue to implement the Strategic Sidewalk Plan for providing sidewalks on existing roads, and adhere to the Sidewalk Policy for any new development. Update the Sidewalk Strategic Plan every 3-5 years.	Ongoing	Medium-High (project specific)	High	High
	Prepare Neighbourhood Traffic Management Plans as necessary to address pedestrian & cycling issues	Ongoing	Medium	High	Medium
	Continue the application of traffic calming measures in residential and school zones	Ongoing	Medium (project specific)	Medium	Medium
Cycling Network	Identify and address deficiencies in the existing network, particularly at road crossings	Short-Medium	Medium-High (project specific)	High	High
	Implement proposed cycling network over planning horizon	Short-Long	Medium-High (project specific)	High	High
	Complete a Downtown Cycling Plan	Short	Medium	High	High
Intersection Safety	Install signage and necessary treatments to improve existing intersections	Short	Low-Medium (project specific)	High	High
	Promote pedestrian supportive design at intersections e.g. smaller radii, curb cuts, bulb-outs	Ongoing	Low	Low-Medium	Medium

Issue	Strategy	Time Frame	Cost to Implement	Effectiveness	Priority
Trail Improvements	Audit existing facilities for lighting, seating, and other amenities. Develop a long-term strategy for improving trail amenities and accessibility	Short	Medium	Medium	Medium
End of Trip Facilities	Introduce changes to Zoning By-Law to include bike-parking/ end of trip facilities as a requirement of development	Short	Low	High	High
	Audit existing bike parking at public facilities & upgrade where necessary	Short	Medium	Medium	Medium
New Development	Require new developments to provide cycling routes which connect to existing facilities	Ongoing	Low	High	High
Integration with Transit	Install bike racks on buses (not currently feasible due to size of bus service bays)	Long	High	Medium	Low
	Provide long-term bike parking at major transit hubs	Short	Medium	Medium	Medium
	Provide pedestrian supportive environment near transit stops & stations, including benches and shelters	Short-Medium	Medium	Medium	Medium
Active Transportation Programs / TDM Measures	Continue to support Active & Safe Routes to School programming	Ongoing	Low	Medium-High	High
	Encourage cycle tourism by establishing partnership with the County of Peterborough, Kawartha Tourism and DBIA and producing promotional materials	Short	Low	Medium	Medium
	Host a car-free Sunday event to gauge public reaction and determine suitability for on-going implementation	Short	Low	Medium	High
	Provide traffic safety education & outreach materials for drivers & cyclists	Ongoing	Medium	Medium	High
Enforcement	Work with the police department to address cycling issues at collision-prone locations	Ongoing	Medium	Medium	High
	Encourage the police department to administer a 'selective traffic enforcement program' that focuses on cycling and share-the-road enforcement campaigns	Ongoing	Medium	Medium	High
Additional Measures	Wherever possible, upgrade existing gravel facilities to pavement	Long	Medium	Medium-Low	Low

5.3.4 INFRASTRUCTURE

Just as with other modes of transportation, active transportation users require infrastructure to make travel viable. Planning networks for cyclists and pedestrians is equally as challenging and rigorous as for automobiles. A summary of some of the key issues in developing the pedestrian and cyclist networks are presented below.

PEDESTRIAN NETWORK

The pedestrian network consists of links such as sidewalks and trails, and nodes such as crosswalks, pedestrian signals, stairs and ramps. These elements must work together to provide a coherent and safe network for pedestrian travel.

Provisions for a variety of types of abilities will help to ensure equity amongst users. By providing for children, the elderly, and people with disabilities, the most vulnerable users of the pedestrian network are protected.

Walking forms the cornerstone of the transportation network. It is a mode choice which places the user in the community setting. People who decide to walk think about safety, the attractiveness of the environment, and a number of other sensory experiences encountered during their walk, including the 'feeling' that the community provides as they traverse it. Creating an inviting, attractive, safe and enriching pedestrian experience will help to improve not just pedestrian mode share, but also quality of life for residents. Every step towards a 'walkable' Peterborough enhances community safety, vibrancy and health.

Sidewalks & Boulevards

Sidewalks provide key community connections for pedestrians. As outlined in the 'Provision of Sidewalks' Policy and the Sidewalk Strategic Plan, the City of Peterborough plans to provide sidewalks on both sides of all new and existing roads.

It is important that sidewalks be constructed with vulnerable users in mind, to the best available standards. In general, they must be wide enough to allow safe operation of a wheelchair, with minimal grade, and designed with proper drainage to ensure puddles or other debris do not accumulate in the path of users. Grades should be kept to a minimum whenever possible and should typically be less than 5-6%. A slope greater than 12% poses difficulties for many users.

Boulevards between sidewalks and roadway curbs are also an important element of well-designed streets. They provide a buffer between the pedestrian on the sidewalk and the vehicular traffic in the street, provide a splash area for water from the road and snow storage, and allow space for landscape treatments and utilities.

The sidewalk environment should include landscaping and streetscaping features designed into the road right-of-way, such as shade trees and plantings, trash receptacles, lighting and utility poles, benches, transit shelters, signs, vending machines and kiosks. Careful placement of these features is necessary to allow for unimpeded and easy pedestrian movement.

Intersections

Intersections often present special challenges for pedestrians, as they do for all users of the transportation network. As the most vulnerable users at any intersection, pedestrians must be given special consideration for safety. A number of key elements are essential for increasing safety at intersections. These measures include:

- For pedestrian comfort and safety in crossing streets, the **maximum crossing width** should be 15 m and not more than four lanes of traffic. Pedestrian signalization should be provided based on a 0.90 to 1.2 metre/second walking speed, with the lower limit used in school zones and road crossings near seniors facilities. Appropriately designed, channelized right-turn lanes, medians, and curb extensions or bulb-outs should be used effectively to reduce the crossing width of a street, especially at complex and busy intersections. Roadway geometry should dictate turning speeds of motorized vehicles to acceptable levels, below 30 km/h for left turns and below 15 km/h for right turns.

- **Raised medians** - on two-way, multi-lane roadways benefit pedestrians by allowing the pedestrian to cross one direction of traffic at a time with a mid-point refuge. Cuts in the median are required to accommodate people with mobility aids. Centre left-turn lanes are vehicle spaces, and therefore do not provide safe refuge for pedestrians crossing the street. Where pedestrian crossings are encouraged across a centre turn lane, the lane should be retrofitted with a median.

- **Curb extensions or bulb-outs** - can be used effectively at the intersection of streets with on-street parking, such as local residential and core area streets, to reduce the pedestrian crossing width of a street. A bulb-out occupies only the non-parking zone at an intersection (i.e. 15 metres or equivalent of 3 parking spaces from the intersection), will stop illegal parking close to the intersection, and places the pedestrian more within the field of view of the driver in the adjacent lane at an intersection. The bulb-out can also provide space for landscaping, street furniture and traffic calming features. They can also be used to ramp sidewalks down to the street level for improved accessibility for people with mobility aids without affecting the existing sidewalk, utilities and other property at the street corner.

- **Intersection and driveway corner radii** - have a marked effect on the pedestrian crossing distance of a street, the distance between the crossing pedestrian and the turning vehicle, and the speed of the turning vehicle. For example, a 15 m radius on an 8 m wide roadway surface (curb-to-curb) with a sidewalk adjacent to the curb will increase the crossing distance by 150% to 27 m, compared to a 4.5m radius with a crossing distance of 11 m. The design of the corner radii depends on the vehicle travel path as it approaches and departs from the intersection or driveway. For example, where parking is allowed, a vehicle typically makes the turn at an appreciable distance from the curb line. In other situations, the vehicle may hug the curb line.

- **Channelized right-turn lanes** - should only be used in Peterborough after careful consideration of site-specific traffic conditions. They can be designed for automobile traffic at low speeds of 20 to 30 km/h, and at an angle that can allow the driver to view the merging traffic flow and pedestrians that may cross the lane. However, experience in other cities shows that channelized right-turn lanes create an unsafe sense of pedestrian security, and automobiles may not yield the right-of-way to pedestrians in these turn lanes. For these reason, careful consideration of their use is recommended.

- **Raised crosswalks** - especially if textured and coloured, are more visible and act as speed humps to reduce vehicular speeds. Raised crosswalks at intersections, and mid-block raised crosswalks are treated by motorists as areas not designed for rapid through movement, but as areas where pedestrians are to be expected. They are extensions of the sidewalk and, with no change in grade, do not require ramps to accommodate people with mobility aids. They can also simplify drainage inlet placements because all surface water will drain away from the crosswalk or intersection.

Pedestrian Intersection Treatment in Vancouver
(www.pedbikeimages.org / Dan Burden)

- **Illumination -** is required at approaches to and at all major street corners to provide clear visibility of pedestrians approaching intersection crosswalks. At night, pedestrians are poor at assessing closure speed and a safe gap in traffic when wanting to cross a street. A pedestrian wearing dark clothing may not be seen by nearly half of all drivers at distances above 30 m. Lighting should illuminate the crossing and waiting areas and/or create backlighting to make the pedestrian silhouette clearly visible on approach. This is of particular importance near schools, in downtowns, commercial areas and entertainment centres, and other areas where pedestrian activity occurs or is encouraged.

In designing near intersections or modifying existing ones, consideration should be given to implementing the above measures to enhance pedestrian safety.

Traffic Calming

Traffic calming strategies are extremely useful for enhancing the pedestrian network. Treatments may include: speed humps, traffic circles, landscaped medians, chicanes, and other treatments which seek mainly to slow through traffic and return the street to a more pedestrian-friendly character. In Peterborough, there is a strong desire to maintain the small town character of the city. Traffic calming results in slower speeds and reduced vehicle traffic on residential streets, improving conditions for residents and encouraging active transportation.

Signage & Way finding

Signage can help to orient pedestrians, as well as provide guidance on their priority in operations (such as at turn bays and intersections). Particularly in the case of trail systems, it is desirable to provide clear signage indicating directional and destination based information. This can be combined with signage in place for other modes such as cyclists.

Lighting

Lighting has an important role to play in creating a sense of safety for all elements of the pedestrian network. As well as providing illumination to allow pedestrians to traverse pathways and sidewalks safely, lighting helps to improve feelings of personal security. In the case of trails or off-road paths, strong lighting can extend the period of time when pedestrians are willing to travel along them. Intersections, isolated areas and commercial areas are also good candidates for enhanced night-time lighting.

Network Amenities-Rest Points, Seating & Public Art

In improving the pedestrian network, there are distinct opportunities for creating desirable travel environments and public spaces which create a legacy of ownership and community pride.

Pedestrian networks must not only be functional but also more attractive than alternative options if significant mode share is to be attained. There are a number of elements which can enhance the pedestrian experience along a corridor. For example, capitalizing on natural attractions such as waterfront scenery or gardens helps to create a pedestrian network which highlights the best of Peterborough.

Providing rest points along routes is important for creating a pedestrian network that is accessible to all residents. Amenities may consist of a number of facilities including benches, water fountains, parking, garbage cans, telephones and even washrooms. Benches are perhaps the most basic and important amenity, particularly for disabled or elderly trail users. Placement may be established based on distance travelled along the trail, but also more frequently, or as a priority, on steep gradients along trails or sidewalks. These rest points serve both utilitarian and recreational users.

Public art can enhance active transportation networks by creating routes where pedestrians are excited to travel. Partnerships with local artists, or the Peterborough Art Gallery should be considered to add context sensitivity and create ownership.

As always, special consideration for placement of these objects must be made to ensure that they do not act as obstacles or impede the path of through movements. They are intended to complement and enhance the pedestrian experience and their arrangement requires detailed understanding of site-specific needs.

Integration with Transit System

In order to promote connectivity with the transit network, pedestrian supportive design at stations and transit hubs will help to increase the number of people willing to walk to these destinations. Pedestrian supportive design may include providing benches and shelter from the weather at major stops and stations, providing bulb-outs to facilitate loading at key locations and ensuring sidewalk connections (as identified in the Sidewalk Strategic Plan).

Area Traffic Management Plans

Neighbourhood pedestrian improvement plans provide detailed analysis, with community input, into specific improvements which can be made to pedestrian access to and within the area. They are useful as planning tools, relying heavily on community feedback, to identify and address specific problems within a neighbourhood. The City of Peterborough should explore the need for pedestrian network analysis and planning at this level. More detail is presented in Section 5.8.

Pedestrians with Special Needs

Like able-bodied pedestrians, a person with a disability travelling independently is usually a shopper, student or employee going about normal business. For the purpose of transportation planning and design, a disability can be classified as a mobility impairment, sensory deficit or cognitive impairment. The objective should be to refrain from erecting special needs barriers within the streetscape, and to strive to eliminate any existing ones over which the municipality has jurisdiction or influence.

The level of energy required by a wheelchair user to push a given distance is about 30% higher than needed by a walker. A person on crutches or with artificial legs requires 70% more energy to go the same distance. If a person in a wheelchair travels a full city block to find no curb cut, doubles back and travels that same distance in the street, it is the equivalent of an ambulatory person going 4 extra blocks, not to mention the extra time and inconvenience. This illustrates the importance of creating barrier-free environments. Recommended design guidelines for new or re-constructed pedestrian facilities are outlined below.

- **Sidewalks -** should continue to follow the City's access guidelines. For example, sidewalks require a minimum clear width of at least 1.1 metres (most are 1.5 metres), and should be provided on both sides of a street in areas where the public are invited. Joints in concrete sidewalks or other breaks in the surface should not result in a lip more than 6 mm high. Maximum crossfall should be 2%, and maximum grade 8% for not more than 9 m. Handrails should be installed along long ramps. Alternatives to steep grades should be clearly signed.

- **Street furniture** - should not block access along the sidewalk for those with special needs, particularly people in wheelchairs. Quadriplegics and people with poor coordination or with prosthetics may not be able to operate standard street furniture such as parking meters or pedestrian-actuated signals.

- **Curb cuts and ramps -** are the single most common features employed to improve the mobility of pedestrians with special needs, but are often inadequately designed and placed. The City's accessibility guidelines require curb cuts be at least 1.0 metre wide, with flared sides that do not exceed an 8% slope, and have a tactile warning texture extending the full width and depth of the ramp. The single most important feature is that the ramp be flared into the street or sidewalk surface. A sudden drop-off of more than 6 mm can tip a wheelchair. Ramps located in the centre of a corner should be avoided. Such locations force the visually impaired and the wheelchair user into the intersection where they must turn to reach the crosswalk. Each corner should have 2 curb cuts or a broad cut serving both corners. Ramps or cut-through islands, along with push-button walk actuators where pedestrian actuated signals are used, should be provided on pedestrian median refuges.

- **Boulevards** - improve the continuity of sidewalks for people using mobility aids at driveways, and are recommended for all new arterial and collector street construction. The driveway can be ramped from the outer edge of the sidewalk to the street, without requiring a change in crossfall of the sidewalk. In existing areas, if a boulevard is not present, the sidewalk should be widened or offset from the edge of the roadway so that a minimum 1 m wide area is provided with no change in the sidewalk's crossfall beyond the driveway ramp.

- **Drainage -** on sidewalks, walkways and crosswalks is important. A poorly drained area that creates a puddle or ice build-up will hide debris that can cause an accident for wheelchair users and others.

- **Route Information** - The City should also continue to cooperate with community groups to produce a mobility map of pedestrian areas such as the downtown. The map would show characteristics of the street such as ramps, curb cuts, grades, pedestrian crossings and audible signals that would influence the travel route selected by people with special access needs. The map would highlight deficiencies that could be prioritized for future improvements.

Summary of Infrastructure Recommendations for Pedestrians

In support of increasing active transportation, the following recommendations are made to assist the City of Peterborough in developing and enhancing the pedestrian environment:

- Continue to implement the Sidewalk Strategic Plan, with consideration for potentially shortening the timeline for implementation pending funding availability

- Apply preferred pedestrian design at intersections including smaller radii, raised crosswalks, illumination, etc.

- Maintain the trail and bikeway signage & wayfinding maps provided throughout the city

- Support the application and installation of network amenities, including the development of a lighting standard for trails and multi-use paths

- Support the application of traffic calming in residential neighbourhoods

- Consider the development of Neighbourhood Pedestrian Improvement Plans

CYCLING NETWORK

Proposed Network

A cycling network generally indicates the most desirable travel routes for cyclists. While a bicycle is considered a vehicle in the Highway Traffic Act and is therefore permitted to travel on any public roadway, the cycling network includes routes which are better suited for travel by bicycle due to the nature of the facilities provided, which could include: signage or pavement markings, dedicated cycling lanes, cycling tracks, or other treatments.

It is important to clarify that a cycling network, rather than indicating where cyclists should be, indicates the routes most likely to be desirable for a range of skills, ages, ability and comfort. Cyclists should also be considered in the planning and design of streets not included in the cycling network, as part of a shift towards 'complete streets' in Peterborough.

A proposed cycling network was developed as part of the 2002 Transportation Plan. Since that time, several of the proposed projects have been implemented, while others are no longer considered viable/desirable due to changes in land use, infrastructure, and other considerations. Given the high priority given to active transportation within the city, there was thus a desire to update the cycling network and explore opportunities for network expansion and enhancement. In developing the cycling network, the study team built upon the proposed cycling network from the 2002 Transportation Plan, as well as a cycling network that had been developed in the intervening years by the Inter-departmental Trails Committee (ITC) and the Active & Safe Community Routes Committee (ASCRC). A collaborative approach was adopted, with input/feedback from City staff and various stakeholder groups, including:

- Peterborough County-City Health Unit
- Peterborough Cycling Club
- Peterborough Bicycle Advisory Committee
- Active and Safe Routes to School Committee
- Active and Safe Community Routes Committee

The proposed cycling network was developed taking into account the cornerstones of cycle network planning:

Each element was considered in evaluating potential routes. For example, several routes presented challenging intersections which would be difficult to navigate safely. Routes which zigzagged along jogs in the road or involved circuitous routing were not considered ideal from a 'directness' viewpoint. The network was overlaid with areas of high demand within the city to ensure that routes would be attractive. Comfort was partially considered by considering the terrain and avoiding steep hills which would be difficult for new or inexperienced cyclists. In general, network development and refinement was an iterative process that took into account:

- Community destinations and desire lines
- Demand for improved downtown cycling facilities & accessibility
- Corridor spacing
- Growth plans
- Physical limitations (e.g., topography)
- Implementation challenges (e.g., encroachment on private property)
- Opportunities for protected crossings

The network was developed to balance the needs of both recreational and utilitarian cyclists, accommodating a diverse group of users with varying fitness level, skill and comfort in traffic, and providing equity across the network.

In general, the proposed cycling network is denser in the downtown core; this is reflective of feedback which indicated a strong willingness and desire to cycle downtown. The network was also designed to provide access to key destinations within the city (e.g. educational institutions, community centres, hospital, tourist sites, etc.) The proposed network will provide continuity and encourage new and existing cyclists to commute by bicycle.

The proposed cycling network consists of both on-road and off-road facilities. Table 25 illustrates the characteristics of the existing and proposed cycling network in terms of network length.

Table 25 Cycling Network Characteristics

	Existing Network (km)	Network Additions (km)	Ultimate Network (km)
On-Road	15[1]	83	97
Off-Road	38	48	86
TOTAL	53[1]	131	183

[1] Includes ~1 km of the Rotary Trail that is to be converted to an off-road trail in the proposed network

As shown in Table 25, the existing network strongly favours off-road trails, but in order to make significant strides in increasing cycling mode share for utilitarian trips it is important to

focus on increasing on-street infrastructure. The proposed network will bring a better balance between on-road and off-road facilities.

Figure 39 illustrates the proposed cycling network. In the case of on-road facilities, the proposed cycling network does not provide an indication of the facility type (e.g. shared-use facilities, cycling lanes, cycling tracks, etc.). The facility type is to be determined at the time of implementation, once a detailed assessment has been made of the physical and operational characteristics of the corridor. In this way, the City is assured of implementing the most appropriate facility type for the corridor in question.

A more detailed description of each project is available in Appendix I.

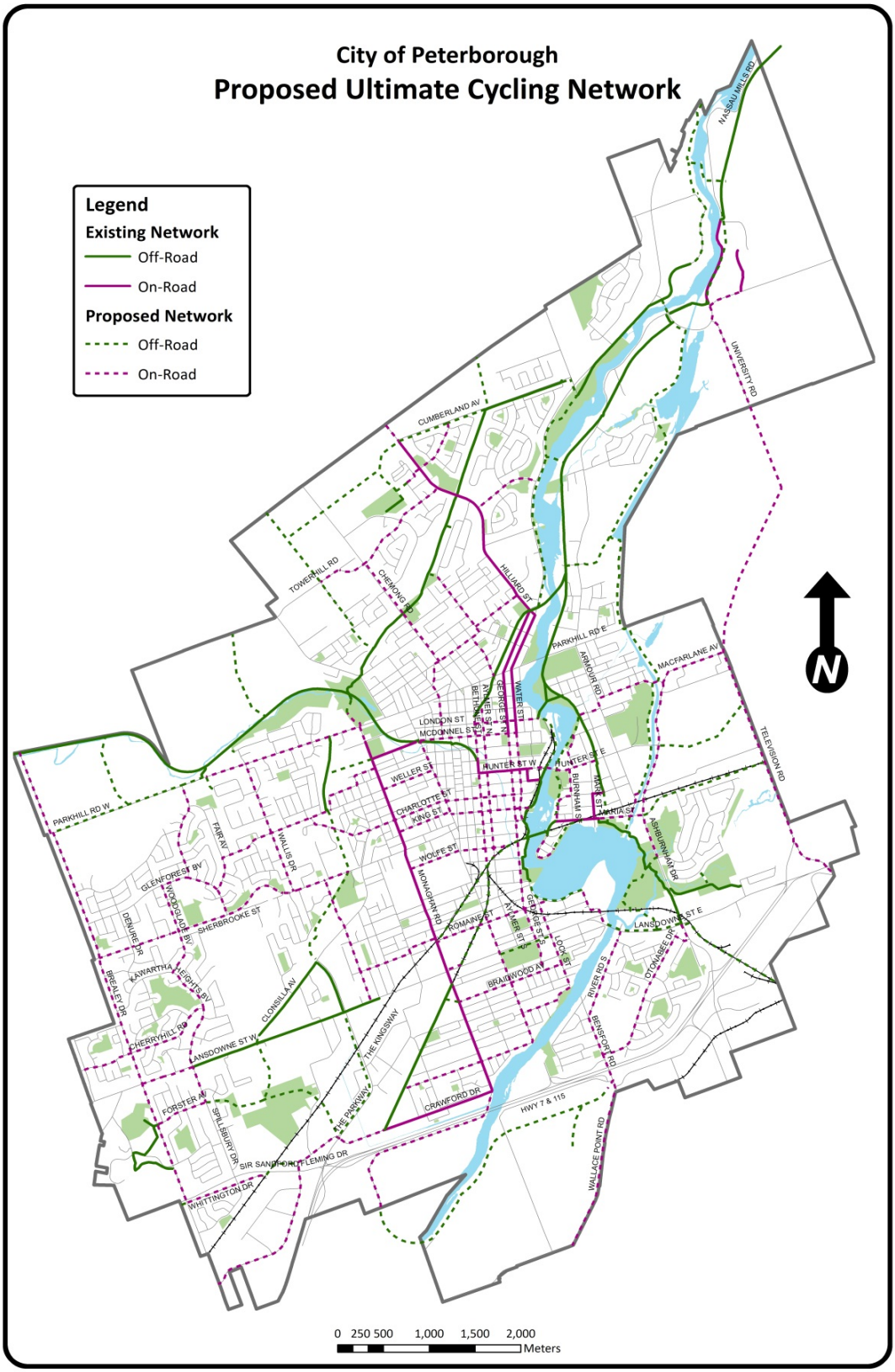


Figure 39 Proposed Ultimate Cycling Network

Existing Network

As part of the changes to the proposed cycling network, a number of upgrades to the existing network which were identified in the study update process have been included.

Facility	Desired Upgrade	Priority
Water St. & George St. Bike Lanes	Upgrade to full time use, possibly to cycling tracks, and examine options for provision of on-street parking – can provide workaround solutions where removing on-street parking is not an option	High
Rotary Trail, Tollington Bridge to Lakefield Trail	Move existing on-road route to a parallel off-road path	High
Clonsilla Ave – Shared-Use Boulevard	Improvement to boulevards, widen with smooth surface free of obstructions and increase driver awareness of cycling route	High
Lansdowne St. W - Shared-Use Boulevard	Improvement to boulevards, widen with smooth surface free of obstructions and increase driver awareness	High
Train bridge just north of Holiday Inn	Widen and replace connection	Medium
TransCanada Trail, Brealey Dr to Jackson Park	Upgrade surface to paving to promote travel by additional modes of active transportation	Low

Implementation Strategy

Cycling projects from the proposed cycling network were prioritized to allow for capital budget planning. The implementation plan for the cycling network improvements includes three time horizons:

- Short-term (2011 to 2021)
- Medium-term (2021 to 2031)
- Long-term (beyond 2031)

The assignment of projects to different horizons was based on a number of considerations, including:

- Network coverage and spacing
- Gaps in the existing network

- Stakeholder and public feedback
- Linkages to key destinations
- Ease of implementation
- Timing of road projects (where cycling improvements could be incorporated)
- Balancing of capital outlays

For the most part, network connections to future development areas are shown as long-term projects, since the development timing is unknown. However, these projects are important elements of the cycling network, and it is recommended that these connections be provided at the time the development occurs (and be paid for by the developer). All upgrades to existing facilities are recommended as short-term improvements, with the exception of surface upgrades to the Trans Canada Trail, which are shown under the long-term horizon.

A detailed breakdown for the implementation of the proposed cycling network is shown below in Table 26.

Table 26 Implementation of Proposed Cycling Network

		Existing Network	Proposed Network Additions[2]				Ultimate Network
			Short-Term (2011-2021)	Mid-Term (2021-2031)	Long-Term (2031+)	Total	
On-Road	(km)	15[1]	29	34	20	83	97
	Cost ($M)		$10-$14	$11-$16	$7-$9	$28-$39	
Off-Road	(km)	38	19	7	22	48	86
	Cost ($M)		$4-$5	$1-$2	$5-$6	$10-$13	
TOTAL	(km)	53[1]	48	41	42	131	183
	Cost ($M)		$14-$19	$12-$18	$12-$15	$38-$52	

[1] Includes ~1 km of the Rotary Trail that is to be converted to an off-road trail in the short term horizon
[2] Cost figures also include upgrades to existing facilities as applicable

Figure 40 illustrates the timing of the proposed projects over the 20-yr planning period.

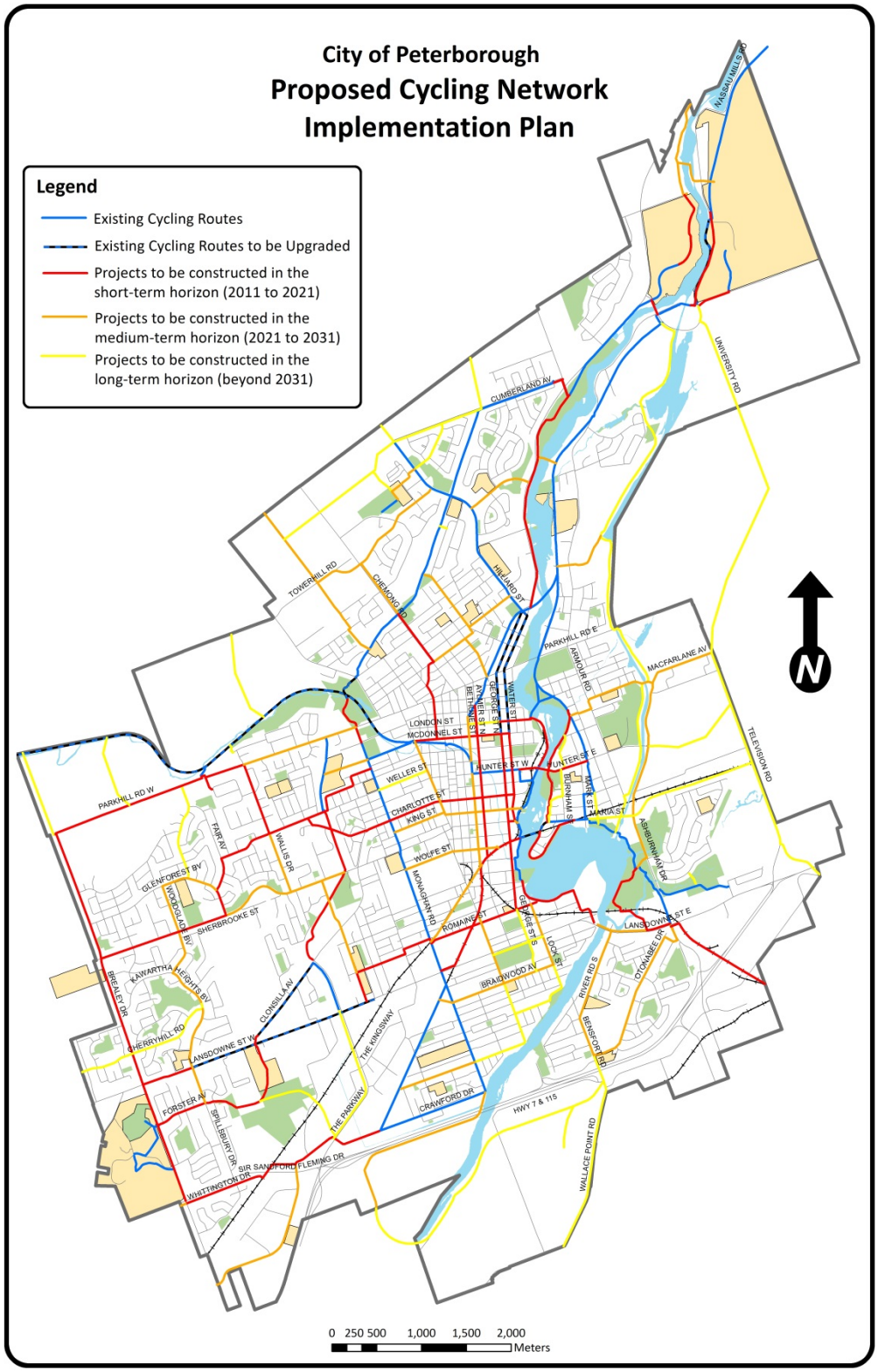


Figure 40 Implementation Strategy - Peterborough Cycling Network

Costing

The cost estimates in Table 27 were developed by considering information from a number of sources, and reflect experience in the City of Peterborough as well as unit costs used in other jurisdictions for master planning purposes.[20] Since the type of cycling facility treatment will be determined at the time of implementation, unit cost estimates were developed for both on and off-road facilities based on an assumed mix of facility types. For example, in the case of off-road paths, "simple" paths were assumed to require minimal work at road crossings, while "complex" facilities would include more comprehensive intersection and crossing treatments. Given the uncertainty in the mix of facility types, a "high" and "low" cost scenario was then defined based on an assumed proportion of "simple" and "complex" projects, providing a range of unit costs for estimating purposes. A similar process was followed for on-road projects.

A summary of the unit cost assumptions is provided in Table 27. In this table, **all cost estimates assume 'normal' conditions and do not include property acquisition costs, utility costs, or major site-specific projects such as bridges, underpasses, or retaining walls**.

[20] Key references included the City of Waterloo's Transportation Master Plan (June, 2010) and the City of Burlington's Cycling Master Plan (draft final version dated June 2009).

Table 27 Assumed Unit Cost Range for On- and Off-Road Cycling Facilities

Facility Type	Assumed Unit Costs	Definition of High and Low Cost Scenarios	Assumed Cost Range
Off-Road	▪ *Simple trail*: $140,000 / km for 3.0 m paved trail where only minor crossing treatments are required ▪ *Complex trail*: $400,000 / km for 3.0 m paved trail where major crossing treatments are required	*Low Cost Scenario* ▪ 80% simple trails ▪ 20% complex trails *High Cost Scenario* ▪ 50% simple trails ▪ 50% complex trails	**$195,000 to $270,000 per kilometer**
On-Road	▪ *Signage & pavement markings only*: $15,000 / km (i.e. cycling lane / shared lane where no pavement widening is required) ▪ *Cycling lanes included with road project*: $230,000 / km ▪ *Cycling lanes (or cycling tracks) not included with road project*: $940,000 / km Note: Costs are for facilities on both sides of the road	*Low Cost Scenario* ▪ 20% signage & pavement markings only ▪ 60% cycling lanes included with road project ▪ 20% cycling lanes/tracks not included with road project *High Cost Scenario* ▪ 20% signage & pavement markings only ▪ 40% cycling lanes included with road project ▪ 40% cycling lanes/tracks not included with road project	**$330,000 to $470,000 per kilometer**

One of the concerns raised during the Transportation Plan Update was the high infrastructure costs for building a substantial on-road and off-road cycling network given that cycling is not considered to be a popular mode choice in the winter. As a result, research was conducted to explore winter cycling and determine whether it is realistic to expect that cycling infrastructure will be used year-round, particularly given the cold and snowy winter climate in Peterborough. The memo, provided in Appendix J, concludes that while there is presently a much lower demand for cycling infrastructure in the winter, the **potential for demand to grow is significant**.

In moving forward with the implementation of the cycling network, it is recommended that the validity of each route be confirmed prior to construction. If a particular route is no longer considered to be appropriate due to changing circumstances, or proves to be prohibitively costly / infeasible to implement, a parallel route providing similar connectivity should be considered.

It is further recommended that input be solicited from key stakeholders, including City departments, major developers, and neighbouring jurisdictions to ensure a coordinated

approach to implementation and design. Finally, in keeping with the data collection and monitoring recommendations presented in Section 5.3.3, it is recommended that the performance of cycling facilities be reviewed on a regular basis to identify both issues and opportunities associated with the planning, design, construction, and maintenance of cycling infrastructure.

Facility Design

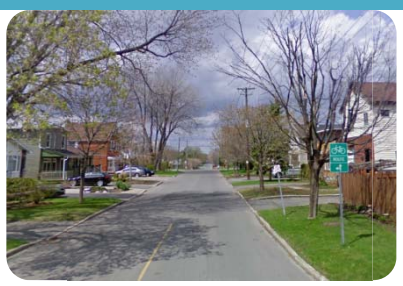
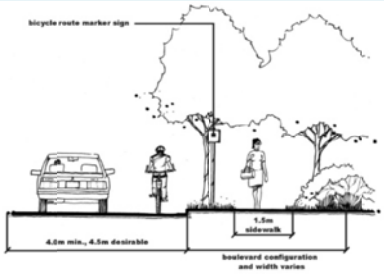
Facility design will be a crucial element in the implementation of the proposed cycling network, which will be determined at the time of implementation. Best practices in facility design do not imply that all facilities are constructed as either dedicated or shared space facilities, but that engineering judgement is used to provide a comfortable operating space for cyclists consistently throughout the network.

Shared and dedicated facilities each have their own challenges and strengths. While separated facilities are generally preferred by new, less skilled and inexperienced cyclists, they also present more design and operation challenges at intersections and crossings. Shared space facilities are less likely to attract new users but can be faster, safer and more efficient for established riders. It is often clear, however, that certain thoroughfares are simply more amenable to a particular facility type by virtue of their traffic volume, street character and speed limit. The main goal of facility design should be to provide a safe, balanced network with consideration and respect for the site specific requirements unique to each travel corridor.

Examples of facility design types which may be appropriate for Peterborough's proposed cycling network are described below in Table 28 .

Table 28 Cycling Facilities

On-Road Facilities – Dedicated Space	
Bike lane ▪ Consists of a dedicated lane separating cyclists from traffic & providing a continuous visual reminder to drivers of the presence of cyclists ▪ Provided adjacent to the curb if no on-street parking, otherwise, between the parking lane and the traffic lanes particularly in downtown and commercial areas ▪ May have a coloured surface, particularly at intersections, to draw the attention of drivers ▪ Typically most beneficial when implemented on arterial-type city streets with higher volumes to provide cyclists with separated travel space	 Cycling lane in Ottawa

Paved shoulders ▪ Paved shoulders give a dedicated travel space but are not clearly marked as cycling infrastructure ▪ Typically recommended on rural roads where traffic volumes and speeds are high ▪ Can present maintenance problems in the winter due to snow accumulation	 Paved shoulder on a multi-lane rural highway, AB (Google Streetview)
Cycle track ▪ Segregated on-street bike lane, separated from other traffic lanes by a physical barrier (can be uni-directional or bi-directional) ▪ May consist of a raised bike lane, elevated several centimetres above the adjacent traffic lanes ▪ Typically, cycling tracks are highly visible with enhancements such as coloured pavements, signage and texture treatments ▪ May require special consideration for cyclists at intersections through the use of bike boxes, bike signals and other preferential treatments	 Cycle Track with Coloured Pavement, Ottawa, ON
On-Road Facilities – Shared Space	
Signed route – No special provisions ▪ Typically reserved for local streets with minimal traffic ▪ Used primarily to indicate good neighbourhood connections between higher order routes	 A signed cycling route, Ottawa, ON (Google Streetview)
Signed route – With wide curb lane ▪ Typically reserved for local and collector streets ▪ Curb lane width is such that vehicles may pass cyclists without crossing into the oncoming traffic lanes ▪ Bike lanes are not provided due to insufficient width or context of the roadway	 Diagram of a wide shared-use lane (City of Windsor Bicycle Master Plan)

Sharrows (Pavement Markings) ▪ Can be applied to signed routes (with/without wide curb lanes) to help cyclists and drivers position themselves in the lane appropriately and reduce the risk to cyclists from on-street parking ▪ Also used on narrowly constrained crossings such as bridges and through intersections to increase driver awareness of cyclist movements	 Single File Sharrow Application on Yukon St, Vancouver, BC (Jacobson et al. 2009)
Bicycle boulevard / bicycle priority street ▪ Low-volume and low-speed streets that have been optimized for bicycle travel through treatments such as traffic calming and traffic reduction, signage and pavement markings, and intersection crossing treatments ▪ Allow through movements for cyclists while discouraging similar through trips by non-local motorized traffic ▪ Motor vehicle access to properties along the route is maintained	 \\ Example of a bicycle boulevard (www.pedbikeimages.org / Adam Fukushima)
Off-Road Facilities	
Multi-use trail ▪ Shared-use trails, typically with maximum speed limits for cyclists around 20km/hr to promote pedestrian safety ▪ May be paved which allows for use by other active transportation modes or crushed rock treatment in more remote locations	 A shared-use trail
In-boulevard multi-use trail ▪ Shared-use trails which lie within the road right-of-way but are separated from the roadway by a boulevard ▪ Boulevard consists of grass feature or landscaping element to buffer the trail from traffic	 An off-road trail in the road right-of-way, Peterborough, ON (Google Streetview)

Each project will present unique challenges for implementation and must be approached with a consideration for the larger network and development strategy. The downtown in particular will present challenges with regards to space and right of way constraints. As a result, it is

recommended that a Downtown Cycling Master Plan be developed to identify issues and opportunities to work around challenging segments in the downtown area requiring special attention.

The design of cycling facilities is dependent on the road environment. Key factors include:

- Presence of parked vehicles
- Traffic speed
- Traffic volume
- Percentage of commercial vehicles
- Presence of transit stops and routes

Signage & Way finding

Signage plays an important role in reminding all users that bicycles are permitted to travel along a roadway and can help to promote a culture of acceptance. Signs can also provide key connectivity, direction or destination information for new cyclists or those not yet comfortable with the network. Mapping along trails helps to indicate connections to neighbourhoods and other trail systems, and is valuable for both recreational users and utilitarian cyclists.

Signage and way finding should be considered an integral component of the cycling network, and applied consistently and rationally in accordance with the most recent design standards. Detailed signage and way finding recommendations should be developed for each project upon implementation and as part of any future cycling study, including the proposed Downtown Cycling Master Plan.

Intersections & Trail Crossings

Intersections are the most dangerous element of any transportation network because of the number of potential conflicts. Intersections require special treatment to alert drivers to the potential presence of cyclists, and should be given careful consideration in the planning of all new cycling facilities. Some tools which can be used to improve safety at crossings and intersections include:

- **Bicycle Sensing Traffic Signals** – Pending the results of the pilot project at the intersection of Parkhill & the Rotary Trail, additional bicycle actuated signals should be installed where required for enhanced cyclist safety and ease at crossings

- **Cyclist Push Buttons** – Conveniently placed to allow cyclists to call signals without dismounting, cyclist push buttons increase the ease of street crossing

- **Separated Bicycle Through Lanes** – Provide a lane for cyclists travelling through the intersection to the left of the right turn lane for vehicles, minimizing the chance for conflict between the two movements

- **Bike Boxes** – Use of bike boxes to provide priority to cyclists at intersections. These are currently being used in Toronto & Vancouver among other cities

Crossride
Source: http://www.mississaugacycling.ca/

- **Crossrides** – Crosswalks which are delineated separately from pedestrian crosswalks at intersections to allow bicycles to legally cross without dismounting

- **Coloured Pavement Treatments** – Continuing bicycle lanes in bright pavement colours through the intersection helps to call attention to through cyclist movements

- **Zig zag pavement treatments** in anticipation of trail crossings (piloted in Virginia, originally in use in UK) – Help to call attention to upcoming mid-block crossings, reducing median speed of drivers

- **Traffic Circles** – Easier to navigate by bicycle than intersections, particularly for turning movements, these are scaled-down versions of the roundabout. Traffic circles operate best on lower volume streets.

Bike boxes provide advance stop lines for cyclists to make left turns
Source: www.pedbikeimages.org / Judi Lawson Wallace

Integration with Transit System

In order to service trips which may be longer or more physically demanding by bike, it is desirable to provide a high degree of connectivity between transit systems and active transportation modes. Strategies to improve transit – cycling connectivity include:

- High quality, longer term bicycle parking at transit hubs and stations
- Bicycle racks on buses to facilitate ride-to, ride-from travel

While Peterborough Transit is not currently able to provide bike racks due to the size of the downtown service bays, a long term aim should be to accommodate these racks or permit bicycles on board buses.

Summary of Infrastructure Recommendations for Cyclists

- Implement the proposed cycling network and planned upgrades of existing facilities as recommended
- Complete a Downtown Peterborough Cycling Study to focus on the selection and design of the most desirable facility treatments along each corridor in light of downtown constraints, as well as signage and way finding components
- Give special consideration for cyclist treatments at trail crossing and intersections when constructing new facilities, and upgrade existing crossings/intersections as required
- Upgrade existing gravel trails to paving to ensure safe year round operations and ease of maintenance, and to accommodate a variety of modes

Bicycle Priority Street
(www.pedbikeimages.org / Dan Burden)

Other Modes of Active Transportation

Although other modes of active transportation such as rollerblading and skateboarding are not directly provided for within this Transportation Master Plan update, many of the improvements recommended for pedestrians and cyclists will also improve conditions for other types of users. In particular, any paths or trails which are upgraded to paving will provide greater mobility for these user groups.

Consideration for trail etiquette will help to ensure there are no conflicts between various trail users. If necessary, signage can help clarify the hierarchy of users on a given trail, sidewalk or path network. Trail etiquette should also be included in any educational initiatives, and also summarized on the City's Trail & Bikeway Maps.

5.4 PUBLIC TRANSIT

VISION FOR TRANSIT IN PETERBOROUGH

Peterborough's transit system shall provide an efficient, reliable, convenient and affordable form of mobility throughout the city for all users that offers an attractive alternative to the automobile, particularly to the Downtown, Trent University, Fleming College and other major activity centres around the City.

5.4.1 TRANSIT SERVICE DEVELOPMENT STRATEGY

The transit service development strategy consists of a number of key elements that will provide an effective and efficient transit service capable of achieving the City's 6% mode share target for transit ridership.

It is estimated that a 6% mode share target would be equivalent to an annual transit ridership level of approximately 4.07 million passenger trips. This translates into an increase in ridership of about 0.89 million annual trips in comparison to the 2011 annual ridership level of 3.18 million trips (i.e. an increase of roughly 28%). Specific measures that should be carried out to encourage and support the attainment of the 6% transit mode share are as follows:

- **Increased service levels on Peterborough transit routes** to encourage and support transit ridership. This would include increasing service frequency on main routes to attract new riders. In the long term, it is assumed that improved services could generate 200,000 to 300,000 passenger trips annually.

- **A student pass agreement between the City and Sir Sanford Fleming College**, similar to the agreement with Trent University. Under this agreement, full-time students would have complete access to the transit system during the school year. At the same time, Peterborough Transit would provide improved services to and from the College. It is expected that this program could generate an additional 450,000 to 500,000 annual transit trips.

- Implementation of the planned **city-wide transit priority program**, providing priority for transit buses at signalized intersections and supplemented with geometric improvements at busy intersections where there are opportunities for bus queue by-pass lanes or similar improvements. This program is expected to improve the operational reliability of the service and will encourage increased ridership over time. The costs of this program are assumed to be included in current Capital Budget programs.

- Implementation of a **fare integration agreement with GO Transit** to provide a discount to passengers transferring between GO Transit and Peterborough Transit. If Metrolinx expands rail service to Peterborough in the longer term, this fare integration agreement would also apply to the new service.

- **Real Time Signs and Public Bus Tracking Systems** have been shown to reduce perceived wait times by 20%.[21] Real time signs are recommended for busy stops. Such signs indicate when the next bus will arrive in real-time taking existing traffic conditions and delays into account, rather than simply reporting the published schedule. In contrast, a public bus tracking system allows transit users to use their cell phone to see when their bus is coming and where it is now. This reduces the stress of not knowing how quickly to get to a stop and would also tell a user whether the bus has already come to their stop. While both systems offer improved transit service, in general, real time signs are considered more effective than public bus tracking systems. The GPS technology purchased as part of the Automated Bus Stop Announcement system is one component of a real time service and it is already in place. Provision of real time services for the transit system should be implemented in the short term.

- An aggressive **travel demand management program** for Peterborough civic employees, other public sector employers in Peterborough and large private sector employers. It is expected that this program would focus geographically on employees in the central business area plus major activity centres such as the University, the Hospital and the College. A travel demand management program could include such measures as charging employees for parking, encouraging car pools, incentives for walking, cycling and public transit, and discounted transit passes for employers who purchase in bulk. The details of these programs would be developed in consultation with stakeholders and could be implemented in phases. As the proponent, it is expected that the City and its employees would take a lead demonstration role. It is assumed that this type of program over an extended period of time could generate 300,000 to 400,000 annual passenger trips.

- **Increased emphasis in land use planning and urban design to integrate walking and public transit services with adjacent land uses**. This is a long term initiative that will gradually encourage and facilitate increased public transit ridership. In communities with low and medium levels of growth, changes in urban form and design will take considerable time to have a major impact. It is anticipated that this initiative could eventually generate between 25,000 and 50,000 annual passenger trips over the long term.

- Taking advantage of **fully accessible conventional transit services**. Peterborough Transit is currently acquiring wheelchair accessible low floor buses to replace retired high floor buses. All regular Peterborough Transit routes now have fully accessible

[21] Litman, T. *Valuing Transit Service Quality Improvements.* Victoria Transport Policy Institute. 2011.

buses available, however, some express routes still rely on high floor buses, and service requirements sometimes result in a bus with steps servicing a regular route. With the introduction of a fully accessible transit fleet, the City has the opportunity to greatly encourage the use of the conventional bus service by senior citizens and some persons with disabilities who can use the accessible conventional service under favourable conditions. This can be pursued through promotional activities, better and more information to target groups, travel training for selected clients and groups, and fare incentives for registered clients of the specialized services. The advantage to the City is that this initiative will not only increase conventional transit ridership but it will alleviate the demand for the much costlier door-to-door specialized transit service. In the long term, it is assumed that up to 50,000 annual trips could be gained on the transit service.

- Another initiative that could be pursued would be to **introduce commuter transit services (for employees and post-secondary students) to outlying communities** such as Lakefield, Bridgenorth, Millbrook & Norwood. However, this initiative has not been included in the assessment because of jurisdictional issues and uncertainty as to the funding arrangement.

5.4.2 TRANSIT INVESTMENT

In the previous section, a number of strategies were outlined for achieving the 6% mode share target for transit. Table 29 illustrates the corresponding capital and operating costs.

Table 29 Transit Investment Required to Reach 6% Mode Share Target

Item	Description	Cost Impact *(2011 Dollars)*
Capital Costs	10 additional peak buses Real-time service technology	+ $5.1 million
Additional Operating Costs	22,000 revenue hours plus additional overhead	+ $2.6 million annually
Additional Passenger Revenue	Revenue related to ridership increase of 1.29 million trips	- $1.2 million annually
Additional Net Operating Costs		+ $1.4 million annually

5.4.3 2011 PETERBOROUGH PUBLIC TRANSIT OPERATIONS REVIEW

The Peterborough Public Transit Operations Review was initiated in September 2011 with the aim of increasing transit ridership, enhancing mobility and accessibility, and improving the cost-effectiveness of transit service delivery.

The Peterborough Public Transit Operations Review will include a comprehensive assessment of conventional transit, Transcab and Handi-Van services. The review process will include the following:

- Development of a five-year service plan for the period 2012-2017 based on a thorough assessment of alternative route structures, alternative service options for low demand areas and times, and alternative service options for persons with disabilities.
- Development of an implementation plan to guide the incremental expansion in service as well as identify revenue generating strategies, fleet requirements, capital and operating expenditure requirements, and corridor protection requirements.

The Peterborough Public Transit Operations Review is expected to be completed by mid-year 2012. Outputs from the review process will recognize and complement the public transit-related recommendations outlined in the Transportation Plan.

Transit Service Guidelines & Performance Targets

To continue to maintain an attractive and efficient transit service and to respond to needs to change service, the establishment of transit service guidelines and performance targets is recommended. The guidelines indicate desired levels of service coverage, frequency of service, hours of service and service performance targets for expanding service and for discontinuing services. These guidelines should be reviewed and updated on a regular basis, based on experience and in response to changing conditions. The guidelines provide a basis to evaluate current services and to consider new service proposals and should be developed as part of the 2011 Public Transit Operational Review.

5.4.4 TRANSIT SUPPORTIVE MEASURES

Transit supportive measures are intended to improve the environment for transit operation thereby maximizing the appeal and efficiency of the mode. Transit supportive measures can include land-use planning measures which provide for pedestrian connections, establish appropriate street patterns and support access by transit vehicles.

The City's Official Plan identifies that development proposals are required to facilitate access to public transit by:

a) Ensuring that all new development forms and street patterns support the use of transit in accordance with established transit and transportation planning principles;
b) Requiring that collector and arterial street patterns support the extension of transit routes in areas of new development;

c) Requiring that sidewalks and other pedestrian facilities connect major traffic generators to public transit;
d) Ensuring that the design and maintenance of transit facilities take user comfort and safety into consideration;
e) Ensuring the appropriate design of streets to accommodate public transit use.

5.4.5 SPECIALIZED TRANSIT SERVICE

Specialized transit services are provided to enable persons with disabilities and mobility restrictions to have similar levels of mobility as are provided by the conventional transit service. Currently, Peterborough provides two options for users with accessibility requirements. These include:

- Conventional transit service is almost entirely made up of low floor buses that are wheelchair accessible and the City has adopted a policy that all new buses which are purchased will be wheelchair accessible low floor buses

- Parallel service (i.e. Handi-Van service) for persons with disabilities unable to use the regular transit services. Persons wishing to use the service must be registered and book trips in advance.

The demand for specialized services is a reflection of the City's population characteristics, the various services available within the City and the quality of accessible transit provided. In recent years, demand for specialized transit has decreased in part due to conversion of the conventional transit fleet to provide fully accessible service. However, the demand for specialized transit can be expected to grow at a faster rate than the population at large in the future. This is related to various factors, including:

- As the general population ages, the number of people with mobility problems will increase

- In recent years many communities have improved medical, employment and educational opportunities for people with disabilities resulting in an increased need for mobility by disabled persons

- Peterborough tends be a provider of medical and other services for people from a large rural area in eastern-central Ontario; As these people relocate to Peterborough to take advantage of the services they will create increased demands for supporting services such as specialized transit

In some of the larger urban areas of Ontario, current demand for specialized services is typically in the range of about 0.5 to 1.1 annual trips per capita. Peterborough's current demand level is fairly typical at 0.66 annual trips per capita. This would indicate that Peterborough's service levels are currently reasonable. However, for the reasons noted above the trend is still likely to be for an ongoing increase in demand.

The recommended service strategy for specialized transit service is a continuation of the current directions of Peterborough Transit. The development of a fully accessible service will be an ongoing program over time, made up of the following elements and initiatives:

- The City should continue to provide easier access features on the transit system that improve accessibility for frail and elderly persons
- A program of ongoing improvements to bus stop amenities such as shelters, benches and signage should be maintained
- Sidewalks in the general vicinity of bus stops should be maintained and upgraded to improve accessibility. This includes wheelchair ramps at intersections, smoothing rough sidewalks, providing sidewalks or paths where none currently exist and ensuring adequate street lighting. Winter sidewalk clearing along bus routes and at bus stops should be prioritized
- Provide proactive public information regarding the accessibility features of the transit service to encourage use which may be extended to training for specific groups such as senior citizens on the use of regular transit service
- Continue to coordinate operations and vehicles between the regular service and the parallel service to encourages efficiency in the use of resources and encourage customers to use the fully accessible regular service

5.4.6 TRANSIT PRIORITY MEASURES

Transit priority refers to a variety of measures that give buses preferential treatment over other vehicles using public roadways. Transit priority measures can reduce bus travel times and decrease the variability of travel times through congested areas, thereby allowing transit to compete more favourably with private auto use. These measures can reduce the costs of operating bus services, improve schedule adherence and the reliability of the service for customers and generally make the service more attractive for customers.

A wide variety of measures have been found to be successful in North American cities (refer to CUTA report: Design and Implementation of Transit Priority at Signalized Intersections). Examples of measures recommended for Peterborough:

- Incorporate transit priority features at signalized intersections

- Provide traffic signage or geometric improvements at critical congested locations to enable buses to bypass traffic queues

- Adequate design and location of bus stops to enable buses to operate efficiently into and out of the traffic flow

Transit priority measures should be planned to avoid major negative impacts on traffic, unless there are sufficient benefits to the transit service to warrant the disruption and should be implemented on an ongoing basis where specific problems have been identified and an assessment has been conducted to determine the most appropriate measure.

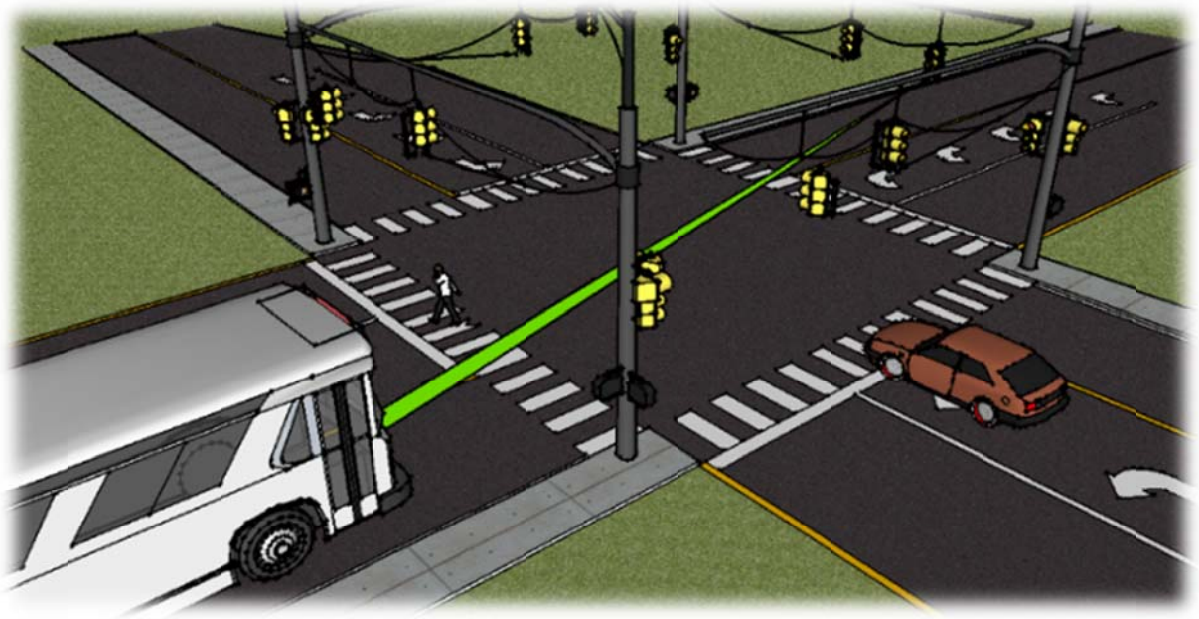


Figure 41 Transit Signal Priority (TSP)
Optical detection is used to determine if the approaching vehicle is a transit or emergency vehicle. When the vehicle requests priority, the system alters the signal timings to provide preference.

The City of Peterborough, in partnership with Transport Canada, commissioned the development of a long-term strategic plan for an integrated Traffic Management System, which included the deployment of a Bus Signal Priority System in 2008. The pilot project should be expanded and rolled out across appropriate transit priority corridors. The intensification corridors defined in the Official Plan (see Figure 38) would be excellent candidates where existing or future transit service is provided.

5.4.7 INTER-REGIONAL TRANSIT

The City of Peterborough is currently served by GO Transit Bus Service with connections in Oshawa to GO Transit Rail. The service operates on weekdays and weekends, with stops in Peterborough at Trent University, Peterborough Terminal and Peterborough South Carpool.

In 2008, the Government of Canada and the Province of Ontario partnered to initiate a study into the feasibility and associated infrastructure upgrades and costs of bringing a commuter rail link to Peterborough (refer to Section 5.10.3 for additional details). The study concluded that costs for the project would be $541 million, far above the $300 million that was committed for the project by the province and the federal government. However, in March of 2011, the federal government reaffirmed their commitment to the funding of the project. The benefits of commuter rail service for Peterborough are numerous and would include:

- Increase in tourism activities from GTA residents
- Increased viability as an economic hub
- Direct increase in jobs for local residents

In the event that rail service is established in Peterborough, careful planning and coordination with existing Peterborough Transit services will help to ensure a successful transition.

- Fare Integration – the establishment of a fare integration agreement with Metrolinx would help to improve service quality for passengers, enhancing the attractiveness of the transit mode
- Frequency of Service – may need to make changes to the transit schedule to support the seamless transfer of passengers between the commuter rail and local transit service. Such changes will depend on the rail service schedule and number of passengers expected for each arrival and departure
- Location of Transit Hub – links will be needed from the rail station to downtown Peterborough, commercial areas, and tourist destinations

5.4.8 TRANSIT TDM INITIATIVES

The main goal of TDM for the transit system should be to raise awareness about the advantages of transit ridership over auto-based travel to help shift attitudes and perceptions about the use of transit.

Complemented by enhancements outlined in this report such as transit priority measures, integration with regional rail, and an increasingly accessible fleet, and bolstered by changes arising from the 2011 Transit Operational Review, the quality and attractiveness of Peterborough Transit will improve.

Innovative ways to increase the public's reliance on transit, particularly during low ridership periods, should be pursued. For example,

- **Summer Transit Passes** – designed for high school students, these are two month passes that allow heavily discounted passes for the summer months to target youths

- **Annual Transit Pass** – provide an incentive to commit to buying an annual pass valid for the entire year

5.4.9 COORDINATION OF SCHOOL SERVICES

The School Boards in Peterborough provide yellow school bus service for students who reside beyond the established walking distance guidelines. In many cases, there is duplication of service between the yellow school bus service and the services operated by Peterborough Transit. Overall efficiencies may be achieved through coordination of these services. Beginning in 2008, Peterborough Transit and Student Transportation Service of Central Ontario initiated a trial program where passes for conventional transit were purchased for secondary school students outside the walk zone. The program has been effective, and plans are on-going for expansion of the program beginning in the 2012/2013 school year.

The School Boards and Peterborough Transit should continue to coordinate school services where greater overall efficiencies can be achieved.

5.5 ROAD NETWORK

5.5.1 NETWORK PLANNING PRINCIPLES

As previously described in Section 4.1, two types of transportation planning strategies are considered in master planning: demand-side strategies to reduce the demand for auto vehicle travel during peak periods, and supply-side strategies involving the construction of road extensions, widening, and other design improvements to increase the capacity of the network. Recommended strategies to control the demand for travel are discussed in Sections 5.2 (TDM Programs), 5.3 (Active Transportation), and 5.4 (Transit). While these strategies have an important role to play in meeting the transportation needs of Peterborough residents and businesses, improvements to road network capacity are also needed to:

- Address existing roadway capacity and operational deficiency needs, including associated negative socio-environmental impacts;
- Accommodate increased roadway traffic volumes due to City growth;
- Accommodate increased public transit and non-motorized transportation within the roadway network;
- Retain an effective Level-Of-Service for regional and local mobility, and;
- Address the public's need for the safe and efficient movement of people and goods within the Peterborough area.

5.5.2 DOWNTOWN ROAD NETWORK

The trip distribution patterns in the City of Peterborough point to the importance of the downtown area as a vital economic centre. The City of Peterborough's Downtown Economic Analysis Study confirmed this fact, and identified the potential for increasing the downtown vitality through the conversion of Water and George Streets from 1-way to 2-way operation to

slow down vehicular traffic, enhance way-finding, improve cycling connectivity, and increase retail activity.

Many communities have been successful in revitalizing their downtowns through the conversion of one-way to two-way streets, which has helped in reducing traffic speeds and circuitous travel patterns, enhancing the pedestrian environment, and fostering commercial activity. Communities that have achieved such successful conversations share common traits – chief among them is the ability to address the shortcomings associated with such conversions as they relate to traffic congestion, property access requirements, as well as curbside parking and loading requirements.

Towards this end, the conversion of George and Water Streets from1-way to 2-way operation was given full consideration, and included in the road network scenarios investigated.

It is generally acknowledged that capacity per lane on 2-way roads is in the order of 10 to 20 percent lower than that on 1-way roads. The lower capacity per lane is primarily due to the introduction of friction from oncoming traffic, increased conflicts at intersections, and increased interference between turning movements and through traffic.

The modelling exercise undertaken to assess the implications of converting George and Water Street to 2-way operation assumed a 15 percent reduction in capacity per lane. Although an argument for a 20 percent reduction can be made on the grounds of signal spacing and lane widths (3.25 to 3.50 meters), a 15 percent reduction was deemed to be appropriate.

Given the City's desire not to compromise on-street parking during off-peak period on George and Water Streets north of Parkhill Road, the conversion of the George/Water couplet to 2-way operation was limited to the section extending from Sherbrooke Street to Parkhill Road.

In order to offset the reduction in capacity on Water and George Street associated with their conversion from 1-way to 2-way operation, their conversion was coupled with the following:

- Conversion of Bethune and Aylmer Streets to 1-way operation from Sherbrooke Street to McDonnel Street.
- Upgrading of McDonnel Street from Water Street to Reid Street from low to medium capacity arterial, through the provision of an additional lane to accommodate left turning lanes at key intersections.

Although the conversion of Bethune and Aylmer Streets to 1-way operation would support the conversion of George & Water Streets to 2-way operation, it was recognized that it would not support the westerly expansion of the Central Business District in the future.

Scenario "E" in Appendix C presents the operational performance associated with the above traffic flow configuration in the downtown area. The George and Water Street couplet would

exhibit unacceptable operational conditions (LOS “F”), particularly for the segment between Charlotte and Sherbrooke Street. Also, it is recognized that cycling facilities are desired on these sections, and there is more opportunity to integrate cycling facilities into these streets in the current section.

Adopting Parkhill Road as the northerly limit for the conversion of the George/Water couplet to 2-way operation, would result in uneven attraction of traffic by this couplet which in turn would result in significant overloading on Water Street in the northbound direction during the afternoon peak hour and significant overloading on George Street in the southbound direction during the morning peak hour. Also, the Aylmer/Bethune couplet provides limited relief due to the relatively lower speed limit compared to that on the George/Water couplet.

The conclusion reached by this study is that even with the recommended short and long-term roadway network improvements and TDM initiatives in Peterborough, the Water/George couplet provides the only reasonable through and local traffic routes in the core. Therefore, this couplet should be maintained in one-way operations to serve growing north-south traffic movement needs in the central city, and thereby avoid traffic congestion conditions that would hamper downtown business vitality.

This maintenance of one-way streets should also be matched with traffic operations measures to control vehicle speeds through the core, ranging from signal synchronization through to speed-oriented traffic calming (i.e., raised intersection and crosswalks where required).

5.5.3 RECOMMENDED 2031 ROAD NETWORK

The recommended long-term road network for the City of Peterborough is presented in Figure 42. This road network is required to accommodate future population and employment growth to the year 2031, and includes the following key initiatives:

- **Nassau Mills Widening** – This project is needed to address the anticipated capacity deficiency over the Otonabee River and includes three main elements:
    1. Replacing the existing 2-lane Nassau Mills bridge (between Water Street & Armour Road) with a twin 2-lane structure;
    2. Replacing the 2-lane Nassau Mills Trent Canal bridge with a 4-lane structure; and
    3. Widening Nassau Mills Road from Water Street to University Road.

- **Pioneer/Nassau Upgrade** – This project involves upgrading Pioneer Road / Nassau Road from a medium capacity arterial to a highway between Nassau Mills Road and County Road 4. By doing so, drivers approaching Peterborough from County Road 4 with a destination on the west side of the Otonabee River will be presented with a convenient, direct route for crossing the river via Nassau Mills Road. As a result, this

project is intended to support the Nassau Mills widening by directing drivers to the expanded crossing.

- **New 2-lane Road between Fairbairn Street and Cumberland Avenue** – This project would follow the right-of-way set aside for the Peterborough Parkway with signalized intersections introduced at Chemong Road and Hilliard Street, and modern roundabouts constructed at Fairbairn Street and Cumberland Avenue, as well as the intersection of Cumberland Avenue, Carnegie Avenue, and Water Street. Although the new road will follow the parkway alignment, the form and function of the road is different than previously envisioned. In building the road, the existing trail through this area would be maintained, separated from the road by a grass boulevard.

  It is anticipated that the project will benefit both existing and new development, as it will help to alleviate anticipated capacity deficiencies within the network. In particular, it is expected to relieve traffic on Towerhill Road, which was frequently cited as an issue by local residents. In terms of new development, the Carnegie and Chemong growth areas will likely see the greatest benefit.

- **Fairbairn Widening** – Under this project, Fairbairn Street will be widened from 2 to 4 lanes between Parkhill Road and the alignment for the new 2-lane road. In addition, a modern roundabout is envisioned at the intersection of Fairbairn Street and Parkhill Road. With only a 2-lane cross-section, Fairbairn Street is expected to experience failure conditions in the future. While the project is intended to work in conjunction with the new two-lane road, it is also required on its own merit, as Fairbairn Street carries traffic from a number of connecting roads which will contribute increased traffic volumes in the future.

  During the public consultation process, concerns were raised regarding the safety of pedestrians crossing Fairbairn Street given the speed and volume of traffic along the road. With the widening of Fairbairn Street, there is opportunity to provide protected crossings at key intersections where such protection may not exist today. The widening also presents the opportunity to provide sidewalks on the west side of the street sooner than might otherwise be the case given the low priority assigned to the missing sidewalks in this location. Moving forward with this project, it is recommended that such opportunities be pursued.

- **Chemong/Reid Improvements** – This proposal calls for widening Chemong Road from a 4 to 5 lane high capacity arterial between Reid Street and Sunset Boulevard. The 5th lane would allow for dedicated left turn lanes at intersections, increasing the intersection capacity. As part of this project, intersection modifications would also be carried out on Reid Street between Chemong Road and Parkhill Road to address localized operational issues in this area.

  It should be noted that the provision of the new two-lane road does not eliminate the need to widen Chemong Road. Improvements to both Fairbairn Street and Chemong

Road are needed to improve access to/from the north, in conjunction with the new two-lane road.

- **Charlotte Street Widening** – This project involves widening Charlotte Street from 3 to 4 lanes between Clonsilla Avenue and Monaghan Road to provide an additional lane in the westbound direction (resulting in 2 eastbound lanes and 2 westbound lanes in this section). As cycling lanes are also called for along this section, additional widening will be needed. In the event that insufficient road width is available, it is recommended that preference be given to the provision of cycling lanes, since this route serves as a key entry point into the downtown for cyclists, whereas drivers have a number of alternatives available.

- **University Upgrade** – As part of this project, University Road would be upgraded from a medium to high capacity arterial from Warsaw Road (County Road 4) to Nassau Mills Road. Similar to the improvements to Pioneer Road / Nassau Road, this project is intended to support the proposed expansion of the Nassau Mills crossing of the Otonabee River by providing a high-quality north-south connection to the crossing from Highway 7 in conjunction with the improvements to Television Road described below.

- **Extension & Widening of Television Road** – This project will help to alleviate congestion on Ashburnham Drive, and also helps to direct traffic to the Nassau Mills crossing of the Otonabee River, ensuring that the new capacity provided at the crossing is used as effectively as possible. In general, the project includes two key elements:

    1. Extending Television Road as a 2 lane high capacity arterial from Warsaw Road (County Road 4) to the current Television alignment; and
    2. Widening Television Road to a 4 lane high capacity arterial from the new Television Road Extension to Lansdowne Street East.

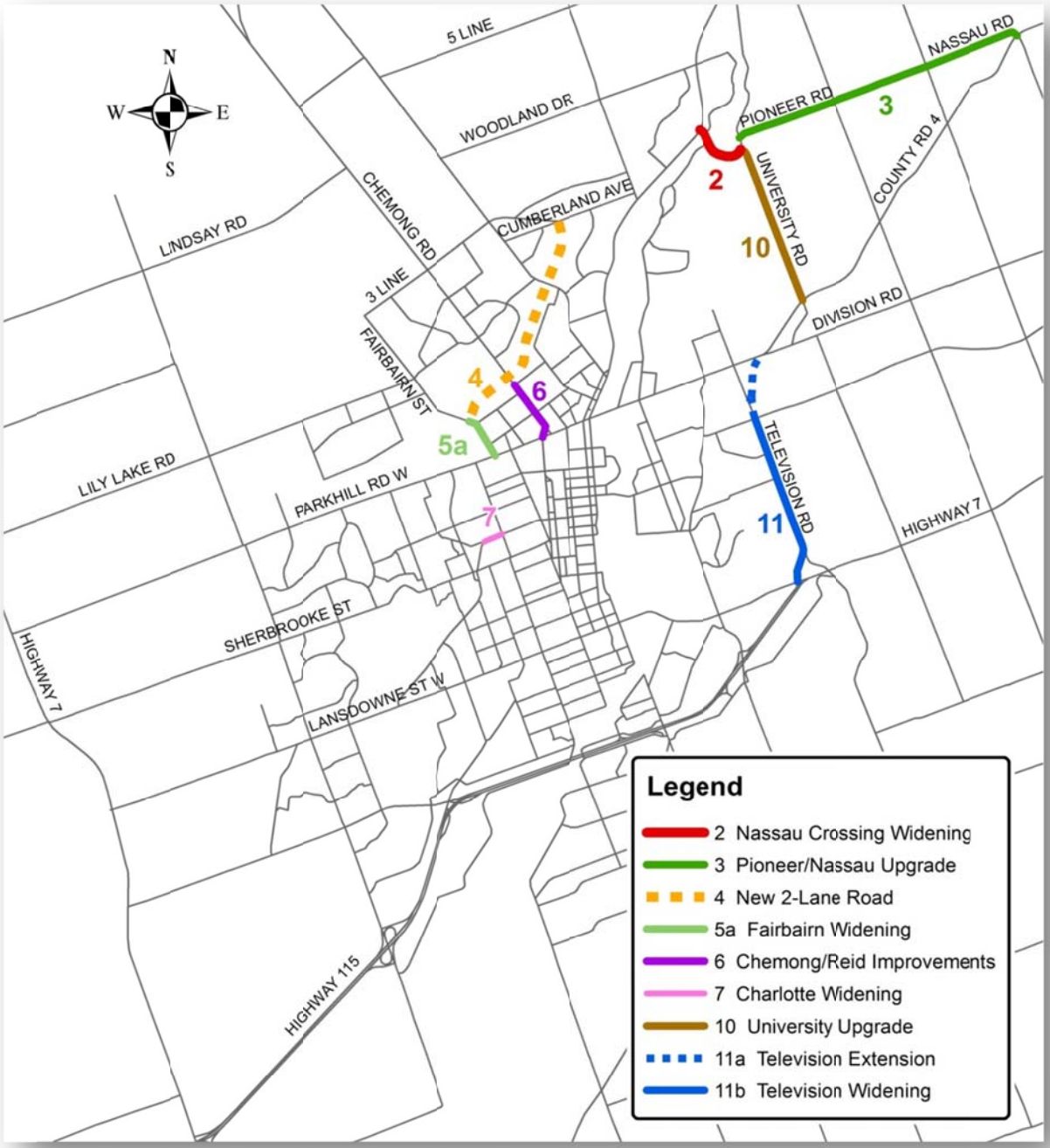


Figure 42 Recommended Ultimate Road Network (2031)

5.5.4 PROPOSED IMPLEMENTATION PLAN & CAPITAL COST ESTIMATES

The allocation of projects to different time horizons was primarily based on an assessment of need – in other words, how soon would a particular project be needed to address the anticipated capacity deficiencies? From the assessment, it was determined that all projects

would be required by 2026, and as a result, no capital expenditures were deferred beyond this time horizon. In reality, the actual timing of projects will depend on funding availability and Council approval. Projects may also be deferred or moved forward depending on how development actually unfolds and the associated change in traffic volumes.

Figure 43 illustrates the proposed implementation plan for the recommended road network. In reviewing this plan, the following points should be noted:

- The widening of Nassau Mills Road between Water Street and University Road has been divided into two phases. Widening the bridge over the Otonabee River is included in phase 1, while widening the bridge over the Trent-Severn Waterway is deferred to phase 2.

- While the widening of Fairbairn Street is required to support the new two-lane road between Fairbairn Street and Cumberland Avenue, it also carries traffic from other roads located farther north – traffic which is expected to increase as new development occurs. As a result, the widening of Fairbairn Street is required in advance of the construction of the new two-lane road.

- Improvements to both Fairbairn Street and Chemong Road are needed to improve mobility to/from the north. From a capital scheduling perspective, improvements to Chemong Road are advanced ahead of the widening of Fairbairn Street in view of current development pressures and operational deficiencies.

- In 2010, the section of University Road between Country Road 4 and the City of Peterborough boundary was reconstructed to County standards as part of a road transfer agreement between the County of Peterborough and Township of Douro-Dummer. As a result, only the City's portion of University Road remains to be upgraded from a medium to high capacity arterial.

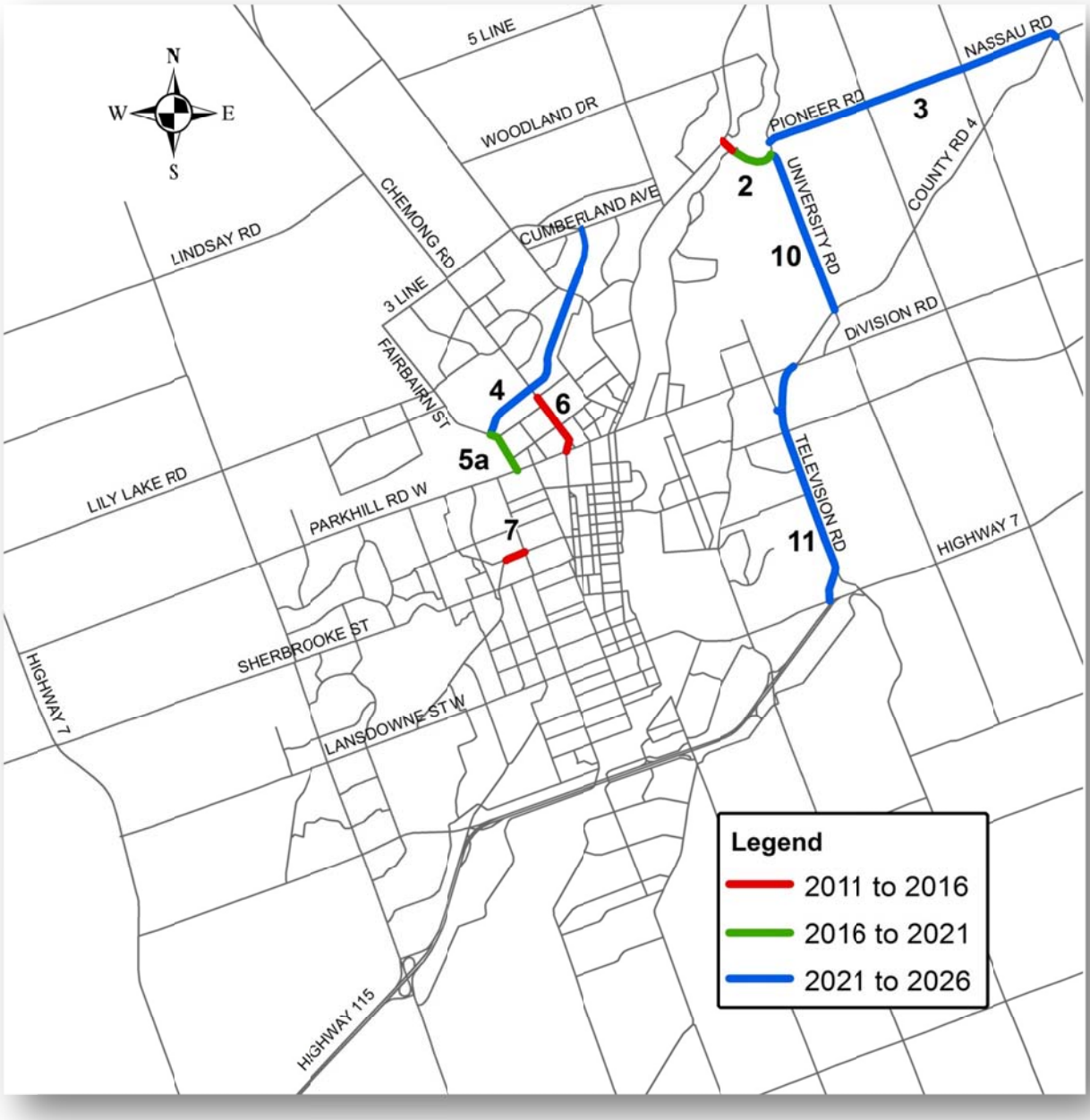


Figure 43 Implementation Plan for the Recommended Road Network

To assist in setting capital budgets, conceptual range-of-magnitude cost estimates were developed for each of the recommended projects. For the most part, the estimates were derived using the generalized per unit construction costs adopted in the 2004 Transportation Plan for the County of Peterborough[22], adjusted for inflation (as estimated from the Ministry of Transportation's 2007 *Parametric Estimating Guide*). However, as a reality check, 2010

[22] The unit costs in the 2004 County Plan are based on City of Peterborough 2001 tender prices adjusted to 2004 dollars.

tender values for the City of Peterborough were examined to determine the per unit cost to construct/reconstruct a collector/arterial road based on recent experience. Overall, the average tender price per linear meter was found to be in close agreement to the values used in the 2004 County Transportation Plan after adjusting for inflation. A sample of the unit costs used to develop the capital cost estimates can be found in Table 30.

Table 30 Sample Unit Costs Applied in Developing Capital Cost Estimates

Type of Project	Unit Cost (2011 Dollars)[1]
Upgrade road from medium to high capacity arterial	$1,100,000 / km
New 2-lane road	$2,900,000 / km
Road widening from 2 to 4 lanes	$2,700,000 / km
New 1-lane roundabout	$750,000 / roundabout
New 2-lane roundabout	$1,500,000 / roundabout

[1] Excludes property and utility costs. Assumes typical conditions.

Table 31 presents the estimated capital cost for each recommended project, expressed in 2011 dollars. **The estimates are based on unit costs for "typical conditions" and exclude property and utility costs**. For certain projects (such as the widening of the Nassau Mills bridge over the Otonabee River, and the new two-lane road between Fairbairn Street and Cumberland Avenue), more detailed cost estimates were available from previous studies. In these cases, the more detailed estimates have been provided in Table 31, adjusted to 2011 dollars.

It is also important to note that several of the recommended projects fall fully or partially within the County of Peterborough (i.e. Projects 3, 10, and 11). Although the costs for these projects have been included in Table 31, they may be partially funded by the County. In fact, the section of University Road outside the City's limits has already been upgraded to County standards, reducing the implementation cost presented herein.

Table 31 Estimated Capital Costs

Implementation Timeframe	Project	Estimated Capital Cost (2011 Dollars)
2011-2016	Nassau Mills Bridge over the Otonabee River	$7.19M
	Widen Nassau Mills (Water to Armour)	$0.56M
	Chemong/Reid Improvements	$3.30M
	Charlotte Widening	$0.59M
	TOTAL	**$11.6M**
2016-2021	Nassau Mills Bridge over the Trent-Severn Waterway	$4.67M
	Widen Nassau Mills (Armour to University)	$1.69M
	Fairbairn Widening	$3.24M
	TOTAL	**$9.6M**
2021-2026	Pioneer/Nassau Upgrade	$4.62M
	New 2-Lane Road	$13.86M
	University Upgrade	$2.56M
	Television Ext. & Widening	$9.55M
	TOTAL	**$30.6M**
TOTAL CAPITAL BUDGET:		**$51.8M**

As shown, the total capital cost of the recommended road network over the twenty year time horizon of the Transportation Plan (2011 to 2031) is estimated at $51.8 million in 2011 dollars or an average of $2.6 million per year for the life of the Plan. A review of historical capital expenditure by the City supports that the investment level required for the implementation of this plan is within the City's financial capabilities.

5.6 GOODS MOVEMENT

The movement of commercial goods is recognized as an important and necessary element of the area's economy. At the same time, the impact of goods movement on residential neighbourhoods and traffic flow is an important issue which must be adequately managed and addressed.

The 2002 Transportation Plan included a detailed study on the following elements of goods movement:

- Growth in local truck movement
- Truck route management
    - Restrictive Management
    - Operational Management
- Truck Route Planning

Since a major review of goods movement was not conducted as part of this Transportation Plan Update, the detailed body of work from the 2002 Transportation Plan is included in Appendix K.

5.7 TRANSPORTATION SYSTEMS MANAGEMENT

Transportation Systems Management (TSM) is a strategy aimed at improving the overall performance of the transportation network without resorting to large-scale, expensive capital improvements.

Benefits of TSM include:

- Low cost, high impact
- Supports more reliable transit flow
- Promotes safety and reduces driver aggression
- Reduces cut-through traffic in residential communities

Give the above benefits, it is recommended that a 'Traffic Operations Management Program' be implemented in the City of Peterborough to optimize traffic flow on the existing road network. As part of this program:

- Traffic operations assessments should be undertaken on a regular basis to address localized deficiencies. Existing operational issues along Parkhill Road suggest that this area of the network may be a priority for localized improvements.
- A reactive program or process should be in place to address public concerns regarding through traffic.

- Sub-area modelling should be undertaken as Greenfields develop or change to ensure appropriate infrastructure is provided.
- The role of Intelligent Transportation Systems should be explored, as described below.

5.7.1 ROLE OF INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

Intelligent Transportation Systems (ITS) have been defined as "the application of advanced and emerging technologies (computers, sensors, control, communications, and electronic devices) in transportation to save lives, time, money, energy and the environment."[23]

The City of Peterborough has a significant investment in a computerized traffic signal management system which has the potential to become the cornerstone of a multi-component Intelligent Transportation System for the City. To leverage the full benefits of ITS, it is recommended that an ITS Strategic Plan be developed in conjunction with the Traffic Operations Management Program to enhance the performance of the existing road network. Possible ITS technologies to be explored include advanced traveller information systems, incident management, transit priority, emergency vehicle management, disaster response, and systems for automated data collection & management.

The ITS Strategic Plan should be implemented in concert with the Traffic Operations Management Program and incorporated into the City's annual operating and capital budgets to ensure that traffic flow on the network is optimized.

5.7.2 ROUNDABOUTS IN PETERBOROUGH

As part of the City's Transportation Systems Management strategy, it is recommended that the use of roundabouts be routinely considered to address both localized operational issues, as well as requirements for new construction. Roundabouts offer a number of advantages over conventional stop and signal-controlled intersections[24]:

- **Improved safety** – Since vehicles travel in the same direction through the roundabout, left-turn conflicts are eliminated. Roundabouts also eliminate the potential for right-angle and head-on collisions. At the same time, traffic moves more slowly through the intersection which not only provides more time for drivers to react, but also helps to reduce collision severity.
- **Improved traffic operations** – Depending on the traffic situation, a well-designed modern roundabout has the potential to reduce vehicle delay and improve traffic flow.
- **Lower vehicle emissions and fuel consumption** – Since the amount of time vehicles spending idling at the intersection is reduced, drivers use less gas, and exhaust emissions are also reduced.

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[23] ITS Canada internet site (http://www.itscanada.ca/english/aboutits.htm)
[24] See for example NCHRP Report 672, *Roundabouts: An Informational Guide,* 2nd Edition, issued by the Transportation Research Board in 2010.

- **Reduced noise** – Slowly moving traffic through a roundabout makes less noise than traffic that must stop and start.
- **Lower maintenance costs** – Traffic signals require electricity 24-hours a day, and must be 'tuned' by City staff to operate efficiently as traffic patterns change. In contrast, roundabouts only need electricity for illumination at night, and maintenance requirements are limited to signage, pavement marking, and landscaping needs.

From a walking/cycling perspective, roundabouts offer both advantages and disadvantages. Pedestrian walking distance is generally increased, making roundabouts less convenient to use. Roundabouts may also be more difficult to navigate for pedestrians who are visually impaired. However, pedestrian safety is generally improved, particularly at single-lane roundabouts, due to lower operating speeds and fewer conflict points. On the other hand, there is some evidence that roundabouts may be less safe for cyclists, especially where multi-lane roundabouts are involved.

5.8 NEIGHBOURHOOD TRAFFIC MANAGEMENT

5.8.1 TRAFFIC MANAGEMENT GUIDELINES

An important issue for some concerned Peterborough residents involves controlling traffic speeds and volumes on their local or minor collector streets. In some of these cases, residential streets intended to provide motorists, cyclist and pedestrians with primarily local access may now carry more through traffic with little relationship to the affected neighbourhood (short-cutting) and at speeds incompatible with the local residential character. In response, many cities set objectives to shift these types of traffic conditions back to levels more compatible with the residential surrounding. This type of neighbourhood traffic management is referred to as "traffic calming".

More specifically, it can be argued that the origin or destination of most traffic on local and minor collector streets should be local to the area being served, and that vehicles should travel at no more than 40-50 kilometers per hour on these streets. This can be achieved most effectively by improving traffic operations on the adjacent arterial road network. Accordingly, optimization of the arterial network should be the primary response in dealing with traffic volume and speed concerns in residential neighbourhoods.

Where optimization of the arterial network is ineffective in addressing these neighbourhood traffic issues, various traffic calming techniques may be considered for existing residential streets. The definition of traffic calming from the *Canadian Guide to Neighbourhood Traffic Calming*, prepared by the Transportation Association of Canada (TAC) is;

"Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized street users."[25]

Traffic Calming Application Criteria – Traffic calming applications can extend along a specific street, several streets or throughout an entire neighbourhood. The previous 2002 Transportation Plan for Peterborough identified five criteria that must be met in order to apply traffic calming measures. From a limited review of industry practice in other jurisdictions (Ottawa and Kingston), it is recommended that the initial criterion related to observed traffic patterns and safety be revised to ensure sufficient flexibility and level of responsiveness to local needs. The following provides a preliminary set of criteria for evaluating the merit of traffic calming initiatives. As the City gains experience in the application of traffic calming, these criteria should be confirmed to ensure they reflect the City's resources and priorities.

1. Two of the following three measurable traffic criteria must be met based on actual existing conditions, as compared to perceptions:

   a) Origin-Destination surveys show that an unreasonable portion of daily traffic on the street is through traffic (more than 20%)
   b) Speed studies show an 85th percentile speed of 5 to 10 km/hr over the posted speed limit
   c) The corridor has more collisions involving vulnerable road users than comparable roads in the City

   If two of these three criteria are met, a detailed traffic calming study may be warranted.

2. No traffic calming measures should be applied to designated highways, arterial roads and major collector roads, as these facilities are specifically planned and designed to carry higher volumes of through traffic at higher speeds. Exceptions to this guideline may be considered in the case of major roadways within special character areas, most notably the downtown (including Hunter Street BIA);

3. Traffic calming should be considered only in response to resident request(s) (i.e. petition), or at the initiation of the City. In either case, local support should be available from a majority of affected residents through use of a mail-back survey, or other public recording technique, to inform affected residents of any traffic calming request, and to poll the level of resident support for such a program. If the amount of resident response is low, typically less that 2/3, and the results of the poll suggest a lack of strong neighbourhood support, the City should re-consider the appropriateness of such a program;

[25] Transportation Association of Canada. *Canadian Guide to Neighbourhood Traffic Calming*. December 1998.

4. Any potential traffic calming application should first consider peripheral arterial roadway network conditions (Level of Service) in either causing neighbourhood traffic problems, or solving such problems, and;

5. Traffic calming should be applied within the context of a comprehensive neighbourhood traffic management plan.

Where these criteria are met, the City should continue use of its current Traffic Calming Policy in following a 10-step process to plan, implement and monitor traffic calming applications:

1. Problem Identification
2. Establish a Traffic Work Group
3. Data Collection
4. Problem Evaluation
5. Identification of Traffic Calming Devices
6. Request for Approval in Principle
7. Evaluation & Monitoring of Traffic Control Devices
8. Approval of Final Installation
9. Removal of Traffic Calming Devices (Optional)
10. Prioritizing Requests

5.8.2 TRAFFIC CALMING TECHNIQUES

Traffic calming techniques rely on a number of set principles:

- Street design allows drivers to drive at, but no more than the desired speed;
- Street design allows local access, while discouraging through traffic, and;
- Traffic calming works best when the roads are properly designed in the first place.

Traffic calming involves physical changes to the layout of the street. To be effective, it must be considered on a neighbourhood or district level so as not to off-load or transfer one street's traffic problems simply onto the adjacent area or connecting street. Measures are most effective at lowering average speeds if they are used in combination, and throughout an area, but are placed judicially. For example, speed tables or humps can slow traffic to less than 40 kph or less at a spacing of 90 metres. Traffic circles are effective in slowing traffic within 50 metres of the circle. Designs must be site-specific, that is, a measure that works at one location may not work in the context of another location.

Traffic calming measures generally fall into two basic categories:

PASSIVE CONTROLS

These controls do not restrict traffic flow, but attempt to influence or encourage motorists to either use alternative routes or reduce their travel speeds. Examples include:

Visual Effects - including signs, pavement markings and in some cases planting, usually with the objective of slowing vehicular speeds and providing notification of pedestrian and/or cycling routes and crossings. They are usually the least cost measures and readily accepted by the public, but constant traffic enforcement is needed for maximum effect. If plantings are included, this results in an added maintenance cost.

According to official traffic management guidelines and standards, stop signs should never be used as speed control devices. An excess of stop signs in a neighbourhood not only confuses drivers, but also offers a false sense of security for motorists at intersections. They also encourage "rolling stops" if too many stops are located along a single travel route. The new Canadian Guide to Neighbourhood Traffic Calming also states that:

> *"In all cases, the primary function of regulatory signs is to regulate traffic movement, not to calm traffic. Using regulatory signs for traffic calming purposes can be ineffective, and can create compliance problems."* [26]

Surface Treatments - Vehicles can be passively encouraged to slow at key stops, such as intersections or mid-block pedestrian crossings, through the use of special surface treatments that create both a visual and physical warning. Examples here include interlocking concrete pavers, stamped concrete, rough pavement surfaces and minor vertical deflections on the vehicle travelway. However, consideration must be given to cyclists when considering surface treatments as some measures may not be cyclist-friendly.

Police Enforcement – Regular and visible Police enforcement of neighbourhood traffic speed is usually rated as highly effective in reducing speeds, but with the following restrictions that limit its use in neighbourhood traffic management:

1. Most Police departments do not have the resources to continually enforce traffic regulations in any one particular area of a city, such as a specific neighbourhood;
2. Adherence to traffic regulations tends to quickly decrease once Police enforcement in an area is removed;
3. The clear linear roadway pattern and narrow geometrics of many local residential streets restricts opportunities for Police surveillance and monitoring of traffic, and;
4. Police enforcement cannot be used to divert traffic off residential streets.

Community Safety Zones – Community Safety Zones (CSZ) are roadway sections or intersections where safety has been determined to be of special concern by a municipality. In Peterborough, the City's Community Safety Zone Bylaw 01-149 currently provides for establishment of up to three (3) such Zones at any one time within the City, where fines for most traffic violations are doubled. The optimum number of zones permissible in any municipality is determined by the ability of local Police resources to enforcement the zones effectively. However, Ontario municipalities that have recently evaluated their CSZ performance have determined that they have been generally ineffective in reducing or

[26] Transportation Association of Canada/Institute of Transportation Engineers, December 1998

solving traffic safety issues.[27] Any success of CSZs is directly dependent on consistent and visible Police enforcement. Where too many Zones are established in a municipality, Police resources to administer the Zones become diluted, adding to the ineffective results. As a result, use of CSZs in Peterborough should be considered only where a high level of consistent enforcement can be guaranteed.

ACTIVE CONTROLS

Active measures create more of a physical impact on vehicles, thereby affecting how motorists use the affected streets. They are usually more effective than passive controls in preventing motorists from using certain streets and/or slowing their speed.

Active controls include the following types of treatments:

Speed Humps - These "vertical deflections" place obstacles on a roadway to slow or redirect traffic. They can also limit emergency vehicle and transit speed. They involve gradual vertical deflections, as set by the City's current Traffic Calming Policy, on a street to induce constant speed. They are effective in providing visual and physical notification to reduce vehicular speed. Flat top humps, also known as Raised Crosswalks and Raised Intersections, are used for special pedestrian crossings of roadways at mid-block or key intersection locations. They have different geometry than speed humps but provide a similar effect. These types of vertical deflections are rated high in reducing traffic speed.

Chicanes - These are a form of "horizontal deflection" or impediment on the street by building out the curb line or locating fixed objects within the travel portion of the street. When located on alternative sides of the street to break up long stretches, they add street "friction" that forces drivers to divert around the objects, thereby slowing down along the strip. Instead of alternating the objects or build-outs, they can also be located across from each other, producing a Pinch Point. Both Chicanes and Pinch Points can usually be included within an existing road right-of-way since they involve "squeezing" the travel lanes. The advantage of either type is that they force vehicles to slow because of the objects and related side friction. Alternatively, temporary measures using concrete planters and barrier curbs for example, can also be

[27] Community Safety Zones: Status of the Practice, Intus Road Safety Engineering, October 2001.

relatively inexpensive. However, they are also generally unattractive and can lack public support. Permanent features add to costs, and the traffic calming restrictions affect all motorists, including area residents. Straight routes through Chicanes can be provided for pedestrians and cyclists.

Gateways - These are another type of vertical deflection to indicate to the driver that the character of a roadway has changed. This can be at the start of a comprehensive traffic calming scheme, a school zone, a commercial area or community entrance. The visual and physical intrusion they represent within the street tends to slow traffic. This can be enhanced by adding other elements such as special surface treatments, pinch points and/or signage and markings. The Gateway width is usually 1-2 metres, with minimum 3.0 metres driving lanes on either side. Gateways are usually affective, and publicly acceptable, when used to announce special community areas or features. Another form of Gateway involves Islands or Refuges. These are wider Gateways, at least 2 metres in width that can include pedestrian-oriented features such as lighting and signage. While Gateways and Islands are effective in controlling travel speed, they may require a widening of the street right-of-way to accommodate the geometrics, and assuming sidewalks and boulevard space is also involved. Alternatively, they may require the removal of on-street parking in the narrowed area.

Parking - On-street parking is an effective traffic calming feature because of its visual obstruction and street friction effects. However, parking may have to be removed to accommodate the needs of any horizontal deflection measures noted above. A decision whether or not to include on-street parking in a traffic calming scheme depends on a number of related land use, property access and pedestrian considerations.

Bicycle Lanes - As with on-street parking, bicycle lanes can reduce vehicular lane widths and introduce side friction to the street, thereby slowing vehicular speeds. Such lanes may require the removal of on-street parking depending on the available lane width. They are not recommended along low volume residential streets in a neighbourhood. Therefore, their use in traffic calming is usually oriented mainly to collector streets where exclusive cycling lanes are appropriate.

Modern Roundabouts and Traffic Circles - These raised circles located in the middle of intersections are very effective in slowing travel speeds around the circle. They require specific right-of-way width to reduce speeds, and can create obstacles for large vehicle through the circles. Roundabouts can also provide a higher intersection Level-of-Service than signals based on substantially shorter average delays on all intersection approaches. They can either be incorporated into the design of new developments where applicable in the roadway plan, or in existing settings where sufficient roadway width can be provided.

Traffic Calming Signage - Most traffic calming techniques must be signed for warning and liability reasons. More general "Neighbourhood Traffic Calming" signs can also be prominently displayed at neighbourhood entrances to notify motorists that calming measures have been installed.

Street Closures - Full or partial street closures, usually at intersections, can be very effective in preventing through traffic movements within neighbourhoods, but also require access to be provided from other streets. They can also result in diversion of traffic to a parallel street, thereby moving the problems rather than solving it. The closed street section will require maintenance with associated costs (i.e. grass mowing, litter cleanup). As an alternative, Partial Street Closures and Diverters can be used to control traffic patterns through an area. While extremely effective in this control, closures and diverters affect all area residents, not just the offending traffic, and so may be difficult to implement. They also limit emergency vehicle access within the affected area, and come with maintenance needs and costs. It is important to maintain pedestrian and cycling access through any closed street.

5.9 PARKING MANAGEMENT

In 2007, the *Strategic Downtown Parking Management Study* was completed to examine options for the supply, management and pricing of parking in Peterborough's central area. Table 32 provides a summary of the main recommendations arising from the study.

Table 32 Strategic Downtown Parking Management Study Recommendations

Strategy	Actions
Increase Parking Capacity & Efficiency	1. Monitor proposals and plans for redevelopment projects in the downtown that will require off-street parking as per the Zoning Bylaw, and determine the impacts of such requirements on the existing off-street parking supply. 2. Optimize the downtown's existing off-street parking supply by offering more permit parking in the underutilized lots on the periphery of the downtown, including the Brock, Gas, Louis and Downie lots. 3. The City should act as a broker to identify and establish private parking spaces available for public and off-hour resident permit parking in the downtown. This and other residential permit parking in the downtown should be provided on a shared basis. 4. Determine opportunities to reduce any wasted space in existing parking structure and lot design, and maintain minimum parking stall geometric design guidelines. 5. Maintain the $1.00/hour on-street parking rate, but strictly enforce the two hour parking limit. 6. Consider adding maximum parking requirements to the parking provisions of the Zoning Bylaw.
Reduce Long-Term Parking Demand	7. Promote active transportation in the City through recommendations of the Transportation Master Plan for walking and cycling enhancements, and use of more Transportation Demand Management initiatives. 8. Encourage transit use as per the City's most recent Transit Operations Review, including charging a higher rate for monthly parking in municipal lots that is currently $40-$50 compared to the current monthly adult transit pass cost of $50. This incentive to use public transit can be further enhanced by increasing the monthly parking permit to $50-60/month, putting the City's parking permit cost more in line with comparable municipalities 9. Continue municipal control over most downtown off-street parking to management the cost and quality of this parking supply.
Improve Parking Management	10. Replace parking attendants in the two municipal parking garage kiosks with automated Pay on Foot equipment, and expand the use of Pay & Display equipment to all municipal surface parking lots. 11. Replace the King Parkade card swipe with a proximity card system. 12. When being replaced with Pay & Display equipment in the more concentrated areas of the downtown, save existing on-street parking meters for use in the periphery of the downtown. 13. Increase the cost of all parking infractions by 35%, except for Parking in an Accessible Space which at $300 is already near the $350 maximum, to enhance the importance and utilization of the existing parking supply in the downtown, and to bring the infraction rates closer in line with comparable municipalities. 14. Continue requiring the Parking Control Services contractor to be responsible for making cash deposits of money collected from the parking services.
Improve Parking Control Services	15. Adjust the current Parking Control Services contract to increase the wage to contract staff to $10.000-$12.000/hour to mitigate the staff turnover problem and associated management, service and revenue impacts on the City 16. Upgrade the current part-time Parking Supervisor Assistant position to a full time position;

	17. The Parking Operations Supervisor should continue to manage the parking citation appeal process in the short term. 18. Prior to installing Pay on Foot automated parking equipment in the two parking structures, immediately reduce the attendant staffing in the kiosks to a single 10:00 a.m. to 7:00 p.m. shift. 19. The contracted provider of parking service should be required, in the parking control services contract, to provide improved job descriptions including an associated training program that includes conflict resolution and customer courtesy. 20. Adjust all on-street meters to decrement to "negative 10" minutes after the meter has expired to give the parker an undisclosed 10 minute grace period. 21. Eliminate the use of the 10 minute courtesy card to save substantial numbers of conflicts with the parking public who expect the added time will avoid a ticket, and to smooth out the collection of parking citations. 22. Eliminate the Voluntary Payment Program providing a parking citation discount for payments made within 7 days. This will increase parking revenues from early payments by 33%.

Source: 2007 Strategic Downtown Parking Management Study, prepared for the City of Peterborough by IBI Group

As part of the Transportation Plan Update, it is recommended that these strategies be retained for implementation where they have not already been completed, and where appropriate, elements of the parking recommendations be incorporated into the Official Plan.

5.10 REGIONAL CONNECTIVITY

The City of Peterborough is encouraged to collaborate with senior governments and adjacent jurisdictions to advocate for increased regional connectivity.

The County of Peterborough and Ministry of Transportation of Ontario, in particular, have long term infrastructure expansion plans that will influence network deficiencies and trip patterns on the City of Peterborough road network. Also, corridor expansions, upgrade or realignment proposed in the City of Peterborough's Transportation Plan extend beyond the study limits, and as such require coordination and establishment of equitable funding arrangements with the County of Peterborough.

5.10.1 ONTARIO MINISTRY OF TRANSPORTATION

The public document issued by the Government of Ontario entitled "Southern Highways Program 2011 to 2015" reaffirms the importance of the Highway 7 in the provincial highway network with a series of studies on Highway 7 from Peterborough to Carleton Place.

The Ministry has already launched an Area Planning and Highway Corridor Study for the Highway 7 through Peterborough to establish long term needs for the movement of people and goods within the study to 2031 and beyond. This study is currently in progress.

At the time of undertaking this Transportation Plan Update, informal discussions with Ministry of Transportation of Ontario with respect to the likely timing for widening Highway 7 from Highway 115 to Fowler's Corners from 2 to 4 lanes are as follows:

- Widening from Highway 115 to Parkhill Road within the next 10 to 15 years (i.e., 2021 to 2026)
- Widening from Parkhill Road to Fowler's Corners sometime beyond 2031.

Actual timing of Highway 7 widening is subject to change based on funding, planning, design, environmental approval, property acquisition and construction requirements

In addition to the Highway 7 widening, plan are afoot to extend Highway 407 to Highway 35/115 by 2020. The easterly extension of Highway 407 will improve the regional connectivity of Peterborough, but will not alter the trip patters within the City of Peterborough. Highway 407 will essentially serve as an alternate route to Highway 401. Since Highway 35/115 connects to both Highway 401 and Highway 407, it is anticipated that travelers will continue to use the same routes to access Highway 35/115 regardless of their final destination (i.e. Highway 401 or Highway 407).

Provincial approval was received on June 3, 2010 for the Highway 407 East Environmental Assessment (EA) Study. On March 10, 2011 a seamless plan was announced to extend Highway 407 East from Brock Road in Pickering to Highway 35/115 by 2020 with the following key dates:

- **By late 2015** – 22 kilometres of new east-west highway from Brock Road in Pickering to Harmony Road in Oshawa, and a 10 kilometre north-south highway (West Durham Link (WDL) connecting Highway 407 East to Highway 401 will be open to traffic

- **By 2017** – Highway 407 East from Harmony Road to Taunton/East Durham Link will be open to traffic

- **By 2020** - the section from Taunton/East Durham Link to Highway 35/115, and a 10 kilometre north-south highway (East Durham Link) connecting Highway 407 East and Highway 401 will be open, completing the project.

On April 28, 2011, Infrastructure Ontario released the Request for Proposals (RFP) to the three short-listed teams to submit proposals to design, build, finance and maintain phase one of the new Highway 407 East. Highway 407 East will be a tolled highway that will be publicly owned. The government will retain the revenues generated by the tolls, set the toll rates and establish service standards.

5.10.2 COUNTY OF PETERBOROUGH

At the time of completing the 2012 City of Peterborough Transportation Plan, the County of Peterborough was in the process of undertaking its Transportation Plan Update. Given the County of Peterborough's active involvement in the development of the City of Peterborough Transportation Plan, it is expected that the County of Peterborough Transportation Plan Update will acknowledge and adopt the capital projects under its jurisdiction that were identified in the City of Peterborough's Transportation Plan Update.

The following projects lie either entirely (1 through 4), or partially (5 and 6), within the County of Peterborough's jurisdiction.

1. Construct new 2-lane CR 18 Bridgenorth Bypass from CR 18/Ward St to County Road 14 Causeway
2. Widen County Road 18 to 5 lanes from CR 1 to Bridgenorth Bypass
3. Extend Television Road as a 2 lane high capacity arterial from Current Television Rd. alignment to Warsaw Road
4. Widen Television Road to 4 lane high capacity arterial from New Television Rd. Extension to Lansdowne Street East
5. Upgrade University Road from medium to high capacity arterial from Warsaw Road to Nassau Mills Road
6. Upgrade Pioneer Rd/Nassau Rd to a higher order facility (needs to be coded in the model as connecting to County Rd 4/Warsaw Rd)

A number of the short term capital improvement recommendations outlined above have been implemented. The longer term improvement recommendations are yet to be initiated and will be subject to review as part of the County's Transportation Plan Update.

It is anticipated that the update to the County of Peterborough Transportation Plan will take place by the summer of 2012.

5.10.3 GO TRANSIT

Traditionally, the City has been a center of railway activity and manufacturing. Unfortunately, the City of Peterborough is no longer served by scheduled passenger rail service. However, GO Transit bus service is currently provided to/from Oshawa and it is anticipated that a commuter rail service to/from the Greater Toronto Area (GTA) will be provided in the medium to long term.

In March 2008, the Federal and Provincial governments agreed to undertake a joint study for the potential reinstatement of passenger rail service between Toronto and Peterborough. The study was led by Metrolinx, the regional transportation authority for the Greater Toronto and Hamilton Area. The purpose of the study was to provide an assessment of the market potential and ridership demand, required infrastructure improvements, and an implementation plan for the proposed service.

The study confirmed that a commuter rail type of service would be appropriate. The study evaluated three potential service levels including:

- Basic Service – two trains departing Peterborough in the morning and returning in the evening;
- Enhanced Service – the Basic Service plus two additional trains departing Locust Hill in the morning and returning in the evening; and
- All-Day Service to Locust Hill – Basic Service plus half-hourly service all day long in both directions between Locust Hill and Toronto.

Based on the ridership forecasts of approximately 1,900 total boardings per weekday for both directions, it was determined that Basic Service would be sufficient to meet ridership projections for the early years of the train service beginning in 2016. Assuming a ramp up to the Enhanced Service beginning in 2021, total (two-way) weekday ridership is projected to increase to 3,700 boardings by 2021 and to 4,160 by 2031. Based on ridership projections for the analysis period to 2031, it was found that all-day and weekend service could not be justified.

In light of the above, the City of Peterborough is encouraged to designate transit station areas and identify transit priority/intensification corridor(s) within the City of Peterborough that can be used by the GO Transit bus service. This would encourage such service to be provided through the City rather than simply be limited to the City's fringes, and in doing so provide a higher transit service and allow for the redeployment of the existing local bus fleet to growth areas across the City.

5.10.4 PETERBOROUGH MUNICIPAL AIRPORT

The City of Peterborough owns and operates the Peterborough Municipal Airport, although the airport lands fall outside the city limits. The airport does not offer scheduled passenger air services. Nonetheless, the Peterborough Municipal Airport is a strong economic driver for both the City of Peterborough and the Kawartha Lakes Region. The airport and its associated aerospace industry contribute in excess of 400 jobs and $40 million dollars in Gross Domestic Product to the region.

The phased development plan to expand and regionalize the airport should continue to be pursued, as put forward in the Peterborough Municipal Airport Master Plan.

6 IMPLEMENTATION & MONITORING

6.1 INTEGRATION WITH THE OFFICIAL PLAN

The Transportation Plan Update recommendations should be incorporated into the City of Peterborough Official Plan. This should be completed through the processing of an Official Plan Amendment recognizing the proposed road and bikeway networks, and supporting policy strategies described herein. In particular, "Schedule B - Road Network" and "Schedule B (a) Bikeway Network" should be amended to reflect the recommendations of the Plan.

The County of Peterborough should be requested to coordinate amendments to adjacent Township Official Plans to protect the future roadway corridors recommended in the Transportation Plan from encroachments that would restrict or constrain the planning and development of potential roadway alignments within these corridors. Such encroachments may involve severances, property rezoning applications, Official Plan policy amendment and development permit approvals.

It is important to stress that when incorporating this Transportation Plan Update into the Official Plan, if any significant changes are made to City and/or area growth projections and fundamental land use assumptions, an associated updating of the Plan's technical framework should be undertaken. This would entail re-running the City's TransCad travel demand forecasting model with the new growth data, reestablishing system deficiencies and evaluating alternative solutions. A policy requiring this type of traffic impact analysis for any change in any of the City and area's fundamental land use policies, or major land use re-designation or re-zonings, should be included in the Official Plans. The policy should further require the preparation of traffic impact studies for development proposals deemed to be significant by the City or neighbouring Townships.

6.2 PLAN MONITORING & REVIEW

The following recommendations are provided with respect to implementation and monitoring of the Transportation Plan:

- Annual transportation system improvement budgets for all modes should be developed and approved in a coordinated fashion. The objective should be to balance expenditures by mode, and maximize effectiveness, efficiencies and economies of scale in the provision of transportation services

- At 5 year intervals, starting with approval of the next City of Peterborough Official Plan update, a statistically valid household travel survey of 3-4% of the total primary and secondary Transportation Plan Update study area households should be provided to update trip making characteristics, measure system performance to

targets and collect public attitudes about the area's transportation system. This data should be provided either through further updates of the Transportation Tomorrow Survey (TTS), or through the City and County's own initiatives should TTS updates not be available. The TTS does not gather attitudinal survey data, so this should be undertaken by the City. Survey results should be combined with Peterborough Transit ridership statistics to form a comprehensive, current picture of transportation mode patterns in the Peterborough area.

- At 5 year intervals, starting with approval of the next City of Peterborough Official Plan comprehensive update, this Transportation Plan should be updated in conjunction with each such Official Plan update. The timing and extent of such reviews should remain flexible based on City and County needs at the time of Official Plan updates.

- To ensure the recommendations of the Transportation Plan are acted upon, on-going monitoring is required. Towards this end, a summary of the recommendations contained in this Plan is provided in Appendix L. This summary should be used to monitor progress towards each recommendation, with progress updates prepared on an annual basis.

- In addition, it is further recommended that transportation indicators be developed and used as a basis for monitoring annual trends in transportation services, expenditures, activity levels, impacts, and other key features of the transportation system. Such monitoring is intended to be undertaken in conjunction with the 5-year transportation surveys described above.

7 GLOSSARY

Accessibility – The extent to which persons with disabilities can navigate a facility with ease as a result of planning and design features which eliminate barriers.

Active Transportation – Active transportation is a general term for the use of non-motorized travel modes which are powered by human energy such as walking, running, cycling, manual wheelchairs and rollerblading.

Arterial – A high capacity route intended primarily to provide mobility, which is designed to accommodate large volumes of traffic moving at medium to high speeds. An example of an arterial street in Peterborough is Lansdowne St.

Boulevard – Refers to the area between the curb of a roadway and the sidewalk (can be either grass or paved).

Built Environment – The combination of buildings, infrastructure and other fixed elements which create the physical environment.

Capacity – The number of vehicles that can reasonably be processed along a roadway or through an intersection in a given period of time (typically hourly).

Carpool / Rideshare – Programs which encourage two or more users to travel together, reducing the number of single occupant vehicles on the road.

Cash-in-lieu Parking – These programs allow developers to pay the City to forego part of the by-law requirements to provide parking spaces. The funds are typically used to provide parking in City lots, or redirected to improve transit service or other sustainable modes.

Collector – A roadway which collects traffic from local streets to provide access to an arterial road. A collector provides a combination of mobility and access. Weller St is an example of a collector street in Peterborough.

Complete Streets – Complete streets are roadways designed and operated to enable safe access for all users. Pedestrians, cyclists, motorists and transit riders of all ages and abilities must be able to safely move along and across streets.

Cycling Lanes – Cycling lanes provide a striped travel lane to provide a separate operating space for bicycle traffic and a continuous visual reminder to drivers of the presence of cyclists.

Cycling Track – A cycling track is a segregated on-street bike lane, separated from other traffic lanes by a physical barrier (can be uni-directional or bi-directional); in some cases may consists of a raised bike lane, elevated several centimeters above the adjacent traffic lanes.

Delay – The additional travel time experienced by a vehicle due to congestion, traffic control devices, poor weather, or other factors.

Goods Movement – The transport of products by any mode (road, rail, etc.).

Level of Service – A concept which is used to quantify travel conditions along a given corridor or intersection. The level of service concept is most commonly used for vehicular travel however it can also be applied to non-motorized modes. For vehicular travel along a roadway, LOS 'A' is indicative of free flow conditions and LOS 'F' is indicative of congested conditions. LOS 'E' typically corresponds to a volume-to-capacity ratio of 0.9, and is often used as a threshold for identifying when modifications to the road network may be warranted.

Local Street – A low capacity, low speed roadway with the primary function of providing access to properties and destinations, rather than providing mobility for through traffic.

Measure of Effectiveness (MOE) – Criteria which are used to measure how well a given alternative achieves key mobility, economic, and environmental objectives for the transportation system

Mixed-Use – Neighbourhoods which are planned to combine a number of different land uses in order to improve the walkability and liveability of a community, while decreasing demand on the road network. Mixed-use may also be applied to buildings which combine multiple functions (i.e. dwelling units and ground floor commercial units).

Mode share / Mode shift – Mode share is the percentage of total users in a transportation network using a particular travel method (i.e. transit, walking, cycling, driving etc.). Mode shift attempts to shift users away from single occupant vehicles to more sustainable modes of transportation.

Multi-use pathways – Shared-use trails typically intended for all modes of active transportation, typically with maximum speed limits around 20km/hr to promote pedestrian safety.

Municipal Class Environmental Assessment (EA) – The Municipal Class EA is a planning process that must be followed for meeting the requirements of the Environmental Assessment Act for specific infrastructure projects.

Neighbourhood Traffic Management – A program aimed at improving the safety and liveability of a neighbourhood through the implementation of a combination of strategies, tools and infrastructure changes (generally referred to as traffic calming) which reduce cut through traffic, slow speeds and provide preferential treatment for active and sustainable modes of transportation.

Peak Period / Hour – The period (i.e. 6:30 AM to 9:30 AM) or hour (i.e. 8:00-9:00 AM) when the greatest number of users rely on an element of the transportation network (i.e. roadway, bus route, etc.).

Right of Way (ROW) – The limits of ownership along a particular corridor. In a typical street cross section, a municipality's right of way includes the roadway, sidewalks and boulevards.

Screenline – A screenline is a fictitious line which is used to determine the total traffic moving across certain key barriers (i.e. rivers and railways) or moving through a particular area in a city (i.e. into/out of the downtown), along a number of roads or routes. Screenlines are used in calibrating transportation models since they provide an aggregated level of travel demand.

Shared-Use – Shared-use facilities require multiple modes to operate in the same right of way. Examples include an HOV lane which allows taxis and buses to use the lane, or a traffic lane with shared operation between cyclists and vehicles.

Short Term / Long Term Parking – Short term parking typically refers to parking with durations less than two hours, with anything over this deemed to be long term parking.

Single Occupancy Vehicles (SOVs) – Trips made with only one person in a vehicle (i.e. a driver and no passengers).

Transit Priority Measures – Transit Priority measures are techniques employed to improve service for transit users, such as HOV lanes, transit signal priority at traffic signals, and segregated transit infrastructure.

Transportation Analysis Zone (TAZ) – A transportation analysis zone refers to a specific geographic area (neighbourhood, business park, etc.) used in the transportation modelling process. Zones are generally defined to have similar levels of either employment or population, and can therefore vary greatly in size due to variations in land use density. In establishing zones, areas with similar characteristics and land use types are grouped together, using major roads and natural features as zone boundaries.

Transportation Demand Management (TDM) - Transportation demand management (TDM) aims to create a more efficient transportation system by promoting active and sustainable modes and introducing land use policies that are conducive to these modes. TDM works by: shifting trips away from single occupancy vehicles to alternatives such as walking, cycling, transit, and carpooling, shifting the time of travel to when the network is less congested, and reducing the total number and length of trips.

Transportation Master Plan – A transportation master plan is a long range planning document which sets out recommended policies, programs, and infrastructure projects to support existing and future development within the community.

Transportation Systems Management – Includes a variety of strategies aimed at improving the overall performance of the transportation network without resorting to large-scale, expensive capital improvements.

Volume – Volume refers to the number of vehicles, cyclists or pedestrians along a roadway, pathway or intersection in some period of time. The most common vehicular volumes used for planning purposes include the number of vehicles per hour (vph or veh/hr), and the annual average daily traffic (AADT).

Volume-Delay Function – A formula which accounts for the delays experienced on a roadway as a result of increasing traffic volume. It determines the impact of traffic congestion on the average travel speed and is used in the trip assignment process of transportation models.