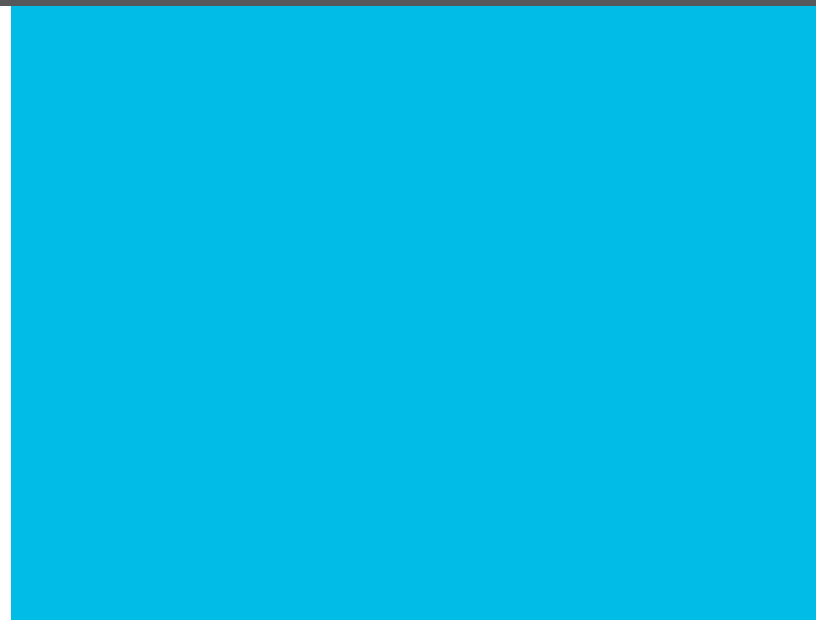




City of Kingston

# 2015 KINGSTON TRANSPORTATION MASTER PLAN

December, 2015



City of Kingston

2015  
KINGSTON  
TRANSPORTATION  
MASTER PLAN

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## Executive Summary

### Introduction

The Kingston Transportation Master Plan (KTMP) provides the long-term direction for the development of transportation networks and supporting policies, programs and services. It is a key strategic document that influences trips made by walking, cycling, transit and the automobile throughout the City over the next twenty years. The 2015 KTMP continues to focus on sustainable modes of transportation and supports investment in transit and active transportation infrastructure. This support combined with an acceptance of some increased congestion and delay for vehicles during the peak travel period, will allow the City to defer road expansion projects and help achieve Kingston's vision of sustainability.

The City's first KTMP was completed in 2004 and identified facilities, programs and policies necessary to encourage a shift away from the automobile that included Transportation Demand Management (TDM) and Transportation Systems Management (TSM), improved pedestrian and cycling facilities, enhanced transit services to increase ridership in addition to the construction of new roads. The completion of the 2015 KTMP provides a comprehensive evaluation and confirmation of the following:

- Progress made since the adoption of the 2004 KTMP
- Strategic direction for the next 20 years (up to 2034)
- Targets for active transportation (walking and cycling), transit, Transportation Demand Management (TDM), Transportation Systems Management (TSM) and automobiles
- Strategies, policies and programs required to achieve the targets for active transportation and transit
- Transportation facilities and on-going investments required to support future growth as identified in the recent urban growth boundary update and to facilitate more trips by walking, cycling and transit
- Emerging trends such as an aging demographic, climate change & sustainability, changing economic climate, energy costs, community health, and technology
- Existing and projected population and employment growth

## Existing and Future Conditions

The City has an extensive transportation system that serves pedestrians, cyclists, transit and automobiles. As shown in the table below, the Household Travel Surveys demonstrate that an increased number of trips are being made by walking, cycling and transit.

**Table E-1. City-Wide Afternoon Peak Mode Shares**

Mode of Travel	2002 Household Travel Survey	2008 Household Travel Survey	2015 KTMP Target
Walking	11%	13%	14%
Cycling	1%	1%	3%
Public Transit	3%	5%	9%
Auto Driver and Passenger	82%	76%	74%
Other	3%	5%	n/a
<b>Total</b>	100%	100%	<b>100%</b>

As the KTMP is a long-term plan, the City's transportation system must be able to accommodate future growth in an efficient and sustainable manner. Population forecasts predict that the population of the Greater Kingston Area will grow by about 26,000 and employment will grow by about 13,000 jobs by 2041. The population and employment forecasts predict that growth in Kingston will peak between 2031 and 2033 followed by a gradual decline. The peak hour transportation targets to be achieved by 2034 for transportation measures are shown in the table below.

**Table E-2. Afternoon Peak Hour Transportation Targets (2015 – 2034)**

System Component	Measure	Existing Target	New Target
<b>Active Transportation</b>	Walking + Cycling Mode Share	14%	17% (14% walking and 3% cycling)
<b>Public Transit</b>	Transit Mode Share	11%	9% City-wide trips by transit
<b>Transportation Demand Management</b>	Reduction in vehicle trips	Not specified	5% fewer trips
	Auto Occupancy Rate	Not specified	1.20 average number of people in each car
<b>Transportation Systems Management</b>	Roadway Capacity Optimization	Not specified	5% improvement for TSM and transit priority measures
<b>Road Network</b>	Volume to Capacity Threshold for Road Improvements	0.9 (LOS D)	1.0 (LOS E) increased congestion

### **Active Transportation – Walking and Cycling**

Walking and cycling are important strategies to improve the sustainability of a community by increasing the travel choices available to residents, supporting healthier and active lifestyles and by reducing the reliance on automobiles. In addition to the existing pathways system, the City is steadily expanding the on-road cycling network that comprises paved shoulders, designated cycling lanes, signed routes and signed routes with sharrows (shared-lane markings). Since 2008, approximately 131 kilometres of cycling infrastructure has been added to City roads. To encourage more walking trips, approximately 74 kilometres of new sidewalks have been installed along with 50 street benches.

Since the existing active transportation mode share is 14% (13% walking and 1% cycling) and almost 40% of residents potentially live within 5 km of work, a 17% (14% walking and 3% cycling) active transportation mode share target is recommended for the 2015 KTMP. The active transportation targets will be reviewed as part of the 2017 Household Travel Survey and the

2019 KTMP and adjusted if required. A more comprehensive study of specific on and off-road facilities for pedestrians and cyclists will be included in the 2016/2017 Active Transportation Master Plan (ATMP).

## Public Transit

The role of public transit is an important element of the 2015 KTMP as continued improvements and investments in transit service will be required to increase ridership. Kingston Transit has experienced steady growth in transit ridership in recent years, from approximately 2.5 million trips in 2002 to 4.2 million trips in 2014, an increase of approximately 5.7% per year. PM peak hour ridership is expected to continue to increase with the introduction of express routes. The 2015 KTMP maintains the transit-supportive direction of the 2004 KTMP and supports further expansion and improvements to the transit network and incorporates the recommendations within the 2011 Kingston Transit Redevelopment Plan (KTRP).

The 2015 KTMP recommends a 9% transit mode share target by 2034 for the following reasons:

- The PM peak ridership required for a 9% transit mode share is a reasonable expectation for transit growth.
- The benefit-cost analysis determined that the 9% transit mode share target is the optimal scenario since the lowest costs for road infrastructure and transit are at the 9% target.
- The benefits of reduced emissions and congestion delay at the 9% target are similar to the benefits for the 11% transit mode share.
- The 9% transit mode share target provides the best balance with KTMP goals and is the most cost-effective solution in terms of overall costs for transit and roads for the defined level of congestion.

A broad range of improvements and investments in Kingston Transit will be required over the next 20 years in order to meet the 9% mode share target. The details of the implementation will be developed as part of Kingston Transit's service review, which should be completed at least every 5 years with the next operations plan to be developed in 2016.

## **Transportation Demand Management (TDM)**

Transportation Demand Management (TDM) is a series of specialized policies, programs, partnerships and performance evaluation recommendations with the following primary goals:

- Reduce automobile use by prioritizing walking, cycling, public transit
- Encourage travel during less congested time periods
- Encourage the use of less congested routes
- Change travel patterns to reduce or eliminate trips

The City of Kingston's "Transportation Demand Management Strategy" (TDM) approved by Council in June 2011, influenced the development of City policies and initiatives such as the Kingston Transit Redevelopment Plan, a parking management strategy, a car-share program and consideration for a bike share program. Other specific TDM initiatives that the City is currently using include discounted and subsidized transit passes, increased levels of transit service, appropriate parking pricing policies and promotion of Park & Ride options.

As the City will continue to develop an integrated TDM program that expands on existing initiatives and establishes new programs, a trip reduction target of 5% is recommended for the KTMP update with an auto occupancy rate of 1.20.

## **Transportation Systems Management (TSM)**

Transportation Systems Management (TSM) measures are essential to maximize the efficiency of the existing transportation infrastructure. TSM considers opportunities to defer or eliminate major new roads or road widening projects by investing in more localized improvements to optimize the efficiency of the existing road network.

Since the 2004 KTMP, the City has been implementing TSM with the construction of turning lanes at key intersections and the installation of advanced traffic signal controllers and equipment to improve traffic signal coordination. Other techniques currently in place include the regular review and optimization of traffic signal timings along arterial road corridors and the use of

portable variable message signs to alert travellers of construction zones, collisions and detour routes.

The 2015 KTMP establishes a target of 5% for the expected additional capacity through the use of TSM. The use of technology to improve the operation of traffic signals is key to the overall TSM strategy. The recommended strategy continues to address traffic operations with intersection improvements such as the installation of dedicated left and right-turning lanes and the optimization of traffic signal timings with a focus on transit priority measures that could include queue jump lanes.

## Road Network

Since the 2004 KTMP, the following major road projects have been completed in the City:

- Centennial Drive extension (Bath Road to Taylor Kidd Boulevard)
- Centennial Drive extension (Princess Street to Resource Road)
- Bayridge Drive extension (Cataraqi Woods Drive to Creekford Road)
- Cataraqi Woods Drive (Midland Avenue to Gardiners Road)
- Cataraqi Woods Drive (east of Gardiners Road to Centennial Drive)
- Cataraqi Woods Drive (Bayridge Drive to Princess Street)
- John Counter Boulevard (Division Street to Montreal Street)
- John Counter Boulevard (Division Street to Sir John A. Macdonald Boulevard)

Municipal Class Environmental Assessment (EA) studies have been completed for the following roads since the 2004 KTMP:

- John Counter Boulevard widening from 2 to 4 lanes - construction completed from Division Street to Sir John A. Macdonald Boulevard with planned continuing work from Sir John A. Macdonald Boulevard to Princess Street (Ministry of Environment approval 2005)
- Wellington Street Extension (Ministry of Environment approval 2008)
- Third Crossing of the Cataraqi River (Ministry of Environment approval 2013)



Level of Service (LOS) is a measure used by traffic engineers to assess how traffic is operating. For the KTMP, the LOS during the afternoon (PM) peak hour is utilized. For automobile travel, the volume to capacity ratio (v/c) is a tool used to identify the congestion level on a road. The recommended target for identifying road improvements in the 2015 KTMP is to revise the volume/capacity ratio from 0.9 (LOS D) to 1.0 (LOS E). This LOS threshold will allow the City to defer capital costs until roads reach capacity.

If growth occurs as expected and if the City meets its targets for the reduction of trips through increased active transportation, transit and TDM, congestion is still expected to occur. The following road projects, combined with the other measures described in the 2015 KTMP, are expected to address long-term transportation needs in the City.

1. Third Crossing of the Cataraqui River
2. Wellington Street Extension
3. John Counter Boulevard
4. Bayridge Drive
5. Cataraqui Woods Drive
6. Centennial Drive
7. Highway 15
8. Leroy Grant Drive

## **Financial Assessment**

The recommendations for active transportation, transit, TDM and TSM, as well as the target set for the level of service threshold, permit the City to defer the need for some road infrastructure expenditures. The City's commitment to support sustainable and active forms of transportation reduces the dependence on costly road construction projects.

The capital investments listed in the table below account for new infrastructure and related transportation services required to support growth within the City over the next 20 years as well as the replacement and rehabilitation of existing transportation infrastructure over the same time period. The capital investment in active transportation is slightly lower than the corresponding

mode share target, the investment in transit is higher than the corresponding mode share target and the investment in roads is essentially the same as the mode share target.

When the investments in TDM and TSM are combined with the investments for active transportation, transit and roads, the total capital cost in 2014 dollars needed to implement the recommendations of the 2015 KTMP over the next 20 years is \$740 million.

**Table E-3. Capital Investments (2014 dollars)  
Transportation Infrastructure and Related Services (2014 - 2034)**

<b>Transportation Program</b>	<b>Development Charges</b>	<b>Tax-based Funds</b>	<b>Total Investment</b>	<b>%Total Capital Investment</b>	<b>2015 KTMP Mode Share Target</b>
Active Transportation	\$34,000,000	\$62,000,000	\$96,000,000	14%	17%
Transit	\$13,000,000	\$72,000,000	\$85,000,000	12.5%	9%
Roads	\$195,000,000	\$305,000,000	\$500,000,000	73.5%	74%
<b>Sub-Total</b>	<b>\$242,000,000</b>	<b>\$439,000,000</b>	<b>\$681,000,000</b>	<b>100%</b>	<b>100%</b>
TDM	\$1,000,000	\$17,000,000	\$18,000,000		
TSM	\$12,000,000	\$29,000,000	\$41,000,000		
<b>Sub-Total</b>	<b>\$13,000,000</b>	<b>\$46,000,000</b>	<b>\$59,000,000</b>		
<b>TOTAL</b>	<b>\$255,000,000</b>	<b>\$485,000,000</b>	<b>\$740,000,000</b>		

Affordability is key to the management of the transportation network and must be considered at every step of a project. All new services and infrastructure will require funding for operations and ongoing maintenance as well as capital cost funding to help ensure public safety. Maintenance costs and operating costs that reflect the needs of the City’s transportation system must be adequately addressed in future budgets to minimize life-cycle costs and maintain service to the public. The City needs to establish an affordable budget and examine priorities on an annual basis to match available funding.

## Implementation and Monitoring Plan

The key recommendations of the KTMP include strategic policies and improvements for transportation infrastructure and related services. It is recommended that the City allocate funds for the further development and implementation of these recommendations to support the strategic direction of the 2015 KTMP.

The detailed list of projects within the short, medium and long-term plans are provided within the 2015 KTMP with a financial summary as follows:

**Table E-4. Financial Summary for 2015 KTMP**

<b>Plan</b>	<b>Time Period</b>	<b>Capital Expenditures (2014 dollars)</b>
Short-Term	2014 - 2020	\$199 million
Medium-Term	2021 - 2027	\$311 million
Long-Term	2028 - 2034	\$230 million
<b>TOTAL</b>		<b>\$740 million</b>

Monitoring the City’s progress with regard to mode share targets, safety and level of service will allow the City to make revisions to programs and policies as needed in order to reflect the objectives of the KTMP. The Implementation Plan for the 2015 KTMP includes on-going reviews of the KTMP and the Kingston Transportation Model and completion of an Active Transportation Master Plan. To support these studies, the City should undertake the following:

- Update the Kingston Transit Operations Plan (2016)
- Complete the Active Transportation Master Plan (2016/2017)
- Update the Household Travel Survey (2017)
- Update the Kingston Transportation Model (2018)
- Review the KTMP (2019)
- Complete the Parking Intensification Study (2020)
- Collect detailed traffic counts that include pedestrians, cyclists and vehicles (on-going)

- Conduct pedestrian and cyclist surveys (on-going)
- Assess transit ridership and performance (on-going)
- Perform road safety evaluations (on-going)
- Assess parking utilization (on-going)

The KTMP will be reviewed at 5-year intervals along with the update to the Household Travel Survey, the Transportation Model and the Active Transportation Master Plan.

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## 1. Introduction

The Kingston Transportation Master Plan (KTMP) provides the long-term strategic framework for the development of transportation policies, networks, programs and priorities. The KTMP is based on projections for population, employment and land use and establishes the future direction for transportation. The KTMP sets a vision for the various modes of travel within the City, which includes walking, cycling, transit and automobiles and evaluates needs throughout the City. A Transportation Master Plan is a high-level strategic document that provides the background information for more detailed studies that must be completed before transportation projects can be implemented.

The City's Official Plan provides a 20-year blueprint for future land uses and development within the municipality. The Official Plan establishes goals and strategies that take into consideration important land use, social, cultural, economic and environmental factors. Under the requirements of the Planning Act, the Official Plan is required to be updated every five years. At the beginning of 2015, work began on the five-year update of the City's Official Plan, a project that is being integrated with the development of the City's new Comprehensive Zoning By-law. In addition to the Planning Act requirements, the five-year update incorporates results from City-led studies and policy reports, provisions from the 2014 Provincial Policy Statement and consideration of planning issues raised by staff, citizens and stakeholders.

One of the foundational studies reflected in the Official Plan is the Kingston Transportation Master Plan. The KTMP is incorporated throughout the Official Plan in its policies and schedules. The recommendations provided in the 2015 KTMP are consistent with the policies outlined in the existing Official Plan and have been confirmed through the draft of the five-year update to the Official Plan.

Future population and employment projections, future land use and the characteristics of the existing transportation network in the City, will result in deficiencies in the transportation system by 2034. According to the City's Official Plan, the transportation goal is:

“To promote an integrated and diverse transportation system for the City through the encouragement of land use patterns, density, road and site design that supports walking, cycling, and transit, as well as commercial traffic, inter-regional travel, and private vehicles. It is the intent of the transportation policies that the system is safe, convenient, affordable, efficient and energy-conserving, while minimizing environmental impacts. This will ensure that community resources are accessible to all residents and the City’s health and sustainability are fostered.”

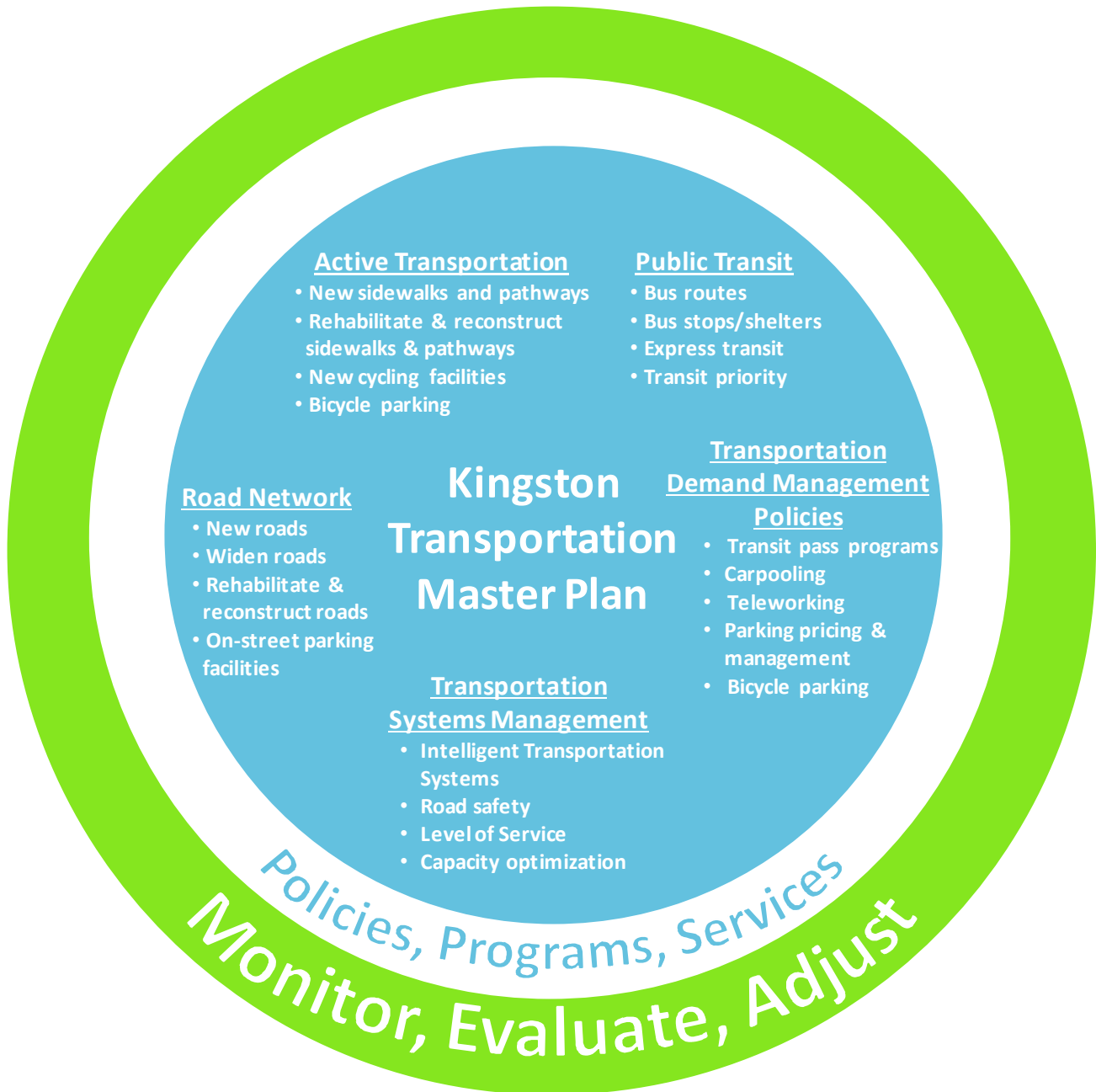
The 2015 KTMP assesses the City’s current and future transportation system by building on previous work that includes the 2004 KTMP, the 2008 Household Travel Survey and the 2009 Transportation Model Update. It examines the City’s transportation needs to the year 2034 with updated forecasts for population, employment and land use and considers future travel needs, areas of traffic congestion, funding constraints and competing priorities.

As illustrated in **Figure 1-1**, the 2015 KTMP evaluates and considers the following five key components in order to determine how to address transportation requirements for the next 20 years:

1. Active Transportation (Walking and Cycling)
2. Public Transit
3. Transportation Demand Management (TDM)
4. Transportation Systems Management (TSM)
5. Road Network

Active Transportation includes walking and cycling and related policies, programs and infrastructure. Transportation Demand Management (TDM) includes measures to reduce the number of vehicle trips during the peak period including transit use, active transportation and carpooling. Transportation Systems Management (TSM) includes measures to increase the operational efficiency of existing infrastructure.

**Figure 1-1 Components of the 2015 KTMP Update**



**1.1 Background**

The City’s first Transportation Master Plan was completed in 2004 and was supported by information collected by the 2002 Household Travel Survey. The Household Travel Survey is

typically completed in advance of an update to the City's Transportation Model and forms the beginning of the KTMP update process.

The 2004 KTMP proposed revised transportation policies and identified improvements to facilities for pedestrians and cyclists, transit enhancements and recommendations for roadway upgrades. In 2008, the City updated their growth forecasts and conducted another Household Travel Survey. This work was used to complete the 2009 update to the City's Transportation Model, which was then utilized to develop trip forecasts for the 2015 KTMP. Since significant upgrades to pedestrian and cycling facilities as well as the introduction of Express Transit have only occurred recently, another travel survey at the start of this study would likely have yielded similar modal splits to the 2008 Household Travel Survey. For these reasons, the Household Travel Survey was not updated for the 2015 KTMP. A planned update to the Household Travel Survey in 2017 will provide an opportunity to review the mode share targets in advance of the review of the KTMP in 2019.

The timeline and schedule for KTMP-related work is outlined below.

- 2002 – City's first Household Travel Survey completed
- 2004 – City's first Transportation Master Plan (KTMP) completed
- 2008 – Household Travel Survey completed
- 2009 – Transportation Model Update & growth forecasts completed
- 2013 – Transportation Model Update & growth forecasts completed
- 2015 – KTMP Update completed
- 2017 – Household Travel Survey to be completed
- 2017/2018 - Transportation Model Update & growth forecasts to be completed
- 2019 – KTMP to be reviewed

The strategic objectives within the 2004 KTMP were to reduce the demand for automobile trips, optimize existing road network usage while meeting the infrastructure needs for all modes. The following recommendations were made to accomplish these objectives:

- Implement integrated programs to manage the City's road network:
  - Promote alternatives to automobile use
  - Optimize road network and the space available for all modes of travel
  - Minimize impact of congestion
- Expand the road network to reduce congestion
- Allocate space to non-auto modes:
  - Remove barriers to non-auto travel
  - Reduce delay to transit users and improve transit system reliability
  - Implement practices to extend the life of roadways
- Apply Area Traffic Management Techniques:
  - Transportation Demand Management (TDM)
  - Traffic Calming
  - Enforcement
  - Traffic Operations and Traffic Movements
  - Street Environment

Some of the short-term recommendations from the previous 2004 KTMP have already been implemented or are underway, while longer term recommendations are reviewed as part of the 2015 KTMP Update. Specific details on progress made since the 2004 KTMP are provided in later sections within this report.

## 1.2 Emerging Trends

As the KTMP is a long-term plan, the City's transportation system must be able to accommodate future growth in an efficient and sustainable manner. It is important to consider emerging trends and how an evolving transportation system could influence future transportation needs in the City. The key emerging trends incorporated within the direction of the KTMP are as follows:

- Population Growth
- Aging Population
- Climate Change and Sustainability
- Community Design
- Changing Economic Climate

- Energy Costs
- Community Health
- Role of Technology

### **Population Growth**

- Forecasts of population growth prepared by Meridian Planning Consultants predict that the population of Greater Kingston Area (which includes the townships surrounding the City) would grow by about 26,000 and employment would grow by about 13,000 jobs by 2041.
- The population and employment forecasts predict that growth in Kingston will peak between 2031 and 2033 followed by a gradual decline.

### **Aging Population**

- The increase in the population aged 65 or more will place demands on transportation systems. While the demand for commuter peak hour-travel may be somewhat constrained, discretionary travel that is most common during the afternoon peak may increase.
- Mid-day travel demands may grow faster than peak-hour travel demands and require increases in off-peak services for transit.
- People with mobility challenges may find it difficult to travel by transit, cycling or walking.

### **Climate Change and Sustainability**

- The City of Kingston has a vision to be Canada's Most Sustainable City, a vision that is reflected in the Sustainable Kingston Plan.
- Goals and actions for sustainable transportation include increase transit ridership, increase use of active transportation, reduce vehicle emissions, reduce impacts to natural areas and other environmental features, reduce urban sprawl and encourage communities with a mix of land uses to encourage walking, cycling and transit use and promote active lifestyles.

### **Community Design**

- To reduce dependency on the automobile, Kingston's Urban Growth Strategy and Official Plan encourage the development of mixed-use communities and focus on intensification within the urban boundary along with some well-planned new communities.

- The City's Draft Urban Design Guidelines describe best practices and important principles for designing new communities to support transit and active transportation.
- The City is undertaking the development of updated cross-sections for local, collector and arterial road requirements for both residential and industrial development in urban and rural settings within the context of the Complete Streets project.
- The City has committed through its OP to lead future secondary plan processes to ensure that new communities meet the goals of the City and its Official Plan.

### **Changing Economic Climate**

- Municipalities continue to face budget constraints with respect to the costs to build, operate and maintain transportation infrastructure.
- The quality of the transportation infrastructure and efficiency are key factors that influence an area's economic capabilities including growth, productivity and competitiveness. Transportation improvements that are most beneficial for the community need to be prioritized.

### **Energy Costs**

- Rising and fluctuating fuel costs could cause people to make fewer car trips, carpool more often, reconsider where they live and work and choose other modes of travel such as transit, cycling or walking.
- Rural residents can make fewer trips and can carpool but transit, walking and cycling alternatives are more applicable in urban areas. Rural areas need convenient park and ride lots with transit service to use transit for trips that include the urban area.

### **Community Health**

- Transportation infrastructure decisions can support active lifestyles and healthy communities. Active modes of transportation (walking and cycling) are generally feasible for shorter distance trips, which limits the number of trips that can use these modes.

### **Role of Technology**

- Technology will continue to influence the need to travel, time of travel and mode of travel.

- Technology is increasing opportunities to manage travel with online trip planners, GPS devices and online applications that find the best routes between locations.
- Intelligent Transportation Systems (ITS) are becoming more affordable. For example, computerized systems to control and optimize traffic signals across a city in real time are becoming more common and can provide improvements to traffic without physical improvements.
- Advances in vehicle technology are under development that may allow vehicles to operate with less space between vehicles which increases the capacity of an existing lane of traffic. The KTMP does not yet consider driverless cars or connected vehicle technology. While there is an awareness of the advances in technology, the technologies are still in their infancy. For example, the first driverless car testbed is expected to be in the United Kingdom and will operate with autonomous vehicles for the first test on the roadway in 2017. Connected vehicle technology is also still in the testing phase. The ACTIVE-AURORA research circuit (Canada's first testbed for connected vehicles) was launched in October 2014. ACTIVE-AURORA is a three-year project to collect and analyze connected vehicle data along the Asia-Pacific Gateway.

### **1.3 Public Consultation**

Throughout the 2015 KTMP consultation process, the public and a wide variety of stakeholders had several opportunities to participate in the planning process. All verbal and written comments and concerns were considered in the development of the report and are reflected in the final KTMP.

In order to gather opinions and information about transportation in the City, a Household Travel Survey was completed in 2008, a Public Attitude Transportation Survey was conducted in November 2013 and a Public Open House was held in June 2014. The Household Travel Survey is used to measure travel mode share and to assess whether mode share targets have been met. The Kingston Transportation Model is updated after completion of the Household Travel Survey since the model must identify corridors with capacity problems. The Public Attitude Survey is a poll of City residents that collects information about their opinions on transportation.



An advertising campaign to announce the commencement of the KTMP and to inform the public about the surveys included print advertisements in newspapers, messages on the City's Twitter feed and Facebook page and radio commercials.

The public clearly indicated a desire to encourage alternative modes of transportation rather than the automobile. The KTMP therefore continues to focus on active transportation, transit, Transportation Demand Management (TDM) and Transportation Systems Management (TSM). The emphasis of the KTMP clearly supports a shift toward modes of travel other than the automobile and making the most efficient use of the existing road network. The public consultation material is included in Appendix B.

### **Public Attitude Transportation Survey**

The Public Attitude Transportation Survey collected information from 846 respondents through both a telephone survey and an on-line survey. The survey collected information on the travel habits of Kingston residents from various age groups. The survey questions focused on the user's transportation preferences, habits regarding walking, cycling, and transit and the transportation needs that residents believe are important.

The opinions from the Public Attitude Transportation Survey helped develop and confirm the direction of the updated KTMP. Consultation is a requirement of the Transportation Master Planning process and the survey was one form of consultation undertaken as part of this study.

The Public Attitude Transportation Survey revealed that the most important overall factors that influence travel choices for Kingston residents are:

1. convenience (38%)
2. travel time (25%), and
3. cost (14%).

Health is another important factor as it was consistently identified by survey participants under the "other" category.

While many respondents did report using alternative transportation modes, the “auto driver mode” is still the most preferred mode choice for Kingston residents. The transit service and cycling each met some or most of the needs of approximately a third of the residents surveyed while walking met some or most of the needs of approximately 60% of the respondents.

The survey asked respondents to prioritize future transportation-related improvements and the following priorities were generally indicated:

- Regardless of travel mode, respondents believe that transit improvements, carpool lots/park and ride lots and cycle lanes and multi-use trails are important
- Auto and transit users believe that widening roads / building new roads is important, while those who regularly walk or cycle did not identify road improvements as important
- Reducing on-street parking downtown and allowing congestion to occur are not priorities.

### **Household Travel Survey**

During the 2008 Household Travel Survey, participants were asked questions about all of the trips made on the previous day by each household member over the age of fifteen by any mode. Walking, cycling, transit, driving a car and even rollerblading were acceptable travel modes and each trip was counted as long as the trip has an origin, a destination and a purpose. Walking around the block, or other trips classified as exercise, were excluded. Some statistical information was also gathered, including age, gender, employment status and number of vehicles available to the household. The sample size surveyed was 2.3% of the population over the age of fifteen, which is considered an acceptable sample size.

Since the Household Travel Survey included trips made by students, a separate trip generation category was included in the Transportation Model for student trips. It was assumed that student trip making would grow at the same rate as population growth.

Based on the expanded survey data it is estimated that on a typical weekday in Kingston, there are approximately 337,000 trips made, which is about 6% less than what was reported in the

2002 Household Travel Survey. A comparison of daily trip rates was made with other communities of a similar size based on the 2006 Transportation Tomorrow Survey, undertaken in the Greater Golden Horseshoe Area. The observed trip rates show that Kingston residents make slightly fewer trips per day than residents in the communities closer to the Greater Toronto Area (GTA), however this is to be expected given the age profile in the City. The City of Peterborough, with a similar age profile to the City of Kingston, has similar daily trips rates to those observed in Kingston.

## 2. Existing Transportation Systems

The existing transportation system includes facilities for pedestrians, cyclists and transit along with the road network. Road infrastructure is required to support active transportation in the form of cycling lanes and sidewalks, as well as transit and automobile travel. It is the most flexible type of infrastructure since all modes of travel can use road infrastructure.

### 2.1 Active Transportation – Walking and Cycling

Walking and cycling are gaining importance as strategies to improve the sustainability of a community by increasing the travel choices available to residents, supporting healthier and active lifestyles and by reducing the reliance on automobiles. According to the 2008 Household Travel Survey, walking and cycling account for about 14% of peak period trips in the City. Walking and cycling can serve both as a utilitarian mode of transportation for short to medium distance commuting and a form of recreational transportation for local residents and visitors such as bike tourism and cycling clubs.

An objective of the 2004 KTMP was to increase walking and cycling trips, especially during the peak hour. The following actions have since been completed to help achieve this objective:

- Installed cycling lanes to build the network across the City
- Provided additional bicycle parking spaces
- Developed guidelines for the installation of pedestrian facilities
- Developed accessible design standards for para-ramps on sidewalks
- Adopted bicycle parking design guidelines
- Installed sidewalks and connections for pedestrians along key corridors
- Equipped all transit buses with bicycle racks
- On-going communication with Kingston Cycling and Active Transportation (KCAT) and Cycle Kingston

The City's road network promotes the use of active modes of transportation with sidewalks, on-road cycling facilities as well as off-road pathways. This helps place neighbourhood commercial

areas within walking or cycling distance of residential land uses and maintains the vision of the Official Plan. The existing system for pedestrians and cyclists provides a framework for a versatile multimodal network.

The majority of Kingston's cycling network is located south of Highway 401, within the City's urban limits. The City manages approximately 120 km of multi-use pathways including the Waterfront Pathway, K & P Trail, Rideau Trail and Great Cataraqui Trail that serve recreational as well as transportation functions. In addition to the existing pathways system, the City is steadily expanding the on-road cycling network that includes paved shoulders, designated cycling lanes, signed routes and signed routes with shared-lane markings known as sharrows. Since 2008, approximately 131 kilometres of cycling infrastructure has been added to City roads. To encourage more walking trips, approximately 74 kilometres of new sidewalks have been installed along with 50 street benches. Sidewalks continue to be constructed and pedestrian countdown devices are being installed at many signalized intersections in order to provide greater comfort to pedestrians.

Pedestrian and cycling trips are commonly grouped together within the 2015 KTMP as they typically reflect shorter distance trips that are less than 10 kilometres. Both modes share many characteristics including cost and affordability, safety, design constraints, travel time, maintenance and directness. Maps related to walking and cycling are provided in Appendix A.

## **2.2 Public Transit**

Kingston Transit is a vital component of the City's goal for sustainable transportation. Kingston Transit has 17 local routes and three express routes that cover the urban areas of the City. All routes operate seven days per week with extra service added during the weekday rush hour periods.

An important objective of the 2004 KTMP was to increase the use of public transit. Actions completed since that time to make transit more attractive and improve ridership include:

- Implemented express routes and more frequent service during peak hours

- Refined local routes for more competitive travel times
- Added routes linking the VIA train station, bus station, downtown, Queen's University and St. Lawrence College
- Increased service linking suburban areas to downtown and employment centres
- Installed more accessible shelters and benches
- Marketed programs to major employers, schools, and organizations
- Implemented online trip planning tools that provide door-to-door trip planning
- Installed Smartcard farebox and next stop annunciation systems on the transit fleet
- Added park-and-ride lots to connect to the local and express service
- Introduced tourism and visitor passes
- Supported land use patterns that promote a "transit first" approach that prioritizes transit services during the development application process under the Planning Act

Kingston Transit has experienced steady growth in transit ridership in recent years, from approximately 2.5 million in 2002 to 4.2 million in 2014, an increase of approximately 5.7% per year. Compared to the corresponding population growth rate of approximately 0.6% per year since 2001, transit's growth rate exceeds that of the population.

The 2008 Household Travel Survey revealed a PM peak period transit mode share of 5% for trips originating within the City of Kingston, up from a 3% mode share in 2003. The estimated PM peak hour ridership on Kingston Transit in 2009 paralleled the data from the 2008 survey with 4,200 riders or 5% of the trips being taken by transit.

In August 2011, Kingston Transit released its Redevelopment Plan (KTRP) for 2011 to 2015. This document identified a plan for improved transit service to increase ridership. The major goals and objectives of the KTRP include improving the route network, improving customer experience and improving productivity and service value to produce an efficient and effective use of the City's resources.

The plan was divided into several phases: a preliminary phase that was completed in September 2010, Phase 1 in September 2013, Phase 2 in May 2015, with longer-term improvements

recommended for implementation after 2015. The key feature of the plan was the introduction of new express routes along major corridors that provide more frequent buses with greater stop spacing. The KTRP also recommended changing many local routes to support and feed the new express routes. The plan also included recommendations for improving bus stop amenities, fleet expansion to support the additional service, maintenance and storage facility requirements and technology enhancements, including transit signal priority, data collection systems and improved rider information.

In September 2013, Kingston Transit initiated its first two express routes as part of the first phase of the Redevelopment Plan. These two routes link the residential areas of the west end of the City to the downtown and serve Cataraqui Centre, Kingston Centre, downtown Kingston, Queen's University, Kingston General Hospital and St. Lawrence College. Since that time, PM peak hour ridership has risen with an observed average weekday PM peak ridership of 4,450 riders in the fall of the 2014. Further increases in the PM peak ridership are expected with the introduction of the remaining express routes in May 2015.

### **2.3 Transportation Demand Management (TDM)**

Transportation Demand Management (TDM) is a series of specialized policies, programs, partnerships and performance evaluation recommendations with the following primary goals:

- Reduce automobile use by prioritizing walking, cycling and public transit
- Encourage travel during less congested time periods
- Encourage the use of less congested routes
- Change travel patterns to reduce or eliminate trips

Since the 2004 KTMP, the following work has been completed regarding parking strategies that support transit and active transportation for peak period trips:

- Active management and monitoring of the downtown parking supply
- Harmonization of the parking by-laws to provide consistent and streamlined parking regulation across the City

- Implementation of Pay and Display parking meters and gate systems for better monitoring of usage
- Implementation of on-street parking permit program to encourage short-term parking with the provision of long-term parking for residents
- Relocation of tour bus parking to more convenient on-street locations in the downtown
- Communicate with large employers and institutions to manage the public parking supply and to encourage a shift to alternative modes

To encourage ride-sharing, the 2004 KTMP recommended park and ride lots at strategic locations around the City, where they could connect to transit. The Ministry of Transportation has carpool lots at the Highway 15, Montreal Street and Gardiners Road interchanges with Highway 401 and the City now operates park and ride lots at the Invista Centre, Centre 70 and the Kingston Gospel Temple.

A TDM Strategy report was prepared for the City of Kingston in 2011, to develop policies to promote efficiency in the transportation system. The concepts discussed in the TDM Strategy influenced the development of City policies and plans such as the Kingston Transit Redevelopment Plan and the transit and parking rate review. A car-share program has been initiated with support from the City and other partners. The feasibility of implementing a bike-share program is also under consideration. The City continues to work on the action items listed in the TDM Strategy document.

## **2.4 Transportation Systems Management (TSM)**

With the high cost of road improvements coupled with funding limitations, the City of Kingston needs to consider innovative ways to maximize the use of the existing infrastructure.

Transportation Systems Management (TSM) considers opportunities to defer or eliminate major new roads or road widening projects through the investment in localized improvements that optimize the efficiency of the existing road network.

The use of technology to improve the operation of traffic signals and increase the capacity on existing roads is critical to the overall TSM strategy. Since the 2004 KTMP, the City has been



implementing TSM with the construction of turning lanes at key intersections and with the installation of advanced traffic signal controllers and equipment to better co-ordinate traffic signals. Other techniques currently in place include the regular review and optimization of traffic signal timings along arterial road corridors and the use of portable variable message signs to alert travellers of construction zones, collisions and detour routes.

Road safety is also an important component to consider when optimizing the capacity of roads and intersections within the City. Since the 2004 KTMP, City Council has endorsed the following road safety initiatives:

- Traffic Calming Policy (2007 with updated policy in 2013)
- Pedestrian Crossing Guidelines (2008)
- Guidelines for the Installation of New Traffic Signals (2009)
- Guidelines for the Installation of All-way Stop Control (2010)
- Guidelines for Establishing Posted Speed Limits - urban, rural and school zones (2011)

Other road safety initiatives include:

- Council provided direction in 2014 to install red light cameras at 10 intersections in 2017.
- City staff continue to monitor the collision database and complete detailed safety reviews as required.
- An on-going traffic counting program collects detailed information about the number of pedestrians, cyclists and vehicles that travel on City streets and through intersections.
- Vehicle speed studies are completed on a regular basis.
- Variable message boards are deployed in order to remind motorists to slow down.
- City staff meet with Kingston City Police regularly to discuss specific road safety concerns and enforcement for red light infractions, speeding and school zone safety.

## 2.5 Road Network

The road network serving Kingston includes Provincial highways (Highway 401, Highway 15 north of Highway 401 and Highway 33 west of Collins Bay) and municipal arterial, collector and local roads.

Highway 401 is the primary inter-city freeway and regional route connecting Kingston to other major highways in the province. Interchanges on Highway 401 within the City of Kingston are at Joyceville Road, Highway 15, Montreal Street, Division Street, Sir John A. Macdonald Boulevard, Sydenham Road and Highway 38/Gardiners Road.

Arterial roads are designed to move traffic and connect to Provincial highways and other arterial and collector roadways. Some arterial roads in Kingston are Highway 2, Highway 15, John Counter Boulevard, Princess Street, Bath Road and Montreal Street. Collector roads such as Union Street, Joyceville Road and Portsmouth Avenue provide connections between local roads within the residential / commercial areas and arterial roads and they also serve as property access. The primary function of local roads is property access in residential and commercial areas. Railways, rivers and wetland areas reduce connectivity in some areas of the existing road network.

The City's detailed road and pavement condition assessment is critical to prioritize which roads need to be rehabilitated or reconstructed. A map of the road network is shown in Appendix A.

Since completion of the 2004 KTMP, the following road construction projects have been completed:

- Centennial Drive extension (Bath Road to Taylor Kidd Boulevard)
- Centennial Drive extension (Princess Street to Resource Road)
- Bayridge Drive extension (Cataraqi Woods Drive to Creekford Road)
- Cataraqi Woods Drive (Midland Avenue to Gardiners Road)
- Cataraqi Woods Drive (east of Gardiners Road to Centennial Drive)
- Cataraqi Woods Drive (Bayridge Drive to Princess Street)

- John Counter Boulevard (Division Street to Montreal Street)

The following Municipal Class Environmental Assessment (EA) studies have also been completed since the 2004 KTMP:

- Wellington Street Extension, a two-lane arterial, connecting Bay Street to John Counter Boulevard using an existing abandoned rail corridor (approved by MOE 2008)
- John Counter Boulevard widening from two to four lanes - construction was completed from Division Street to Sir John A. Macdonald Boulevard in 2014 with planned continuing work from Sir John A. Macdonald Boulevard to Princess Street (environmental clearance 2005)
- Third Crossing of the Cataraqui River from John Counter Boulevard on the west shore to Gore Road on the east shore (approved by MOE 2013)

### 3. Future Transportation Needs

Future transportation needs are identified with forecasted traffic volumes that are based on population and employment growth. A statement of transportation needs and opportunities describes deficiencies in the transportation system and opportunities for improvements to active transportation, transit, Transportation Demand Management, Transportation Systems Management and the road network.

#### 3.1 Future Growth Forecasts

The population and employment growth forecasts assumed for the 2015 KTMP are based on the growth forecasts developed for “City of Kingston and Kingston Census Metropolitan Area (CMA) Population, Housing and Employment Projections Report”, by Meridian Planning<sup>1</sup>. The Kingston CMA includes the City of Kingston, the Township of South Frontenac, the Township of Frontenac Islands and Loyalist Township.

Population and employment growth projections completed by Meridian did not include student populations. Student enrolment numbers for Kingston institutions were however used along with information from the Household Travel Survey that pertained to students in order to account for student trips within the Transportation Model for the KTMP.

**Table 3-1** summarizes the projected population growth for the Kingston CMA from the Meridian Planning report.

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<sup>1</sup>Meridian Planning Report: City of Kingston and Kingston CMA Population, Housing and Employment Projections. September 2013 (updated October 2013)

**Table 3-1 Projected Population Growth Kingston CMA (2011 – 2041)**

Year	City of Kingston Population Forecast	CMA Population Forecast (outside City of Kingston)	Total Kingston CMA Population Forecast
2011	123,410	36,190	159,600
2021	135,720	40,570	176,290
2031	147,960	44,210	192,170
2041	142,850	42,680	185,530

Based on the above forecasts, the population in the Kingston CMA will increase by 21% from 2011 to 2034 when the population is expected to peak, then gradually decline to 185,530 by 2041. From a transportation perspective, this will influence the distribution of people in Kingston. Older established neighbourhoods may experience a reduction in population as the average household size decreases, while the population may increase in new growth areas, where larger household sizes are expected.

Forecasts of future employment growth were prepared for each major sector of employment (Industrial, Commercial, Institutional and Primary industries). Forecasts were also prepared for residents who work at home, assuming a gradual increase in the work-at-home rate by 2041. Additionally, for residents who are employed but do not have a fixed place of work such as construction workers, truck drivers, delivery and sales representatives, estimates in this category were made based on patterns from the 2011 Census. **Table 3-2** presents the projected employment growth from the Meridian Planning report (Exhibit B Base Case).

**Table 3-2 Projected Employment Growth Kingston CMA, 2011 – 2041**

Year	Employment City of Kingston	Employment CMA outside the City	Employment Total Kingston CMA
2011	67,510	6,000	73,510
2041	79,870	6,710	86,580

**3.2 Allocation of Future Population and Employment**

Once population and employment numbers are estimated for future years, these numbers are assigned to various areas of the City to predict where trips will occur.

Allocation of future population was based on the inventory of “Pending and Committed Urban Residential Subdivisions Report” by the City of Kingston Planning, Building and Licensing Services Department dated December 31, 2013.

Allocation of future population also considered intensification along the Princess Street Corridor, future short to medium- term secondary planning areas such as Clogg’s Road, the Alcan site, Sydenham Road at Highway 401 and other areas where there are vacant residential lands such as the former Psychiatric Hospital Lands on King Street West and potential development in the North Block. Road infrastructure is required to service land that will be developed. Some road projects expected by the City are intended to provide access to development areas.

The allocation of future employment growth to various areas of the City was based on the inventory of vacant employment lands and maps provided by the City of Kingston’s Planning Division in January 2014 and used in the City’s Development Charges background work. Work-at-home employment was based on the population in each area of the City and the ratio of 0.029 work-at-home employees per capita. For employment with no fixed workplace, the results of the 2008 Household Travel Survey were used to allocate these jobs.

More population and more employment will increase the number of trips that will occur during peak periods. Trips may be made by transit, automobile or active transportation modes.

### **3.3 Forecasting Future Transportation Deficiencies**

The City's Transportation Model was used to forecast travel demands, assess future transportation needs and identify potential areas of congestion in the City. Congestion problems identified in the model were addressed through a shift in travel mode from automobile to transit or active transportation, through transportation systems improvements, road widenings, building new roads and through the reduction in peak hour trips through the implementation of various transportation demand management programs. The KTMP study identified the different strategies that the City can utilize to address future transportation needs along with appropriate targets for each strategy.

The Transportation Model forecasted PM peak hour traffic volumes on the road network within the City and in the surrounding areas and defined the origin year as 2014 and the horizon years as 2024 and 2034. The evaluation of future conditions included all transportation-related projects completed up to 2013 as well as the widening of Highway 401 from 4 to 6 lanes between Montreal Street and Highway 15. The base-case scenario within the Model for 2034 assumed that the number of trips by walking, cycling and transit remained the same as in 2014 and that there were no modifications to the road network between 2014 and 2034.

The Transportation Model indicated that in 2034, approximately 81 kilometres or 8% of the City's road network will exceed acceptable levels of congestion. Sections of major arterial roads are expected to experience high levels of congestion. In general, additional north-south capacity is required in several areas from the Cataraqui River westerly to Collins Bay. Additional east-west capacity is also required across the Cataraqui River and between downtown and Little Cataraqui Creek. The alternatives that are available to address these capacity assessment needs are assessed in detail later in this report.

### **3.4 Problem Statement**

Future transportation issues in the City must be resolved through improvement strategies that align with the goals of the Official Plan. These strategies must consider multi-modal travel and

address the expectations for a positive travel experience. The transportation problems and opportunities that the City is expected to face by 2034 include the following:

- **Road Network Capacity Deficiencies** – The population of the City of Kingston is forecasted to grow by over 24,000 new residents and over 14,000 new jobs are expected by 2034. The projected population and employment growth within the City of Kingston will generate more trips that will increase pressures on the road network. Congested roads in urban areas often have constraints for infrastructure improvements. This emphasizes the importance of initiatives to encourage alternative travel modes such as walking, cycling and transit and to manage travel demand during peak travel periods.
- **Lack of Road Network Connectivity** – With much of the population growth allocated to areas outside of the downtown core, road network connectivity is essential between growth areas and commercial areas, employment areas, provincial highways and the downtown core. The feasibility of addressing gaps in the road network must be determined.
- **Public Transit Opportunities** – The City’s transit service is focused in the urban areas of Kingston and the improvements outlined in the Kingston Transit Redevelopment Plan should result in higher ridership. To encourage people to shift from cars to transit, the overall “door-to-door” travel time must be competitive, the service must be reliable, convenient, cost-effective and have the capacity to accommodate new riders. This will require increased service frequency, transit signal priority measures, fleet expansion and appropriate TDM policies, most notably in the provision of public parking. Additionally, rural residents require convenient transit connected park and ride locations to improve access to the urban area served by transit.
- **Active Transportation Opportunities** – The existing active transportation network is discontinuous. In order to encourage more walking and cycling trips, improvements to the network are required in order to improve the comfort and convenience of active transportation.



- **Transportation Demand Management Opportunities** – The implementation of the recommendations within the Kingston Transportation Demand Management Strategy is expected to reduce the demand for trips in peak periods and promote walking, cycling, transit and carpooling.
- **Transportation Systems Management Opportunities** – The implementation of measures to increase the efficiency of the existing road network is expected to improve the level of service on the road network and reduce the pressure to build new roads and widen existing roads.

## 4. Strategic Assessment of Transportation Alternatives

The recommended strategy in the 2004 KTMP was “A New Direction”, which emphasized that non-automobile modes should be prioritized before the consideration of road network improvements. The 2015 KTMP continues to focus on sustainable modes of transportation and supports investments in active transportation and transit. This support combined with an acceptance of a greater level of delay for vehicles will allow the City to defer road improvements and help achieve the City’s vision of sustainability. This approach requires an integrated solution that considers policies that influence land use, parking supply and pricing and integration of travel modes as well as infrastructure investment.

As indicated by detailed traffic counts completed throughout the City, the PM peak hour is the time of day with the highest volume of traffic on most roadways. For this reason, the PM peak hour is the time period considered for the KTMP’s strategic assessment of transportation alternatives.

The following sections provide further detail regarding the effectiveness of various transportation strategies with consideration for the Transportation Model results, comments from the public consultation, best practices from other jurisdictions and the estimated costs of infrastructure investments.

### 4.1 Active Transportation

Walking and cycling can reduce reliance on the car for short to medium distance commuting trips and can facilitate connections to transit. Active transportation also serves as recreation for local residents and visitors.

Trips that included transit as part of the journey were included in transit mode share. In the 2008 Household Travel Survey, walking and cycling accounted for about 14% (13% walking and 1% cycling) of PM peak hour trips in the City. In order to determine potential future mode share targets for active transportation, the average trip length cited within the 2008 Household Survey for walking and cycling trips was considered. People are more likely to choose active forms of

transportation as the length of their trip becomes shorter. To increase the active transportation mode share, there must be significant increases in the number of short-distance walking and cycling trips.

Under base-case conditions for 2034, it was estimated that people would choose active transportation as follows:

- 26% of people would use active transportation for trips under 5 km
- 11% of people would use active transportation for trips between 5 and 10 km
- 7% of people would use active transportation for trips more than 10 km

**Table 4-1** below highlights the active transportation and transit targets from Ontario municipalities that are similar in population and characteristics to Kingston. Some ranges are shown where TMP’s have set targets based on different scenarios that range from moderate to aggressive.

**Table 4-1 Transportation Targets in Comparable Ontario Municipalities**

<b>Municipality</b>	<b>Transit Target</b>	<b>Active Transportation Target</b>
City of Peterborough	6%	8%
City of Barrie	7 - 12%	12 - 20%
City of Belleville	4.5%	n/a
City of London	10 - 20%	15%
City of Kingston	9%	17%

Increased active transportation mode share targets must include the implementation of infrastructure and policies such as cycling master plans, bicycle sharing programs, advisory committees that provide guidance to council, enhanced winter maintenance and educational and enforcement programs.

The cycling mode share target within the 2015 KTMP projects that cycling ridership will increase from 1% to 3% by 2034 in the City which represents a 200% increase. Almost 40% of respondents in the Public Attitudes Transportation Survey indicated that their place of employment is within 5 km of home, which makes them potential candidates for active transportation.

One of the challenges for active transportation is the allocation of future residential land use relative to employment areas. The majority of planned population growth is north of Princess Street and east and west of Gardiners Road. While there is a large employment node just east of Gardiners Road along Centennial Drive, the bulk of the employment in the City will continue to be located in the downtown area, which is over 9 km away. Another challenge for active transportation is the climate and the reduced active transportation mode share during the winter.

Since the existing active transportation mode share is 14% and almost 40% of residents potentially live within 5 km of work, a 17% (14% walking and 3% cycling) active transportation mode share target was selected for the 2015 KTMP. An additional 2,700 people will need to switch to active transportation to achieve this target. This increase in active transportation results in a modest decrease in automobile traffic. Because of the locations of future growth areas within the City, the ability to increase the active transportation mode share is somewhat limited since most trips from these areas would be greater than 5 km. The planned intensification along the Princess Street Corridor and in the downtown area will however facilitate an increase in the active transportation mode share.

Active Transportation mode share targets need to be set and embraced by City Council and the Administration. The chosen targets should represent a challenge to achieve, yet be realistic. An update to the Household Travel Survey in 2017 will provide an opportunity to assess the effectiveness of the investment in facilities and programs to support walking and cycling. The active transportation targets will be reviewed again as part of the KTMP review in 2019 and adjusted if required.

## 4.2 Public Transit

The role of transit is an important element of the 2015 KTMP since continued improvements in service are required to achieve increases in transit ridership. The transit mode share percentage includes combined transit + walk trips and transit + cycle trips. The City has made progress towards increased transit ridership in recent years through investments in the transit system and service improvements.

The transit mode share target for the 2015 KTMP was selected based on data collected and studies undertaken since the 2004 KTMP that include an analysis of the impacts associated with a range of transit mode share targets. The following elements were considered in the selection of the most appropriate transit mode share:

- peak hour transit ridership needed to achieve the target
- transit operating costs to accommodate that ridership
- transit capital costs for new buses
- reduction in congestion associated with more transit use
- deferred road construction that would be achieved with increased transit use

The 2008 Household Travel Survey revealed a PM peak period transit mode share of 5% for trips originating within the City which is an increase from the 3% share in 2003. The estimated PM peak hour ridership on Kingston Transit in 2009 paralleled the data from the 2008 Household Travel Survey with 4,200 riders or 5% using transit. Peak period ridership figures supplied by Kingston Transit from the Fall of 2014 have similar peak period transit use, despite strong annual ridership growth of 11% over this same time period. This suggests that the bulk of the ridership growth was achieved during the off peak and is supported by the average weekday PM peak ridership of 4,450 riders in 2014.

PM peak hour ridership is expected to increase with the new express bus routes. Express routes implemented in September 2013 (the route 501 and 502) were included in the analysis of the 2014 PM peak mode share with ridership information from October 2014. The entire express routes plan was considered in the development of the future ridership projections. With the

addition of new express routes in May 2015, the City currently has three express routes in operation.

With the information from the 2008 Household Travel Survey and recent ridership numbers, the 2004 KTMP transit target of 11% was re-considered and the 2015 KTMP developed a process to select an achievable target. Transit mode share targets that ranged from 5% to 15% were assessed for the PM peak in 2034.

To achieve the overall transit mode shares, higher transit use is required in the downtown area to compensate for typically lower transit use in suburban areas. The split between downtown area and suburban targets is shown in the **Table 4-2** below.

**Table 4-2 Required Mode Share by Area to achieve Overall Mode Share**

<b>Overall Mode Share</b>	<b>5%</b>	<b>8%</b>	<b>9%</b>	<b>11%</b>	<b>15%</b>
Downtown Mode Share	6.5%	12.0%	14.0%	18.0%	24%
Suburban Mode Share	3.1%	3.9%	4.1%	4.4%	6.2%

For example, a 9% overall transit share could be achieved with 14% of downtown trips and 4% of suburban trips. With a transit mode share target of 9% by 2034, the PM peak hour riders are projected to increase from 4,450 to 9,250, which is more than double the number of existing transit riders in the PM peak.

The Kingston Transportation Model was used to assess the range of transit mode share targets. For each scenario, evaluation measures were generated from the modelling work that included estimates of peak hour transit ridership, increased transit operating costs and transit capital costs for new buses, the extent of road network congestion and associated road widening costs, estimated greenhouse gas emissions and user delay savings due to reduced congestion.

As shown in **Table 4-3**, similar overall costs were identified for the 5%, 8% and 11% transit mode share, when the costs required for needed road infrastructure improvements were added to the

capital and operational costs needed for transit. The road infrastructure costs are not a project-based cost estimate. The costs presented are based on the order of magnitude at \$3.9 million per km for each km of roadway that is expected to be over capacity. The costs are based on a typical urban arterial road widening from 2 to 4 lanes and exclude property and additional costs for major structures. A reduced investment in road infrastructure permits additional funds to be invested in transit.

**Table 4-3 Costs in 2034 for Transit Mode Share Targets (2014 millions of dollars)**

<b>Overall Mode Share</b>	<b>5%</b>	<b>8%</b>	<b>9%</b>	<b>11%</b>	<b>15%</b>
Annual Operating Cost	20	31	33	39	51
Capital Cost	0	17	22	32	52
Total Transit Cost	20	48	55	71	103
Road Infrastructure Costs	191	164	152	144	117
<b>Total investment for transit and roads</b>	<b>211</b>	<b>212</b>	<b>207</b>	<b>215</b>	<b>220</b>

When the costs required for needed road infrastructure improvements were added to the capital and operational costs required for transit, similar overall costs were identified for the 9% and the 5% transit mode share. With the 9% transit mode share, there is more spent on transit and less spent on roads, with the additional benefit of reduced emissions and delays due to congestion. The estimated operating cost for a single year at a 9% transit mode share for the year 2034 is \$33 million in 2014 dollars. To reach the 11% transit mode share, significant additional investment would be required in transit, with a minor reduction in the amount of roadwork required. The operating cost for a single year of operations at an 11% transit mode share for the year 2034 is \$39 million in 2014 dollars. The estimated annual operating budget increase for each year from 2015 to 2033 has not been calculated but it should be assumed that the operating budget would need to increase incrementally in each of those years to build capacity that would accommodate a 9% or 11% mode share. The level of investment required to achieve an 11% transit mode share is therefore difficult to justify.

The 2015 KTMP recommends a 9% transit mode share target by 2034 for the following reasons:

- The PM peak ridership growth required for a 9% transit mode share is a reasonable expectation for transit growth.
- The benefit-cost analysis determined that the 9% transit mode share target is the optimal scenario since the lowest costs for road infrastructure and transit are at the 9% target.
- The benefits of reduced emissions and congestion delay at the 9% target are similar to the benefits for the 11% transit mode share.
- The 9% transit mode share target provides the best balance with KTMP goals and is the most cost-effective solution in terms of overall costs for transit and roads for the defined level of congestion.

Transit-oriented development and parking policies are key elements required to meet the transit target mode share of 9% since parking pricing and availability can influence a shift in mode choice from automobile to transit. Development and intensification along express bus routes may also influence a shift to transit.

### **4.3 Transportation Demand Management (TDM)**

Transportation Demand Management (TDM) is a series of specialized policies, programs, partnerships and performance evaluation recommendations with the following primary goals:

- Reduce automobile use by prioritizing walking, cycling and public transit
- Encourage travel during less congested time periods
- Encourage the use of less congested routes
- Change travel patterns to reduce or eliminate trips

#### **4.3.1 Shifting Mode of Travel**

The diversion of trips to other travel modes has been used around the world to reduce the demand for automobiles on the road in the peak hour. Transit may be made more attractive by



increasing service levels, providing discounted or subsidized transit passes, making transit stops easier to access, making routes and schedules easier to understand, offering customized trip planning and providing real time information on transit arrivals. Ridesharing/carpooling also reduces the number of automobile trips. Ridesharing programs feature ride-matching assistance and other incentives and may be implemented by the municipality and major employers. Ridesharing may be encouraged through the designation of high occupancy vehicle lanes, free parking and ride guarantees. Walking and cycling may be more attractive with designated pedestrian corridors, expanded cycling network with dedicated corridors or lanes and secure bicycle storage facilities at key destinations. Parking policies also encourage a shift away from auto-based trips. Controls on the number, cost and availability of all day parking in the downtown core and at major employment sites encourage transit use and ridesharing.

#### 4.3.2 Shifting Time of Travel

Large employers in a municipality may move their shift-change times away from the typical peak hour. With a large workforce in the education, manufacturing and institutional sectors in Kingston (Queen's University, St. Lawrence College, Kingston General Hospital, Canadian Forces Base Kingston and the City of Kingston), there may be opportunities for the City to work with business leaders in the community to adjust shift changes and working schedules to manage transportation demand.

#### 4.3.3 Shifting Route of Travel

Depending on the number and location of travel barriers and bottlenecks, travellers may have the option to select one of several routes. Traveller Information Systems are available that provide updated information on delays related to construction and collisions and directs drivers to the best route.

#### 4.3.4 Shifting Trip Making

Promoting mixed-use land development patterns, which allow employees to live closer to where they work, is a powerful form of voluntary trip reduction. Other programs, such as work-at-home can also reduce peak hour demand. Social and organizational barriers are still a factor

influencing the relatively low work-at-home rates. Some programs have been effective with participants working from home as little as one day a week. Other measures that impact the number of trips made are flexible work and completing several tasks in one trip instead of several.

#### 4.3.5 TDM Targets

The combination of ride sharing, work-at-home and flexible work hours can reduce the number of trips during peak periods.

To encourage ridesharing, the 2004 KTMP recommended Park and Ride lots at strategic locations around the City, where they could be connected to express or regular transit routes. The Ministry of Transportation has carpool lots at the Highway 15, Montreal Street and Gardiners Road interchanges with Highway 401. The City operates carpool lots at the INVISTA Centre, Centre 70 and Kingston Gospel Temple.

Kingston residents have cited barriers that included finding a suitable person to ride with and the desire to have a car available in case of an emergency but many have indicated a willingness to carpool. Online ride matching services that can be used to help find suitable ridesharing partners are operating in other Ontario communities and could be developed for Kingston.

For the updated KTMP, the feasibility of additional ridesharing was reviewed with consideration for the need for increased parking prices at employment locations and additional parking on the urban fringe. An auto occupancy rate of 1.20 (one car in five has 2 people) was selected as a realistic scenario.

The best opportunities to use TDM to further reduce auto demands during peak periods is through strategies that encourage increased work-at-home (telecommuting) and shifting time of travel away from peak hours (such as flexible work hours). From research and experience elsewhere in Ontario, the most likely range of trip reduction targets that could be achieved with these TDM measures is between 2% and 6%.

Based on current trends to more work-at-home participation, it is realistic to expect that the proportion of residents in Kingston working from home could increase from 3% to 5% by 2034. This increase would eliminate over 400 trips during the peak hour, which is the equivalent of almost half a lane of traffic. A trip reduction target of 5% due to other TDM measures was therefore selected.

#### **4.4 Transportation Systems Management (TSM)**

Transportation Systems Management (TSM) considers opportunities to defer or eliminate major new roads or road widening projects through the investment in localized improvements that optimize the efficiency of the existing road network. With the cost of road improvements and funding limitations, the City needs to consider innovative ways to maximize the use of existing infrastructure.

The City has been implementing TSM for a number of years with the installation of advanced traffic controllers and turning lanes at key intersections and with the co-ordination of traffic signal systems. Optimization of the existing infrastructure benefits all users of the network including pedestrians, cyclists and transit.

##### **4.4.1 Optimization of Arterial Corridors**

The primary optimization strategies considered in the 2015 KTMP include:

- Improve traffic signal efficiency
- Implement intersection improvements
- Prioritize traffic operations along major corridors

##### **Improve traffic signal efficiency**

The optimization of the City's traffic signal system can be an effective short-term strategy to manage delay-related issues on specific corridors or at key locations although the degree of improvement may be limited. It is a challenge to reduce delays with traffic signal timing adjustments at intersections with major roads in both directions. Traffic signal coordination can

increase capacity in the through lanes when additional green time is allocated to the direction with the highest vehicle volumes. Transit can benefit from transit priority measures at traffic signals that permit buses to bypass general traffic flow and proceed through the intersection ahead of stopped vehicles.

### **Implement intersection improvements**

Exclusive left-turn and right-turn lanes at an intersection or a two-way left turn lane between intersections, can increase the capacity of an arterial road and reduce the delays for through vehicles. For the overall capacity of a corridor to be increased, additional turn lanes at major intersections are often required. Transit can benefit from the construction of queue jump lanes in the vicinity of intersections in conjunction with a separate traffic signal that provides transit priority.

### **Prioritize traffic operations along major corridors**

The provision of additional green time at a traffic signal along a major corridor may increase delays to side roads and entrances but it can be an effective measure when the corridor becomes congested and the cost of widening is prohibitive. The provision of priority to the major corridor is most effective where the intersections along the corridor have separate left and right-turn lanes and where side streets or major entrances are either signalized or controlled to minimize disruptions to the through traffic.

#### **4.4.2 Application to the City of Kingston**

Evidence has shown that corridor optimization through TSM could result in a 5 to 15% increase in the capacity of major roads. This improvement can be effective to defer the need for road widenings and new roads. The measures described above should continue to be considered on major arterial roads in the City.

Specific measures to be applied to each corridor need to be reviewed as part of a City-wide program of arterial road optimization. For example, Bath Road, Sir John A. Macdonald Boulevard, Gardiners Road, the new portion of John Counter Boulevard and many sections of Princess Street are already designed as high capacity arterial roads with limited direct access

with two-way-left turn lane and separate turning lanes at key intersections. On these corridors, the capacity optimization treatments may be limited to the provision of a greater share of available green time along the major roadway during peak periods in order to boost capacity and defer the need for widenings.

Within the 2015 KTMP, the benefits of capacity optimization are reflected through the application of an overall 5% increase in roadway capacity on key arterial roads. The target of 5% considers the work already completed and currently underway in the City to increase operational effectiveness. Corridor optimization measures were considered for the key arterial roads listed below.

- Gardiners Road
- Bath Road
- Princess Street
- John Counter Boulevard
- Sir John A. Macdonald Boulevard
- Division Street
- Highway 15
- LaSalle Causeway
- Brock Street
- Johnson Street
- Bayridge Drive

## **4.5 Road Network**

### **4.5.1 Level of Service Thresholds**

Level of Service (LOS) at an intersection can be quantified as a measure of time in terms of delay experienced by a driver. For a roadway, the LOS is a measure of how many vehicles are on a section of roadway. For automobile travel, the volume to capacity ratio ( $v/c$ ) is a tool used to identify the congestion level on a road. The maximum traffic volume that a road can

accommodate is a v/c ratio of 1.0. A v/c ratio of 0.9 indicates that 90% of the available capacity of a road is being used.

Roadway level of service considers characteristics such as:

- Speed
- Travel Time
- Freedom to manoeuvre
- Traffic interruptions
- Comfort
- Convenience

A visual interpretation of the traffic density associated with the different levels of service is shown in **Figure 4-1**. The 2004 KTMP set LOS D during the PM peak hour as the point at which a deficiency is identified.

**Figure 4-1 Level of Service and Volume to Capacity Ratios**



Given the constraints in urban areas, most municipalities favour transportation strategies that encourage travellers to use non-auto modes. As a result, a lower LOS for automobile travel is becoming more accepted in urban areas.

**What are the implications of changing the accepted LOS threshold?**

Selection of an “acceptable level of service” or congestion levels during peak periods determines how many kilometres of road and other transportation project needs will be identified. The acceptance of a higher level of congestion will allow the City to defer lower priority infrastructure

works. **Table 4-4** summarizes the implications of selecting various LOS (v/c) thresholds for the PM peak hour in the City of Kingston by 2034.

**Table 4-4 Assessment of LOS Thresholds**

	<b>LOS D</b> Max v/c=0.90	<b>LOS E</b> Max v/c=1.00	<b>LOS F</b> v/c>1.10
<b>Road Network Congestion</b> (km of road at or over capacity)	81 km	49 km	26 km
<b>Road Widening Cost (2014 dollars)</b>	\$315.9M	\$191.1M	\$101.4M
<b>Additional Congestion Delay Comparison</b>	0	45%	100%

The adoption of a higher acceptable v/c ratio means that fewer kilometres of the road network need to be improved which would reduce road construction costs but increase delay to users. There would be 45% more delay due to congestion with the selection of LOS E instead of LOS D. The increased delay will affect commuters by adding time to their trip. For example, for an average commuting time of 20 minutes, the trip will take an additional 9 minutes.

LOS F means that drivers will experience severe congestion, long queues and significant delays. The selection of a threshold greater than LOS E means that the roadway would be operating in gridlock for automobiles, transit and commercial vehicles. There would be an impact on the economy if the road network experienced severe delays and queues on a regular basis.

From a sustainability perspective, an increase in delay to users may encourage people to reconsider their travel options. They may travel outside the peak hour, use a different route, shift to a different mode of travel, or even reconsider the need to take a trip at all. Increased delay may influence people to live in close proximity to work, transit services and other amenities. In recognition of the need to balance these considerations, the recommended target for the identification of road improvements within the 2015 KTMP is a maximum volume/capacity ratio of 1.0 (LOS E). This threshold will allow the city to defer capital costs until roads reach capacity. The additional levels of congestion will provide incentive for travellers to use active transportation

and transit. Since the City’s population is forecast to peak in 2034 and then gradually decline, it is reasonable to adopt a higher congestion threshold in order to avoid the potentially unnecessary construction of new roads.

**4.6 Recommended Transportation Strategy**

A summary of the 2015 KTMP peak hour transportation targets to be achieved by 2034 that incorporate the individual strategies described in the previous sections are outlined in **Table 4-5**.

**Table 4-5 Peak Hour 2034 Transportation Targets**

System Component	Measure	Existing Target	2015 KTMP Target
<b>Active Transportation</b>	Walking + Cycling Mode Share	14%	17% (14% walking and 3% cycling)
<b>Public Transit</b>	Transit Mode Share	11%	9% City-wide trips by transit
<b>Transportation Demand Management</b>	Reduction in vehicle trips	Not specified	5% fewer trips
	Auto Occupancy Rate	Not specified	1.20 average number of people in each car
<b>Transportation Systems Management</b>	Roadway Capacity Optimization	Not specified	5% improvement for TSM and transit priority measures
<b>Road Network</b>	Maximum Volume to Capacity Threshold for Road Improvements	0.9 (LOS D)	1.0 (LOS E) increased congestion

The key actions required to reach the transportation targets by 2034 include the following:

- Expand upon and accelerate the level of investment in transit and active transportation in order to defer road improvements.



- Improve the environmental footprint of the transportation system and promote healthy and active lifestyles.
- Incorporate measures to increase auto occupancy and reduce the number of trips by vehicle.

It is important to note that actual transportation mode shares may change over time. For this reason, the targets identified within the 2015 KTMP will be re-evaluated with the completion of the 2017 Household Travel Survey. **Table 4-6** identifies actual mode shares from previous Household Travel Surveys and provides a comparison with the recommendations of the 2015 KTMP.

**Table 4-6 Mode Share Comparison from Household Travel Surveys**

Mode of Travel	2002	2008	2015 KTMP Target
<b>Walk</b>	11%	13%	<b>14%</b>
<b>Cycle</b>	1%	1%	<b>3%</b>
<b>Public Transit</b>	3%	5%	<b>9%</b>
<b>Auto Driver and Passenger</b>	82%	76%	<b>74%</b>
<b>Other</b>	3%	5%	<b>n/a</b>
<b>Total</b>	100%	100%	<b>100%</b>

The recommended targets will require ongoing investment in transit infrastructure and implementation of policies consistent with higher transit use as well as greater support for walking, cycling and carpooling. Adequate contributions from growth and development will be required to help fund the necessary changes.

From a sustainability perspective, the continued emphasis on the use of alternative modes is consistent with the Sustainable Kingston Plan and should result in improved local air quality and reduced greenhouse gas emissions from the transportation sector. This strategy will continue to influence and shape emerging land use in the City, which is a powerful tool to change travel habits and behaviour.

## 5. Active Transportation – Walking and Cycling

Walking and cycling are gaining importance as strategies to improve the sustainability of a community by increasing the travel choices available to residents, supporting healthier and active lifestyles and by reducing the reliance on automobiles. Walking and cycling can serve both as a utilitarian mode of transportation for short to medium distance commuting and a form of recreational transportation for local residents and visitors such as bike tourism and cycling clubs. Active transportation is an important TDM component through the reduction of automobile trips with the prioritization of walking, cycling and public transit.

The 2015 KTMP establishes an active transportation target of 17% which includes 14% walking and 3% cycling trips by 2034. To achieve these targets, infrastructure, maintenance policies, education and enforcement is required. Infrastructure is needed to expand the walking and cycling network and provide connections to create direct routes and increase the level of safety and comfort. Education and enforcement are required to strengthen the safety and comfort of active transportation users. A detailed cycling and pathway network that builds on previous work is recommended to be developed as part of an Active Transportation Master Plan (ATMP). The ATMP is scheduled to be completed in 2016/2017 and funded by approved development charges. A more comprehensive study of specific on and off-road facilities for pedestrians and cyclists will be included in the ATMP.

### 5.1 Active Transportation Considerations

Many transportation trips in the City are short, especially in the urban areas. Trips less than five kilometres are most suited for active transportation and 36% of all trips in Kingston are estimated to be five kilometres or less. Medium-distance trips of between five and ten kilometres could also be suitable for cycling. An 8 km trip takes approximately 25 to 30 minutes by bicycle. These medium-distance trips are projected to represent 27% of trips.

For people to choose to walk or cycle for transportation, it must be the most attractive option. Depending on the user, this attractiveness is based on a mix of convenience, ease, comfort,

cost, health and environmental concerns. When planning to promote active transportation in Kingston, it is important to consider the following:

- **Comfort** – For someone to choose walking or cycling as a mode of transportation, the user must feel comfortable using the infrastructure that is available. Preference surveys from Ontario and elsewhere indicate that people would choose to cycle more often if there were more bicycle lanes and physically-separated infrastructure. These preferences correlate with what is observed in Kingston. The walking and cycling mode share is higher downtown, where vehicle speeds are lower, more walking and cycling infrastructure is provided and there are land uses and urban design features amenable to active transportation.
- **Network Connectivity** – The network of on-road and off-road routes should connect and link key communities and destinations that are likely to be used for active transportation. Residential areas should be connected to schools, parks and recreation areas and commercial & shopping areas. Signage plays a role in supporting wayfinding and educating users about available connections and demonstrating to other users that active transportation is a viable option.
- **Directness** – Walking and cycling are both beneficial for health, compared to the sedentary activity of driving. Despite the recognized health benefits, a walking or cycling route that is indirect will add distance and time to the trip and will be less attractive for the user.
- **Travel Time** – The lower average speeds for walking and cycling, compared to driving, increases the overall sensitivity toward detours, indirect routings and other increases to trip length. For example, adding an extra 500 metres to a trip adds about six minutes by walking, two minutes by cycling, but about half a minute by driving. Adding time to walking and cycling trips can make them unattractive, resulting in people choosing to drive. Some users, such as risk-tolerant cyclists, may compensate by choosing to cycle on a busier road, rather than choose a longer, route on roads with less traffic or lower vehicle speeds. People who do not feel comfortable using routes without separated infrastructure may choose not to cycle at all if more comfortable routes add too much time to the trip.

- **Maintenance** – The regular maintenance of shoulders, surface pavement, pot holes and catch basins will be required for a high-quality riding surface. Winter plowing, sanding and salting are essential, if cycling and walking are to be promoted as viable alternatives year-round.
- **Cost and Affordability** – Both the capital construction and ongoing maintenance costs of active transportation facilities should be considered. To reduce costs, on-road facilities should be maintained at the same time as the road. Active transportation improvements can be coordinated with planned road work.
- **Safety** – The provision of a safe environment for motorists, pedestrians and cyclists requires a smooth and well-maintained riding surface with gentle slopes. For shared use facilities, proper visibility, signage and pavement markings are required.
- **Design Standards** – The use of consistent design standards for cycling facilities will help make the facilities recognizable to both users and motorists and will offer a consistent look and feel.
- **Trip End Facilities** – The provision of convenient, secure bicycle storage facilities and amenities such as rest areas and showers at places of employment and at key destinations such as community buildings and businesses can play a role in encouraging cycling.
- **Marketing** – Public awareness and education through marketing such as bicycle route maps are essential to increasing the active transportation mode share. The marketing of bicycle tourism can also play an economic development role.

## 5.2 Active Transportation Recommendations

Depending on the user, walking is typically appealing for trips of less than 2 km. Cycling can be an attractive travel mode for trips up to 5 to 10 km. The majority of these trips in Kingston are however currently completed by car. To increase the use of active transportation to achieve the minimum City-wide mode share target of 17% (14% walking and 3% cycling), walking and cycling

must be more comparable with driving for short and medium-distance trips. A collection of infrastructure, policy and program improvements can help achieve the active transportation modal share goals. Examples of improvements that would make walking and cycling more attractive include:

- Implementation of a connected network of infrastructure that provides an active transportation network that results in decreased collision and injury rates (for example, paved shoulders, multi-use pathways, designated cycle lanes).
- Provision of off-road walking and cycling connections that shorten trip lengths compared to auto trips. For example, a pathway extending from a cul-de-sac to an adjacent arterial road would shorten walking trips to destinations along that arterial, such as bus stops and stores.
- Development of policies that require appropriate walking and cycling infrastructure in new neighbourhoods and bicycle parking requirements in new developments.
- Implementation of education and enforcement programs that inform road users of the rights and responsibilities of all road users and enforce traffic violations.

### 5.2.1 Cycling and Pathway Network

The 2015 KTMP provides recommendations for the improvement and expansion of walking and cycling networks in accordance with the principles of directness, time-effectiveness and comfort.

The 2003 Kingston Cycling and Pathways Study recommended two cycling and pathway networks: one network with a utilitarian focus and one network with a recreational focus. The utilitarian network was intended to attract people currently using direct routes on arterials roads to make their trips. The recreational network was intended to serve people who are cycling for leisure purposes in the urban or rural area, with typical trip durations of 1 to 2.5 hours.

The network planning philosophy used in the 2003 Study considered utilitarian and recreational cyclists as different types of cyclists that are best supported with different networks. Bicycle

network planning since that time recognizes that people who cycle for utilitarian purposes represent a broad demographic that reflects the overall population. This includes people accessing jobs, stores and services and students accessing school and recreational activities and seniors accessing services and community activities. People also choose to cycle for recreational purposes and represent a broad cross-section of the population that includes families cycling to a park, riders touring over a long distance and individuals practicing high-speed cycling. Successfully accommodating this diverse user-base on the network requires infrastructure that can accommodate people riding at different speeds, people riding different distances, people with varying levels of experience handling a bicycle and people with varying levels of comfort riding in and interacting with motorized traffic.

The 2015 KTMP recommends a cycling and pathway network building upon the:

- Existing network of bicycle lanes and routes
- Utilitarian-focused and recreational-focused networks from the 2003 Study
- Pathway network described in the Official Plan

The 2015 KTMP cycling and pathway network will be reviewed as part of the 2016/2017 Active Transportation Master Plan (ATMP)

A potential cycling and pathway network for the future is illustrated on Map 4 in Appendix A. This network builds on the existing network of bicycle lanes and routes that have already been implemented in Kingston. The utilitarian-focused and recreational-focused networks previously recommended in the 2003 Study have been added to the network, as well as the pathway network described in the Official Plan.

The following areas in Kingston have limited cycling routes and pathways. A more comprehensive study of specific on and off-road facilities for pedestrians and cyclists will be included in the 2016/2017 ATMP.

- Princess Street corridor
- Employment and retail areas along Gardiners Road
- Dalton Avenue employment area
- Inner residential areas west of downtown
- Rural areas

To better serve these areas, additional links have been added to the network. The expanded network connects to all residential, commercial and industrial areas within the urban areas and connects to major institutions such as Queen's University. The network includes most arterials and major collector roads in the urban area, which provide direct routes between many areas of Kingston. The proposed cycling and pathway network forms a primary network for Kingston and is supported by connections to trip generators using more minor streets.

The general hierarchy of cycling facility types range from shared lanes, paved shoulders, designated lanes and lanes separated from vehicle lanes. Selection of facility type requires consideration of many factors, including roadway characteristics, nearby land use and the volume and type of users. An update to the Cycling and Pathways Study should be part of the Active Transportation Master Plan and should include additional analysis to assess the appropriate facility types for the components of the recommended cycling and pathway network.

The characteristics of cycling facilities are described below in a hierarchical order starting with the types that are more appropriate for roads with low vehicle volumes and low speed and moving toward the types that are more appropriate for areas with higher speeds and higher vehicle volumes.

### **Shared Road Lane / Signed Route**

- Designated on-road routes can be used to connect with existing off-road trails and to link communities and destinations.
- "Share the Road" signs alert motorists that there may be cyclists on a particular route.
- Signed bike routes provide wayfinding to cyclists.

**Paved Shoulder**

- Paved shoulders of 1.2 to 1.5 metres wide or greater can help improve safety.
- Can be implemented as part of already planned road construction/reconstruction or added to existing roads as a new project.

**Designated Bike Lane**

- Designated bike lanes further delineate the presence of cyclists and can further improve safety.
- Warranted on roads with high vehicle volumes and/or high speeds and in more developed areas.

**Separated Bike Lane**

- Separated bike lanes further separate cyclists from the road and can improve riding safety and comfort.

**Off-Road Multi-Use Trail**

- Trails are typically shared by cyclists, walkers, joggers and in-line skaters.
- Completely separates trail users from the road

**5.2.2 Active Transportation Master Plan**

The proposed cycling and pathway network is the basis for the development of the cycling and pathway components of the City's new Active Transportation Master Plan (ATMP). The ATMP should address both walking and cycling and include the following:

- Review each cycling and pathway facility in the proposed network to determine the type of facility appropriate for that corridor such as cycle tracks, bicycle lanes and shared lanes, in accordance with Ontario Traffic Manual Book 18.
- Review existing cycling and pathway infrastructure to verify whether the facility types in use are consistent with the philosophy of the proposed network and that deficiencies along the existing network are addressed in the ATMP.
- Examine opportunities to add cycling facilities along rural roads.



- Review local streets in Kingston that are not included in the proposed network to determine whether the installation of cycling facilities along these streets is required to create formal secondary routes that support the primary network.
- Assess the City's sidewalk network, including a gap analysis to determine where sidewalk gaps exist and to prioritize for sidewalk infill projects. Consider pedestrian volumes and desire lines to identify locations for mid-block pedestrian crossings or other crossing treatments.
- Develop a phasing plan for the implementation of active transportation infrastructure improvements based on the priority of active transportation projects. High-priority projects may include projects that close network gaps, provide connections to key attractions or hubs and address locations with higher collision rates between vehicles and cyclists/pedestrians. The phasing plan should also consider the timing of planned roadway and utility construction projects, as these projects may provide an opportunity to implement active transportation infrastructure in conjunction with other construction, reducing the cost of active transportation infrastructure.

When the ATMP is completed in 2017, it should be reviewed and updated on a regular basis in conjunction with updates to the KTMP.

### 5.2.3 Supporting Programs

A number of programs are recommended to further support an increase in the use of walking and cycling for transportation. Some of the items that could be included in the ATMP are as follows:

- Develop a wayfinding program for pedestrians and cyclists that identifies key destinations in the City such as institutions, transit hubs and shopping centres.
- Provide walking and cycling connections to new transit hubs or carpool lots as the Kingston Transit system expands.
- Include secure bicycle parking at transit hubs and carpool lots.
- Update the City's cycling map periodically so users have access to updated information on the cycling network and provide an on-line version of the map.

- Inform the public of the opening of new segments of active transportation infrastructure such as new pathways or bicycle lanes. Highlight any new connections to transit hubs. Target marketing to nearby residents using flyers or door hangers.
- Provide a feedback form on the cycling section of the City's website to allow users to suggest improvements, identify locations with potholes, areas with poor maintenance and/or defective traffic signal detectors.
- Follow the City's policy for winter maintenance according to the report "State of Good Repair – Designated Cycling Lanes".
- Maintain the City's monthly street sweeping initiative.
- Replace catch basin grates that are not bicycle-friendly, including those with inlet holes or slots that run parallel with the flow of traffic, grates in a poor state of repair or poorly seated on the catch basin. On new or reconstructed streets, consider using catch basins that are outside of the bicycle travel area, as outlined in Ontario Traffic Manual Book 18.
- Design a marketing program to promote cycling as a commuting option and as a recreational activity.
- Implement a "Complete Streets" policy for Kingston. This policy would expand on policies included within the Official Plan and would clearly define the need to consider all modes of transportation such as walking, cycling, transit and the automobile, when designing new streets and when developing rehabilitation plans for existing streets.
- Consider requiring additional sidewalk locations. The sidewalk construction policy in the Official Plan currently requires sidewalks adjacent to developed lands on both sides of new and reconstructed arterial and collector roads where feasible and on one side of local streets. Consider amending City policy and guidelines as needed to require sidewalks on both sides of roads near schools, bus stops and major trip generators where this would facilitate active transportation.
- Consider amending zoning by-law requirements for bicycle parking. Currently, in the urban area, bicycle parking is required for residential uses, as well as non-residential uses in the downtown and harbour areas. There is no distinction between short-term and long-term parking and there is no requirement that long-term parking be secure. Requiring bicycle parking for non-residential uses outside of downtown and providing minimum requirements for secure bicycle parking will further encourage cycling.

## 6. Public Transit

The 2015 KTMP maintains the transit-supportive direction of the 2004 Transportation Master Plan and supports further expansion and improvements to the transit network. The 2015 KTMP incorporates the 2011 Kingston Transit Redevelopment Plan (KTRP) as the basis for the transit recommendations.

The objective of the KTRP is to create a transit system that is more attractive for a variety of trips throughout Kingston. The KTRP retains the downtown and nearby Queen's University as the largest focus of the transit network, since trips to and from downtown have the best potential for transit use due to lower travel speeds in the area and the need to find and pay for parking. Improvements to the transit network in other parts of the City will help increase the mode share. Transit is, however, likely to remain less convenient than the automobile in the suburban areas, even after implementation of the improvements identified in the current KTRP.

The 2015 KTMP establishes a target of 9% of trips made by transit by 2034. To achieve this target, Kingston will need to complete the implementation of the recommendations of the KTRP and continue to invest in the transit system and improve service levels through 2034. Measures in the KTRP include network improvements, additional park and ride lots, transit priority at intersections, real-time customer information and other new technologies to support transit service. Kingston Transit must follow the completion of the KTRP in 2016 with a service review and new 5-year operational plans that continue to focus on the achievement of the 9% mode share target established by the KTMP.

### 6.1 Planned Enhancements for Kingston Transit

Kingston Transit began implementation of the first phase of the KTRP in 2013 and the final phase of the approved recommendations will be in operation in 2015. The two phases of the KTRP have resulted in a network of express routes, modified and expanded local routes and expanded service frequency across the daytime, evening and weekend time periods.

Express routes with 15-minute transit service during peak periods travel along Princess Street, Bayridge Drive, King Street, Brock Street, Johnson Street, Bath Road, Gardiners Road, Division Street and Highway 15 via Highway 2. These routes and the service frequency are illustrated on Maps 5 and 6 in Appendix A.

Other improvements to be implemented by 2016 as part of the current KTRP include:

- Fleet expansion to support additional peak period service
- Ongoing bus stop improvements consistent with adopted design guidelines that include larger concrete pads, additional shelters and benches and improved accessibility
- Improved marketing to customers with the use of new technologies, advertising and partnerships with employers to support Transportation Demand Management programs.

## **6.2 Next Steps for Kingston Transit**

A broad range of improvements and investments in Kingston Transit will be required over the next 20 years in order to meet the KTMP's 9% mode share target. Population and trip modelling through 2034 project that transit ridership will need to grow by 92% to 8 million rides per year compared to 2014 levels. The details of the implementation will be developed as part of Kingston Transit's service review, which should be completed at least every 5 years with the next operations plan being developed in 2016.

### **6.2.1 Route and Service Expansion**

Kingston Transit will grow ridership by increasing service frequency on the existing express routes and adding higher frequency transit service on additional streets across the urban and suburban areas of the City. Evening, Sunday and holiday service frequencies will also increase to provide a consistent level of off-peak service 7 days a week to ensure that transit remains a viable alternative.

The urban and downtown areas will continue to have the highest frequency of service in the City with particular focus on the Princess Street corridor, Queen's University, Kingston General Hospital and St. Lawrence College areas. Overall service frequency in these areas will generally

increase to better than 10 minutes during PM peak hours with express service routes increasing peak frequency service to a bus every 7.5 minutes.

Express service will also be expanded to link more of the suburban areas to the system backbone. Local routes will be expanded into existing and developing suburban areas to facilitate more convenient connections to the expanding express system. Frequency of service on the local routes will be developed to complement the travel patterns of the users and to minimize the barriers to using transit.

There is no existing transit service in the rural area of Kingston, which is generally located north of Highway 401 and east of Highway 15. Park and Ride lots provide rural residents access to express and local transit in several locations near the rural/sub-urban boundary that include locations at the Highway 401 interchanges.

The provision of rural transit is generally designed to increase equity in the overall transportation system and cost-recovery is typically low. Rural transit service is not expected to contribute to the City transit mode share target. As the population ages, more people will become dependent on other means of transportation. Without transit or automobiles, many rural residents rely on carpooling with friends or family. Provision of a basic level of transit service over the horizon forecast in the 2015 KTMP can help this population stay independent.

Opportunities may exist to link service operating in rural areas of the City and County, such as small community shuttles, vans and other specialized services to the Kingston Transit transfer points to allow rural residents to transfer onto the conventional transit system. Programs such as the Community Transportation Grant Program, administered by the Ontario Government, may be beneficial in coordinating existing community-based rural transportation resources to provide a more meaningful rural transportation option.

Conceptual plans that illustrate the service levels targeted for the City are included on Map 7 in Appendix A.

### 6.2.2 Infrastructure Upgrades and Expansion

Investments in bus stops, transfer points and maintenance facilities will be required to support the system growth. The following infrastructure components will need to be developed as part of the transit capital plans to complement the service levels being introduced:

- **Transfer Points and Bus Stop Infrastructure:** Continue to upgrade transfer points and bus stop infrastructure to a standard that is accessible and provides a comfortable and safe waiting location for riders. Investment in the Downtown Transfer Point and the Cataraqui Centre Transfer Point are required in the short term with other transfer points in the future. Bus stop infrastructure must be supported by connections to pedestrian and cycling networks.
- **Park-and-Ride:** Identify potential locations for additional park and ride lots throughout Kingston. Park and Ride locations may be dedicated lots or partnerships with existing or new developments where surplus parking can be used. Where possible, locate park and ride lots along express transit routes being implemented as part of the Transit Plan.
- **Transit Priority Measures:** Traffic signal priority and queue jump lanes improve travel time for buses through signalized intersections. Identify corridors where transit priority measures may be beneficial over a corridor. Determine the type of measures to be implemented, their locations and the costs and benefits.
- **Operation Facility, Bus Storage and Maintenance:** Expand the current transit operations and maintenance centre to accommodate new fleet and staff as required. Exploration of satellite storage and maintenance facilities in other areas of the City should be evaluated during service reviews.

### 6.2.3 Technology Enhancements

Introduce new technologies that enhance customer service and improve the reliability of transit that include:

- Real-time bus arrival information and other enhanced rider information tools

- Transit Signal Priority
- Automatic passenger counting and automatic vehicle location systems to enhance service planning and scheduling
- Information systems that enhance the accessibility of the service
- On-demand and specialized transit options

## 7. Transportation Demand Management (TDM)

Transportation Demand Management (TDM) is a series of specialized policies, programs, partnerships and performance evaluation recommendations with the following primary goals:

- Reduce automobile use by prioritizing walking, cycling and public transit
- Encourage travel during less congested time periods
- Encourage the use of less congested routes
- Change travel patterns to reduce or eliminate trips

Active transportation is an important TDM component through the reduction of automobile trips with the prioritization of walking, cycling and public transit. Opportunities that influence travel behaviour through parking policies, strategies that encourage work-at-home (telecommuting) or reduce trips for school travel and policies that shift travel away from peak hours are also key TDM considerations. The main purpose of TDM is to maximize the effectiveness of a variety of measures in order to defer costly infrastructure projects.

### 7.1 Parking

Parking impacts the long-term viability and growth of businesses and plays a vital role in the local economy. The parking-related objectives of the 2015 KTMP are as follows:

- Highlight potential issues, challenges and opportunities
- Review policies, practices and other planning techniques that may inform future decisions on the provision and management of parking
- Develop future actions

In support of local business and other social and cultural activities, the City oversees and regulates 4,000 parking spaces in over 20 lots and structures. In addition to municipal parking lots and structures, the City provides 1,400 on-street metered parking spaces with a maximum duration of between two and three hours. The City also provides on-street parking permits in several areas of the downtown.



### 7.1.1 Strategic Approach to Parking Management

A sustainable future parking environment will optimize the current parking supply, plan for appropriate future supply and provide for unexpected needs. There will be an unsustainable demand for parking if there are:

- Dispersed development patterns that encourage single occupant vehicle travel
- Fewer convenient travel options
- Continued automobile dependency

These challenges will need to be addressed through changes in the City's Planning and Development policies and through appropriate management of the City's parking supply. Some measures to consider include:

- Develop a long-term parking supply management plan for all areas of the City with priorities targeted to the desired type of parking
- Manage the on-street parking supply to discourage long-term parking and promote transit and active transportation
- Regularly review parking fees and fines to support parking supply management
- Increase park and ride lots in the City's rural and suburban areas to encourage transit and carpooling.

### 7.1.2 Parking Policy and Development Policy Recommendations

Changes to parking and development policies are recommended to further manage parking supply and demand as the City grows. Consultation with local residents, businesses and other key stakeholders on these changes is required. Recommendations include:

- Review and confirm parking ratios in the zoning by-law to reflect appropriate parking supply for development
- Periodically review and update the cash-in-lieu-of-parking by-law to determine areas that are appropriate for this policy

- Amend parking requirements in zoning by-laws to include:
  - maximum parking supply requirements
  - minimum bicycle parking and secure bicycle parking requirements
  - policies to permit shared parking
- Provide guidelines for pedestrian-friendly and urban-friendly designs for parking facilities
- Investigate reducing minimum parking supply requirements along express bus routes or in areas of higher-density, mixed-use development
- Reduce minimum parking requirements or cash-in-lieu-of-parking payments for new developments or redevelopment of existing buildings where the developer supports reduced transportation demand and use of non-automobile modes. This reduction could be earned through the provision of various TDM programs such as:
  - Dedicated spaces for car share services
  - Car-share memberships of a specified duration such as one year for new residents
  - Discounted or free transit passes of a specified duration such as one year for new residents
  - Additional secure bicycle parking beyond required minimums
  - On-site integration of transit, such as an integrated transit terminal that would be applicable to large development sites
- Require developers to include a comprehensive TDM Plan as part of future development applications with sustainable travel as a key consideration. This TDM Plan shall be a component of the developer's Transportation Impact Study to assess whether the implementation of TDM measures may support the reduction in the amount of parking required and the amount of traffic generated.

### 7.1.3 Parking Operation and Supply Management Recommendations

Residential intensification is primarily planned along the Princess Street Corridor and transit-supportive centres, including downtown Kingston. A modest level of intensification is encouraged in other urban residential neighbourhoods. As intensification continues within the urban boundary, increased management of both parking supply and parking demand will be required. The reduction in the need to drive will reduce parking requirements and appropriate parking

supply management will encourage drivers to choose other options. Specific recommendations include:

- Conduct parking supply studies to recommend options to support intensification of development
- Ensure that transit fares and passes are a more competitive price than long-term parking costs
- Increase the cost of parking in high demand areas in the City
- In areas of high demand, review on-street parking rates to determine whether an increase would encourage more short-term parking and higher parking turnover or shift trip demand to other transportation modes
- Expand park-and-ride lots in suburban Kingston to encourage transit use and carpooling and decrease parking demand in the urban areas
- Investigate parking technologies that support parking supply management principles and encourage short-term, high turnover on-street parking and longer term parking in lots and structures
- Monitor parking utilization and ensure appropriate regulations and operating policies are in place to maximize utilization of the existing supply.

## 7.2 TDM Priorities

Kingston should continue to develop an integrated TDM program, expand on existing initiatives and establish new programs to achieve the 2034 targets. A set of proposed directions has been produced for TDM based on Kingston's experience and characteristics, the results of the Public Attitude Transportation Survey, public comments and the City's future goals. These specific directions are:

Short Term (2014 to 2019):

- Direction 1: Strengthen policy support for "Complete Streets" and sustainable transportation modes
- Direction 2: Promote sustainable travel for all time periods
- Direction 3: Target commuter travel including transit incentives

- Direction 4: Target school travel including the “Active and Safe Routes to School” program
- Direction 5: Increase investment in active transportation infrastructure such as cycling facilities, sidewalk and pathway network and winter maintenance
- Direction 6: Align active transportation facilities with express bus network

Medium Term (2020 – 2025):

- Direction 7: Finalize urban parking strategy
- Direction 8: Use parking to support TDM including public transit and active transportation

Longer Term (beyond 2025):

- Direction 9: Monitor and refine urban parking strategy including pricing reviews
- Direction 10: Use parking to support TDM including transit and active transportation such as park and ride lots at transit nodes, at Highway 401 interchanges and intensification areas.

The priority actions associated with each of these directions are listed in more detail in Appendix C. The initiatives within the 2011 TDM Strategy Report should be implemented and Kingston should incorporate priority actions into a cohesive City-wide TDM plan, which would provide more guidance on implementation.

## 8. Transportation Systems Management (TSM)

Transportation Systems Management (TSM) measures are essential to maximize the efficiency of the existing transportation infrastructure. TSM considers opportunities to defer or eliminate major new roads or road widening projects by investing in more localized improvements to optimize the efficiency of the existing road network.

The 2015 KTMP establishes a target of 5% for the expected improvement through the use of TSM. The use of technology to improve the operation of traffic signals and increase the capacity on existing roads is critical to the overall TSM strategy. Since the 2004 KTMP, the City has been implementing TSM with the construction of turning lanes at key intersections and the installation of advanced traffic signal controllers and equipment to better co-ordinate traffic signals. Optimization of the existing infrastructure benefits all users of the network including pedestrians, cyclists and transit.

Other TSM techniques currently in place include the regular review and optimization of traffic signal timings along arterial road corridors and the use of portable variable message signs to alert travellers to construction zones, collisions and detour routes.

Traffic management measures, such as one-way streets and roundabouts, are transportation planning and traffic operational decisions that are typically made during the detailed design phase or as a result of a specific traffic operations study. Since one-way streets can limit access to properties, confuse motorists unfamiliar with the City and can result in higher vehicle speeds, the City would carefully consider any decision to change a street from 2-way to 1-way to ensure that the change would be of benefit to all road users.

The City recently completed TSM initiatives related to the following areas:

- Technology-based TSM initiatives
  - Installation of GPS clocks at many traffic signal controllers throughout the City in order to improve the coordination between signals.

- Utilization of portable variable message boards to provide information to motorists about road closures, construction detour routes and emergency events.
- Traffic signal timing improvements
  - In order to minimize delays for all users, traffic signals will continue to be retimed and optimized throughout the City, with a focus on the following areas: Gardiners Road, Bath Road, Princess Street, John Counter Boulevard, Division Street, Highway 15, Bayridge Drive, Downtown core area.
- Installation of key turning lanes
  - Dedicated turning lanes were recently installed at intersections on Gardiners Road, Princess Street and at key intersections on Highway 15.

The recommended TSM strategy is to continue to address traffic operations with intersection improvements such as the installation of dedicated left and right-turning lanes, optimized traffic signal timings with a focus on the use of technology and transit priority measures that could include queue jump lanes. Between intersections, the installation of two-way left-turning lanes can be considered to remove turning vehicles from the through lane but this upgrade may require a road widening.

The use of technology to improve the operation of traffic signals is key to the overall TSM strategy. It is recommended that the City continue to evaluate the feasibility of connecting traffic signals to a centralized system that would allow intersections to be monitored and traffic signal timing changes to be made on a real-time basis. City staff will continue to work with Utilities Kingston on this project as schedule and budget permits.

## 9. Road Network Improvements

Even with the achievement of the 2015 KTMP targets related to active transportation, transit, TDM and TSM, road network improvements will still be required. The road projects identified will improve travel in the City with the addition of capacity or through the addition of connections to the network to better serve development or to distribute traffic to alternative routes. The road network projects, combined with the other measures described in the 2015 KTMP, are expected to address long-term transportation needs in the City.

The KTMP considers the construction of new roads and widening or rebuilding existing roads. When forecasting future transportation deficiencies within the City, lack of road connectivity is an ongoing issue. With much of the population growth allocated to areas outside of the downtown core, road network connectivity is essential between growth areas and commercial areas, employment areas, provincial highways and the downtown core. It is critical to address gaps in the network in order to maintain the City's economy.

The KTMP recommends upgrades on several corridors through roadway widening and capacity optimization. These potential projects are intended to alleviate congestion through intersection improvements such as centre turning lanes, right-turn lanes, signal co-ordination strategies and transit priority measures such as High Occupancy Vehicle (HOV) lanes and queue jump lanes at intersections.

The 2015 KTMP recommended road network:

- Addresses future travel demand and maintains the volume to capacity ratio below 1.0 which is level of service (LOS) E.
- Addresses congestion on major routes between rural and urban areas of Kingston.
- Improves traffic distribution with the provision of additional routes where road widening is not feasible.
- Provides an additional Cataraqui River crossing with the construction of the Third Crossing.
- Supports expected population and employment growth with the provision of access to growth and development areas.

- Minimizes impacts to residential properties.
- Has low potential for impacts to community facilities and cultural resources such as cemeteries and Kingston's heritage areas.
- Supports business in the downtown core with improved access.
- Minimizes impacts to businesses with the provision of effective reduction in traffic delays.
- Avoids environmentally sensitive areas.

Mitigation of impacts will be determined during future Class EA Studies for specific infrastructure projects.

### **9.1 Development of Recommended Plan for the Road Network**

Areas of the road network that will be operating over capacity in 2034 were identified using the traffic volume forecasts from the Kingston Transportation Model. The Model results assumed that the targets for active transportation, transit, TDM and TSM were met. The Model considered Highway 401 as an option for Kingston motorists. The continued congestion across the LaSalle Causeway indicates however that few drivers are willing to travel the extra distance to use Highway 401. Many residents have stated that they feel more comfortable driving on urban City roads where vehicle speeds are lower and traffic volumes, especially truck volumes, are less than on Highway 401.

Potential road network alternatives to address capacity deficiencies were identified. These road network projects are the final component of the 2015 KTMP, which includes recommendations for active transportation, transit, TDM and TSM.

The 2015 KTMP selects a LOS E (a maximum volume/capacity ratio of 1.0) as the threshold to determine when roads need to be built or widened. The recommended target of LOS E means that there will be more congestion in Kingston during the peak hours of travel and drivers will experience more delay on the main streets and at intersections. The Kingston Transportation Model was used to assess traffic volumes and the corresponding road capacities to identify general locations where additional capacity is needed. If growth occurs as expected and if the



City meets the targets for the reduction of trips through increased active transportation and transit, congestion is still expected to occur in the following areas:

- East-west travel
  - Crossing the Cataraqui River
  - In and out of downtown from the west and north-west
  - Crossing Little Cataraqui Creek between John Counter Boulevard and Bath Road
  
- North-south travel
  - South of Highway 401 between Gardiners Road and Division Street
  - South of Highway 401 from Division Street to Montreal Street
  - North of Highway 33/Bath Road between Bayridge Drive and Gardiners Road
  - North of Concession Street

These locations were investigated to determine if road network improvements would be feasible and if so where such improvements may be implemented to best serve the City's transportation network. There are limited alternatives available to address growth on the transportation network due to significant constraints related to water bodies and protected lands, constrained rights-of-way due to existing development and extensive lands under federal control.

Employment growth is expected in the downtown area and if there is a need for new roads, the lack of available right-of-way will be an issue. Alternatives to new roads in the downtown area are discussed in the KTMP in the sections related to Active Transportation, Public Transit and Transportation Demand Management.

## **9.2 Recommended Road Improvements**

A network of proposed road projects was developed in order to address future traffic congestion. The congestion was identified through the use of the Kingston Transportation Model, which assumes that the targets for active transportation, transit, TDM and TSM were met by 2034. Some potential projects will provide access for future development areas and will relieve congested roads through providing alternative routes and increasing road network connectivity.

Other projects widen existing roads to reduce congestion. The ability to provide alternative routes for traffic is particularly important where opportunities to widen roads and improve operations are limited.

The roads throughout the City each have a role to play in moving traffic to their destinations. The recommended projects will become part of the network of roads in Kingston that work to efficiently meet the City's transportation needs.

The recommended road infrastructure projects to be implemented by 2034 are listed below.

- **Third Crossing:** A two-lane road/bridge from John Counter Boulevard to Gore Road crossing the Cataraqui River.

This new bridge crossing provides an alternative to the LaSalle Causeway corridor. Following completion of the Third Crossing Environmental Assessment in 2010 that identified the annual average daily traffic (AADT) on the Causeway as approximately 23,000 vehicles per day, City staff have monitored the traffic volumes at this location. The AADT measured during this period has ranged from 24,026 to 27,376 vehicles per day. This indicates a preference for the LaSalle Causeway for daily commuters rather than Highway 401, which is most likely due to a combination of factors including increased travel distance, high traffic volumes and speeds on Highway 401 and the high percentage of truck traffic on Highway 401.

The Third Crossing project recommended as part of the 2015 KTMP has a two-lane cross-section, although provisions were provided to accommodate up to a 4-lane cross-section in the environmental assessment study. Since the Class EA Study for the Third Crossing received clearance in 2013, new population and employment growth forecasts have been used to update the travel demand projections for vehicles crossing the Cataraqui River. Although the need for the Third Crossing continues to be justified, it is important to be mindful that the population of the City is predicted to peak in the early 2030's and then start to decline. This future trend of population decrease is one of the factors that led to the recommendation for a two-lane cross section on the bridge. Other factors considered were:

- the recommended level of service threshold for road congestion
- other modes of transportation, including walking and cycling and transit
- changes in transportation technologies
- changes in population demographics
- infrastructure life-span
- project costs

A supplementary report that provides additional details in support of this recommendation will be appended to the approved Third Crossing Environmental Study Report.

- **Wellington Street:** A two-lane extension from Bay Street to John Counter Boulevard.

This road extension provides additional north-south transportation capacity to meet the projected travel demand in this part of the City. The new road extension also provides road and associated municipal infrastructure to support potential infill developments south of John Counter Boulevard and will also serve as an alternative route from downtown to the future Third Crossing.

A number of related studies have been completed since the Environmental Study Report was completed in 2006 and the province approved the Wellington Street Extension EA in 2008. These include a new growth study, Household Travel Survey and updates to the Kingston Transportation Model. In addition to the data from these studies, higher thresholds for the recommendation for new infrastructure were established as part of the 2015 KTMP. The previous threshold was a LOS D, which indicated that new infrastructure should be considered when 90% of the available capacity of a road is utilized. The proposed threshold in the 2015 KTMP is a LOS E, which indicates that new infrastructure should be considered when all available road capacity is used. New targets were also set for use of transit and active transportation modes.

The transportation modelling work undertaken with the 2015 KTMP assumptions demonstrates that the Wellington Street extension continues to be required to reduce

congestion on north-south roads in the area and to provide transportation capacity for the projected travel demand. This work also reveals that the expected traffic volumes are close to the maximum volume of traffic that the roads in the area can accommodate.

Further work to better define the potential transportation needs in this area is planned. On May 5, 2015, Council directed staff to prepare a Request for Proposals for “an exceptional, forward-thinking, livable, green and innovative” secondary plan that will be undertaken in 2016 for the Inner Harbour and Old Industrial Area. The decision to pursue a secondary plan for these two areas was part of an alternative evaluation for the Wellington Street Extension (WSE).

Secondary plans establish local development policies to guide growth and development in defined areas of a city where major physical changes are expected and desired. Secondary plans are developed for parts of the city that include large areas of underutilized land that would benefit from suitable redevelopment, areas targeted for major public or private investments and areas where development is occurring, or proposed, at a scale, intensity or character which necessitates a reconsideration or reconfiguration of local streets, blocks, public works, open spaces or other public services or facilities.

A secondary plan also contains the land use planning policies, which are incorporated as an amendment to the Official Plan. The City of Kingston Official Plan identifies both future and completed detailed planning areas. Two of these identified areas are the Inner Harbour Area and the Old Industrial Area. In the 1980's both of these areas had secondary plans completed that were never fully implemented. Given the recent public input related to the WSE, the expressed desire to create a long-term vision of this area of the City and the age of the past planning studies undertaken for both the Inner Harbour and Old Industrial Area, it is the intention of the City to advance the secondary planning effort for this combined area.

As a result, the secondary planning work will produce a concept plan and vision for the future development/redevelopment of the area. The vision will form the framework for the secondary plan and identify the locations of specific land uses and policies that will provide direction for

further detailed planning through zoning by-law amendments and site plan process. In addition to providing further detail, analysis and recommendations regarding specific land uses, the secondary plan will identify infrastructure requirements. There will also be a high level review of the financial impact of the development of the plan on the City, including development charges and other associated financing requirements.

Public consultation will be a critical part of the secondary planning process and there will be multiple opportunities and a cross section of innovative techniques used for gathering input. The secondary plan will also provide recommendations regarding the revitalization of the area, including, but not limited to, economic development mechanisms, potential planning tools, heritage conservation tools, and community organizations and partnerships and public services and utilities.

The outcomes of the Secondary Plan process may change the assumptions that were made at the time of the initial Wellington Street Extension EA Study and this KTMP. The recommended plan could change based on the results of the Secondary Plan.

Because of this potential for change and the fact that the need for the WSE project just meets the established threshold to support inclusion of the project in the City's road network, it is recommended that a Class EA update study be undertaken once the Secondary Plan is complete to assess/confirm the project need and to identify any changes to potential impacts. This process will provide another opportunity for public consultation and will allow for the engagement of community stakeholders, review agencies and the general public in the re-examination of alternative solutions including but not limited to the detailed evaluation of measures to maximize the capacity of existing arterial and collector roads prior to the construction of new infrastructure. A more detailed assessment of traffic operations in this geographic area of the City is also recommended as part of the Class EA update study to supplement the analysis from the Kingston Transportation Model.

- **John Counter Boulevard:** A widening from two lanes to four lanes from Division Street westerly to Princess Street (approved for construction).

The need to widen John Counter Boulevard was identified as a priority by City Council a number of years ago in an effort to address current and future operational and safety needs, provide for alternative modes of transportation and accommodate planned regional growth across the Cataraqui River. Funding for the project was approved in the 2006 capital budget and construction of project Phases 1 & 2 (widening from Division Street to Sir John A. Macdonald Boulevard) was completed in 2013. In 2015, the remaining phases of the road widening project were approved by City Council as part of the 2015-2018 Multi-Year Infrastructure program.

A subsequent phase of the John Counter Boulevard project will involve road widening from 2 lanes to 4 lanes from the future Wellington Street Extension (northerly terminating point) to Division Street. This road widening will allow traffic to efficiently use the alternative north-south routes (such as Division Street, Montreal Street and Wellington Street) between Highway 401 and the downtown and capacity for future connection to the Third Crossing.

- **Bayridge Drive:** A two-lane extension of Bayridge Drive from Sierra Avenue to Creekford Road (completed in September 2015).

This extension will provide improved access for population growth in the area. The connection to Creekford Road will also help re-distribute traffic by providing an alternative north-south route to the Highway 401/Gardiners Road interchange via Creekford Road to Gardiners Road.

- **Cataraqui Woods Drive:** A two-lane extension of Cataraqui Woods Drive from Centennial Drive to east of Sydenham Road (approved for construction).

This extension will improve access to development in this area and provides an alternative east-west route between Gardiners Road and Sydenham Road north of Princess Street. This extension provides additional route options for residential areas that abut Cataraqui Woods Drive and also relieves potential future congestion on Sydenham Road south of the new Cataraqui Woods Drive with the provision of this alternative route to the west.

- **Centennial Drive:** The completion of two-lane Centennial Drive from Cataraqui Woods Drive to Gardiners Road (approved for construction).

The completion of this road in the network will serve traffic in the residential and employment areas east of the Gardiners Road corridor and will help distribute traffic to/from the Highway 401/Gardiners Road. Along with the proposed Cataraqui Woods Drive extension, this connection will also help reduce congestion on Princess Street.

- **Highway 15:** A widening of Highway 15 from 2 lanes to 4 lanes between Highway 2 and Gore Road (Third Crossing) with potential further improvements to Highway 401.

This proposed road widening project will address existing and future congestion on Highway 15 and support both existing and future residential, commercial and employment land developments east of the Cataraqui River. The 2015-2018 Multi-Year Infrastructure program includes budget to commence an environmental assessment in 2015 that will evaluate alternatives to provide additional transportation capacity within the study area, which includes the potential for widening Highway 15 from 2 to 4 lanes. Pending completion of the EA, there is also capital budget to undertake the road construction work with a projected commencement in 2017.

- **Leroy Grant Drive:** A two-lane extension of Leroy Grant Drive from Elliott Avenue to Concession Street.

This road connection will improve access to adjacent residential areas and future development lands within Queen's University Innovation Park and the Alcan District lands. The extension of Leroy Grant Drive will also help address traffic congestion on other north-south routes such as Division Street and improve access to the downtown core.

The overall road network improvements proposed for the 2015 KTMP Update are illustrated on Map 8 in Appendix A.

## 10. Financial Assessment

### 10.1 Capital Costs

The City continues to make significant investments in transportation infrastructure and related services that include both capital and operating expenditures. Typical sources of municipal capital funds are as follows:

- tax-based funds (current year taxes, reserve funds and debentures),
- development charges,
- user fees (revenues from transit and parking), and
- specialized grants.

The capital funding investments for transportation infrastructure and related services identified over the next 20 years are summarized in **Table 10-1**. Capital funds contributed from Development Charges are based on project costs identified in the “City of Kingston – 2014 Development Charges and Impost Fee Background Study”. Capital funds contributed by the municipal tax base are derived from the 2015 Fifteen-Year Capital Expenditure Forecast (2015 - 2029) plus further projections over the 20-year period to 2034.

The capital investments listed in Table 10-1 account for new infrastructure and related transportation services required to support growth within the City over the next 20 years as well as the replacement and rehabilitation of existing transportation infrastructure over the same time period. The capital investment in active transportation is slightly lower than the corresponding mode share target, the investment in transit is higher than the corresponding mode share target and the investment in roads is essentially the same as the mode share target.



**Table 10-1 Capital Investments (2014 dollars)  
Transportation Infrastructure and Related Services (2014 - 2034)**

<b>Transportation Program</b>	<b>Development Charges</b>	<b>Tax-based Funds</b>	<b>Total Investment</b>	<b>%Total Capital Investment</b>	<b>2015 KTMP Mode Share Target</b>
Active Transportation	\$34,000,000	\$62,000,000	\$96,000,000	14%	17%
Transit	\$13,000,000	\$72,000,000	\$85,000,000	12.5%	9%
Roads	\$195,000,000	\$305,000,000	\$500,000,000	73.5%	74%
<b>Sub-Total</b>	<b>\$242,000,000</b>	<b>\$439,000,000</b>	<b>\$681,000,000</b>	<b>100%</b>	<b>100%</b>
TDM	\$1,000,000	\$17,000,000	\$18,000,000		
TSM	\$12,000,000	\$29,000,000	\$41,000,000		
<b>Sub-Total</b>	<b>\$13,000,000</b>	<b>\$46,000,000</b>	<b>\$59,000,000</b>		
<b>TOTAL</b>	<b>\$255,000,000</b>	<b>\$485,000,000</b>	<b>\$740,000,000</b>		

When the investments in TDM and TSM are combined with the investments for active transportation, transit and roads, the total capital cost in 2014 dollars needed to implement the recommendations of the 2015 KTMP over the next 20 years is \$740 million.

Capital costs for new infrastructure projects recommended in the 2015 KTMP and reflected in the 2014 Development Charges By-law are summarized in **Table 10-2**.

**Table 10-2 Capital Costs for 2015 KTMP recommendations as identified in the 2014 Development Charges By-law**

<b>2014 – 2034 Projects and Studies</b>	<b>Cost Estimate</b>
<b>Active Transportation</b>	
Highway 15 (Highway 2 to Gore) – multi-use path, dedicated cycling lanes	\$1,800,000
John Counter Blvd (Sir John A Macdonald to Princess) – sidewalks, dedicated cycling lanes	\$4,800,000
Centennial Drive (Resource to Gardiners) – sidewalk, multi-use path, dedicated cycling lanes	\$1,000,000
Cataraqui Woods Drive (Sydenham to 560m east) – sidewalks, dedicated cycling lanes	\$300,000
Third Crossing – multi-use path, dedicated cycling lanes	\$24,200,000
Wellington Street (Bay to John Counter Blvd) – sidewalk, multi-use path, dedicated cycling lanes	\$1,000,000
Leroy Grant Drive (Concession to Elliott) – sidewalks, dedicated cycling lanes	\$800,000
<b>Public Transit</b>	
Transit priority measures (capital road works)	\$2,000,000
Downtown transit terminal	\$4,000,000
Transit shelters	\$850,000
Transit buses (full size and access buses)	\$6,000,000
<b>TSM</b>	
City-wide intersection & corridor improvements	\$12,000,000
<b>Road Network</b>	
Highway 15: widening from 2 to 4 lanes (Highway 2 to Gore Road)	\$11,700,000
John Counter Blvd: widening Sir John A. Macdonald Blvd. to Princess )	\$53,700,000
Centennial Drive: 2-lane road (Resource Road to Gardiners Road)	\$3,800,000
Cataraqui Woods Drive: 2-lane road (Sydenham Rd. to 560m east)	\$3,400,000
Third Crossing: 2 lane bridge/road (Elliott Avenue to Gore Road)	\$95,800,000
Wellington Street: 2-lane road (Bay Street to John Counter Blvd)	\$17,900,000
John Counter Blvd: widening (Division St. to Wellington St. extension)	\$3,300,000
Leroy Grant Drive: 2-lane road (Elliott Avenue to Concession Street)	\$5,400,000
<b>KTMP Study Updates</b>	
Transportation Model Update (2019) + KTMP (2024)	\$500,000
Transportation Model Update (2029) + KTMP (2034)	\$500,000
Active Transportation Master Plan (ATMP)	\$150,000
Parking intensification Study	\$100,000
<b>Total</b>	<b>\$255,000,000</b>

In addition to development charges, tax-based funds are a major component of capital funds for both new and existing transportation infrastructure. As illustrated in **Table 10-1**, the capital investments in the various transportation programs are significant and will be used to fund additional new infrastructure, supporting programs and the replacement and rehabilitation of existing infrastructure. Replacement and rehabilitation requirements will be prioritized on an on-going basis with asset management evaluations. Specific projects will be identified through the development of supporting plans including the Active Transportation Master Plan (ATMP), the Kingston Transit service review plan and the Transportation Demand Management (TDM) plan. The City continues to use multi-year infrastructure plans to allocate capital funds to various budget envelopes that include:

- Road Reconstruction
- Road Rehabilitation
- Active Transportation
- Traffic Management
- Traffic Calming Measures
- Bridges and Culverts
- Storm System Improvements
- Street Lighting

Capital funds are also allocated on an annual basis to support other transportation infrastructure assets that include:

- Fleet Replacements – Transit
- Bus Stops and Shelters
- Transit Buildings
- New Buses
- Parking Lots

The City continues to advance work on detailed asset management plans for all municipal infrastructure, which will enable improved infrastructure life-cycle cost analyses and

establishment of long-range capital plans and budgets with improved accuracy. A recent estimate of the replacement value of the City's road infrastructure is approximately \$1.5 billion. Based on the assumption of a 2% annual capital reinvestment rate that assumes an average 50-year infrastructure life-span, the City's road network would require annual investments of approximately \$30 million. The current long-range capital forecasts incorporate provisions to continue to build the required financial capacity to meet asset management requirements for transportation infrastructure, which is largely based on the City's on-going commitment to the 1% incremental tax policy for capital. Beyond these measures, it will also be important that the City completes continued research on new and innovative approaches to maximize infrastructure life-cycle. This work alongside advancements in efforts to build effective infrastructure asset management programs will continue to be an integral part of managing the overall transportation network.

Affordability is a key component to the management of the City's transportation network. The 2015 KTMP recommendations for active transportation, transit, TDM and TSM, as well as the new roadway target of LOS (level of service) E, permit the deferral of a number of road projects that had previously been identified based on the 2009 Transportation Model Update and the existing LOS D. Examples of significant road projects that can be deferred include:

- Division Street: widening 4 to 6 lanes (John Counter Boulevard to Highway 401)
- Centennial Drive: widening 2 to 4 lanes (Bath Road to Creekford Road)
- Gardiners Road: 2 lane extension (Bath Road to Days Road)

The deferral of these road improvement projects amounts to a combined savings of approximately \$56 million in capital expenditures. This highlights the City's commitment to sustainable transportation that reduces the dependence on costly road construction projects in order to manage congestion.

## 10.2 Operating Costs

The City establishes an annual operating budget that includes a variety of operating and maintenance programs for the municipal transportation network and related services. Funding for the operating budget is typically drawn from the following sources:

- property taxes,
- fees and service charges, and
- payments in lieu of taxes from the Federal and Provincial governments.

Operating and maintenance programs directed to the City's transportation system include:

- Public Works
  - Roads Maintenance
  - Roads Winter Control
  - Sidewalk Surface Maintenance
  - Beautification (portion)
  - Park Space and Facility Maintenance (portion)
  - Centralized Support and Driver Training (portion)
- Engineering
  - Traffic Management
  - Bridge Maintenance
  - Traffic Signals
  - Street Lights
- Transit
  - Transit Operations
  - Bus Stops and Shelters
  - Transit Revenues

The current annual transportation operating and maintenance budget is approximately \$30 million. By comparison, estimates completed as part of the 2004 KTMP showed that the annual transportation operating and maintenance costs were approximately \$14.5 million. Although the budget has increased by approximately 107% over the last decade, the increases were largely attributed to inflation and growth in the City’s transportation system. Growth since the 2004 KTMP is summarized in **Table 10-3** below.

**Table 10-3 Growth in City’s Transportation System**

<b>Transportation Component</b>	<b>Total in 2004</b>	<b>Total in 2014</b>	<b>Increase (2004 - 2014)</b>	<b>% Increase (2004 - 2014)</b>
Road Network	1875 lane-km	1954 lane-km	79 lane-km	4%
Sidewalks	375 km	520 km	145 km	39%
Cycling Lanes	None	119 km	119 km	100%
Transit	109,026 service hours	196,999 service hours	88,000 service hours	81%

Increases in service level standards have also contributed to the overall budget requirements as a result of additional amendments to the Minimum Maintenance Standards for roads, the establishment of inspection and maintenance standards for sidewalks and signs and accessibility considerations for all modes of transportation.

It is also important to note that the annual operating and maintenance budget for the City’s transportation system represented approximately 12% of the total municipal operating budget in 2004. By comparison, this same portion of the budget represents approximately 9% of the overall municipal operating budget in 2015. As a result, maintenance and operating costs that reflect the needs of the City’s transportation system and ensure public safety must be adequately addressed in future budgets. With projections over the next 20 years for continued growth in the transportation system, shifting population demographics that may further increase accessibility requirements and aggressive efforts to promote non-automobile modes of transportation in a

“complete streets” environment, the City must be mindful of additional service demands which will continue to contribute pressure on operating budgets.

The adoption of the “State of Good Repair” policy in 2012 for the maintenance of cycling facilities, includes new provisions for street sweeping and the prioritization of road, catch-basin and manhole repair on dedicated cycling lanes. This policy is an example of how increased service requirements will place additional demands on existing operations and maintenance budgets. Important considerations for the City to address these demands include:

- Continued investments in comprehensive asset management programs and research
- Evaluation and adoption of new technologies and best practices to maximize efficiencies in the operation and maintenance of the transportation infrastructure and supporting services

### **10.3 Non-Municipal Tax Funding Sources**

#### **Past programs**

One potential source of government funding is through federal and provincial infrastructure programs such as the former Building Canada Fund (BCF) – Provincial-Territorial Infrastructure Component (2008). Delivered jointly with the Government of Ontario, the BCF supports infrastructure projects of national, regional and local significance that contribute to economic growth, a clean environment and stronger communities.

Although there may not be similar provincial or federal government funding programs available at this time, it is likely that new programs will be introduced. The City should continue to strive to complete environmental assessments and designs as necessary such that they are ready to use in applications for funding from government programs as they arise.

#### **Federal Gas Tax Fund**

An example of a federal program currently in place is the Federal Gas Tax Fund (GTF). The Federal GTF provides funding for municipalities to assist with the building and rehabilitation of infrastructure. Over the first five years of the fund (2014 - 2019), \$10 billion has been allocated to municipalities through the federal GTF. Over the next ten years an estimated \$22 billion will be

provided, on a per capita basis for eligible projects. There is no requirement for municipalities to contribute toward a particular project.

### **Provincial Gas Tax Fund**

The provincial government supports projects to reduce congestion through transit funding for municipalities. Two cents per litre of provincial gas tax revenue is allocated to municipalities based on existing ridership levels and population to help improve public transit. The Ontario government provided \$2 million in funds to the City of Kingston in 2014. Since this became a permanent program in 2013, this funding is expected to continue each year.

### **Development Charges**

Development Charges have typically been used to provide funding for new road infrastructure projects for the municipality. The ability to secure additional development charges for transit, active transportation and TDM initiatives will help ensure that needs related to growth are paid for by development. Current rules under the Development Charges Act limit the amount of funding that the development industry has to contribute to new initiatives or strategies when a municipality improves service levels beyond what has traditionally been provided.

For capital projects to be eligible for development charges funding, projects need to demonstrate that they are required to accommodate future growth. Projects are not eligible if they:

- increase the level of service (LOS) better than the historic ten-year average,
- provide benefit to existing development, or
- provide excess capacity.

Projects often fail to satisfy each of the above criteria. For projects that do not fully meet these criteria, the amount eligible for financing is subject to a deduction. Development-related capital projects not pertaining to roads, water supply services, waste water services, storm water and drainage control, police and fire protection and highways are subject to a 10% statutory deduction. The Ontario Government is currently consulting widely with various stakeholders about potential future changes to the Development Charges Act.



## 11. Implementation and Monitoring Plan

The 2015 KTMP establishes transportation-related needs and opportunities within the City over the twenty-year period from 2014 to 2034. The key recommendations of the KTMP include strategic policies and improvements for transportation infrastructure and related services. It is recommended that the City allocate funds for the further development and implementation of these recommendations to support the strategic direction of the 2015 KTMP.

The list of recommendations includes the preparation of plans for active transportation and transit that typically should be completed every 5 years. The costs associated with the recommendations are capital costs and do not include operating and maintenance costs.

### 11.1 Short-Term Priorities

**Table 11-1** lists the projects and programs in the City's short-term implementation plan for active transportation, transit and road improvements and the related costs of each initiative for the time period from 2014 to 2020. Many of the projects listed, including individual projects not listed within the larger programs such as Road Reconstruction and Rehabilitation, have been identified within the 2015-2018 Multi-Year Infrastructure Program, which was approved by Council in February 2015.

**Table 11-1 Short-Term Implementation Plan (2014 - 2020)**

	<b>Cost</b>
<b>Active Transportation</b>	
Active Transportation Master Plan (ATMP)	\$150,000
Highway 15 (Highway 2 to Gore) – multi-use path, dedicated cycling lanes	\$1,800,000
John Counter Blvd (Sir John A Macdonald to Princess) – sidewalks, dedicated cycling lanes	\$4,800,000
Cataraqui Woods Drive (Sydenham to 560m east) – sidewalks, dedicated cycling lanes	\$300,000
Active Transportation (tax-based funding)	\$11,300,000
<b>Public Transit</b>	
Transit Priority Measures	\$1,000,000
Transit Stop and Shelter Upgrades including Downtown Transfer Point and West End Transfer Point	\$4,950,000
Expanded Transit Fleet	\$4,600,000
New Technology for Transit	\$2,000,000
Transit Service Review and Operation Plans	\$125,000
Transit Fleet Replacement	\$14,100,000
<b>TDM</b>	
Parking Intensification Study	\$100,000
Park and Ride Lot (new and expanded)	\$300,000
Parking Lot and Structures	\$16,000,000
<b>TSM</b>	
City-wide Intersection and Corridor Improvements	\$4,000,000
TSM measures (tax-based funding)	\$4,600,000
<b>Road Network</b>	
Highway 15: widening from 2 to 4 lanes (Highway 2 to Gore Road)	\$11,700,000
John Counter Blvd: widening (Sir John A. Macdonald Blvd to Princess Street)	\$53,700,000
Centennial Drive: 2-lane road (Resource Road to Gardiners Road)	\$3,800,000
Cataraqui Woods Drive: 2-lane road (Sydenham Road to 560m east)	\$3,400,000
Road Reconstruction and Rehabilitation (tax-based funding)	\$55,900,000
<b>KTMP Study Updates</b>	
Transportation Model Update (2019)	\$250,000
<b>Total Cost</b>	<b>\$198,875,000</b>

The forecast for short-term capital budget requirement totals \$198,875,000 over the period from 2014 to 2020. This represents approximate 27% of the overall capital budget requirement of \$740 million over the course of the 20-year plan.

## 11.2 Medium-Term Priorities

**Table 11-2** lists the projects in the City's implementation plan in the medium term for active transportation, transit, road improvements and the related costs for each initiative. The preparation of accompanying plans for active transportation, transit, roads, transportation systems management and transportation demand management will be used to identify, evaluate and prioritize individual projects as part of future multi-year infrastructure programs and capital budget submissions. Regular reviews and updates of the KTMP are also included on the list of initiatives.

**Table 11-2 Medium-Term Implementation Plan (2021 - 2027)**

	<b>Cost</b>
<b>Active Transportation</b>	
Third Crossing – multi-use path, dedicated cycling lanes	\$24,200,000
Wellington Street (Bay to John Counter Blvd) – sidewalk, multi-use path, dedicated cycling lanes	\$1,000,000
Active Transportation (tax-based funding)	\$20,100,000
<b>Public Transit</b>	
Transit Priority Measures	\$1,000,000
Transit Stop and Shelter Upgrades including Transfer Points	\$1,850,000
Expanded Transit Fleet	\$11,500,000
Maintenance Facility Expansion	\$8,000,000
Transit Service Review and Operation Plans	\$50,000
Transit Fleet Replacement	\$14,200,000
<b>TDM</b>	
Park and Ride Lot (new and expanded)	\$300,000
<b>TSM</b>	
City-wide Intersection and Corridor Improvements	\$4,000,000
TSM measures (tax-based funding)	\$9,800,000
<b>Road Network</b>	
Third Crossing: 2 lane bridge/road (Elliott Avenue to Gore Road)	\$95,800,000
Wellington Street: 2-lane road (Bay Street to John Counter Blvd)	\$17,900,000
John Counter Blvd: widening (Division St. to Wellington St. extension	\$3,300,000
Road Reconstruction and Rehabilitation (tax-based funding)	\$97,900,000
<b>KTMP Study Updates</b>	
Transportation Master Plan Update (2024)	\$250,000
<b>Total Cost</b>	<b>\$311,150,000</b>

The forecast for medium-term capital budget requirement totals \$311,150,000 over the period from 2021 to 2027. This represents approximate 42% of the overall capital budget requirement of \$740 million over the course of the 20-year plan.

### 11.3 Long-Term Priorities

**Table 11-3** lists the projects in the City’s implementation plan in the long term for active transportation, transit and road improvements and the related costs of each initiative. The

preparation of accompanying plans for active transportation, transit, roads, transportation systems management and transportation demand management will again be used to identify, evaluate and prioritize individual projects as part of future multi-year infrastructure programs and capital budget submissions. Regular reviews and updates of the KTMP continue to be included on the list of initiatives.

**Table 11-3 Long-Term Implementation Plan (2028 - 2034)**

	<b>Cost</b>
<b>Active Transportation</b>	
Leroy Grant Drive (Concession to Elliott) – sidewalks, dedicated cycling lanes	\$800,000
Active Transportation (tax-based funding)	\$31,100,000
<b>Public Transit</b>	
Transit Priority Measures	\$1,000,000
Transit Stop and Shelter Upgrades including Transfer Points	\$600,000
Expanded Transit Fleet	\$5,750,000
Transit Service Review and Operation Plans	\$75,000
Transit Fleet Replacement	\$14,200,000
<b>TDM</b>	
Park and Ride Lot (new and expanded)	\$300,000
<b>TSM</b>	
City-wide Intersection and Corridor Improvements	\$4,000,000
TSM measures (tax-based funding)	\$15,100,000
<b>Road Network</b>	
Leroy Grant Drive: 2-lane road (Elliott Avenue to Concession Street)	\$5,400,000
Road Reconstruction and Rehabilitation (tax-based funding)	\$151,400,000
<b>KTMP Study Updates</b>	
Transportation Model Update (2029) + KTMP Update (2034)	\$500,000
<b>Total Cost</b>	<b>\$230,225,000</b>

The forecast for long-term capital budget requirement totals \$230,225,000 over the period from 2028 to 2034. This represents approximate 31% of the overall capital budget requirement of \$740 million over the course of the 20-year plan.

A summary of the costs for the short, medium and long-term capital plans are provided in **Table 11-4**.

**Table 11-4 Financial Summary for 2015 KTMP**

<b>Plan</b>	<b>Time Period</b>	<b>Capital Expenditures (2014 dollars)</b>
Short-Term	2014 - 2020	\$199 million
Medium-Term	2021 - 2027	\$311 million
Long-Term	2028 - 2034	\$230 million
<b>TOTAL</b>		<b>\$740 million</b>

The total capital cost in 2014 dollars needed to implement the recommendations of the 2015 KTMP over the next 20 years is \$740 million.

**11.4 Monitoring the KTMP Objectives**

Monitoring the City’s progress with regard to mode share targets, safety and level of service will allow the City to make revisions to programs and policies as needed in order to reflect the objectives of the KTMP. The Implementation Plan for the 2015 KTMP includes on-going reviews of the KTMP and the Kingston Transportation Model and completion of an Active Transportation Master Plan. To support these studies, the City should undertake the following:

**Household Travel Survey and Transportation Model Update**

The Household Travel Survey should be completed in advance of the update to the KTMP in order to monitor changes in travel, assess mode share targets and provide input to the model. Monitoring travel behaviour will allow the City to confirm that progress is being made towards achieving the goals listed in the 2015 KTMP. The Household Travel Survey should be completed every 5 years. The Kingston Transportation Demand Model is used to identify capacity issues along corridors and should be updated after the Household Travel Survey.

**Pedestrian and Cyclist Surveys**

In order to understand the demographics of people who choose active transportation and where they walk and cycle, periodic interviews of pedestrians and cyclists should be completed. The

surveys may focus on areas with proposed new walking or cycling infrastructure or where changes to infrastructure might impact walking and cycling. As the active transportation network expands and trip patterns change, the City should prepare an annual report that highlights improvements to the active transportation network and documents potential increases in the walking and cycling mode shares.

### **Transit Ridership Monitoring and Surveys**

Monitoring transit ridership across the City helps assess how transit users respond to changes to the transit system. Kingston Transit began implementation of the first phase of the Kingston Transit Redevelopment Plan (KTRP) in 2013 and the final phase of the approved recommendations will be in operation in 2015. The two phases of the KTRP have resulted in a network of express routes, modified and expanded local routes and expanded service frequency across the daytime, evening and weekend. It is likely that there will be changes in ridership patterns and demographics in response. Kingston Transit should complete periodic surveys to gain information about who uses the system, when riders use the system and the purposes for which they use the system. In order to review the system and plan for the future, a comprehensive service plan should be completed at least every 5 years.

### **Traffic Data Collection**

The annual traffic counting program at major intersections in the City should be continued in order to monitor traffic and assist with traffic signal timing updates and corridor improvements. These counts should continue to include pedestrians, cyclists and vehicles. The level of development and the presence of any new infrastructure at the time of the count should be identified in growth areas.

### **Road Safety Performance**

A network screening of collisions through the collection and analysis of collision data should be completed every five years. This process would review all collisions in the City in the previous 5 years and identify intersections or road segments where the observed number of collisions is greater than expected. A before-and-after analysis of collisions in locations with new or improved infrastructure should also be completed.

# **Glossary and List of Acronyms**

2015 Transportation Master Plan



## Glossary

**Annual average daily traffic:** Total volume of vehicle traffic on a road segment for one day. It is derived by taking an average of all traffic volumes collected on every day of the week over a period of one year.

**Active transportation:** Walking and cycling and related infrastructure.

**Carpool:** Two or more people traveling in one vehicle when they would have otherwise driven separately.

**Complete Streets:** A Complete Street is designed for all ages, abilities, and modes of travel; integrating safe and comfortable access for pedestrians, bicycles, transit users and the mobility-impaired as an integral planning feature.

**Development charges:** A fee collected by the City of Kingston to recover their capital costs related to growing their communities. Examples of these capital costs are roads, water and wastewater systems, and libraries for new residents.

**Environmental assessment:** The formal process mandated by the provincial government used to predict the environmental effects (positive or negative) of proposed initiatives prior to the decision to move forward with the proposed action.

**Household Travel Survey:** The Household Travel Survey is a random telephone survey used to measure travel mode share and to assess whether mode share targets have been met. The Kingston Transportation Demand Model is updated using the data collected from the Household Travel Survey and it can help identify corridors with capacity problems.

**Level of service:** A qualitative measure used to assess how traffic is operating on a roadway or at an intersection.

**Mode share:** The percentage of person trips made by one travel mode relative to the total number of person trips made by all modes.

**Park-and-ride lots:** A parking lot for transit customers who wish to park their vehicle and ride the bus the remainder of the way to their destination.

**Peak hour:** The hour with the highest traffic volume.

**Peak period:** The period with the highest traffic volume during weekday morning and evenings.

**Public Attitude Transportation Survey:** The Public Attitude Transportation Survey is a poll of City of Kingston residents to collect information concerning their opinions on transportation. It is done as part of the public consultation process.

**Ridesharing:** Two or more people traveling in one vehicle when they would have otherwise driven separately.

**Screenline:** A screenline is an imaginary line established throughout the City to measure traffic volumes and traffic patterns. The screenlines are usually established at physical barrier locations (rivers, railroads, limited access highways) where the number of crossing points is limited.

**Transit Mode Share:** The ridership numbers are the count of people that ride the bus. The transit mode share is calculated based on the ridership numbers and the total number of trips by all modes taken by the population of Kingston.

**Transit priority measures:** Measures to improve travel time for buses through signalized intersections such as traffic signal priority and queue jump lanes.

**Transportation Demand Management (TDM):** TDM examines ways to reduce the number of trips, to change the timing of trips away from the peak travel period and to influence the mode of

transportation used. The focus is on the movement of people and goods rather than the movement of vehicles.

**Transportation Systems Management (TSM):** TSM considers opportunities to defer or eliminate major new roads or road widening projects by investing in more localized improvements to optimize the efficiency of the existing road network.

**Trip:** A single direction person movement made by any mode of travel.

## List of Acronyms

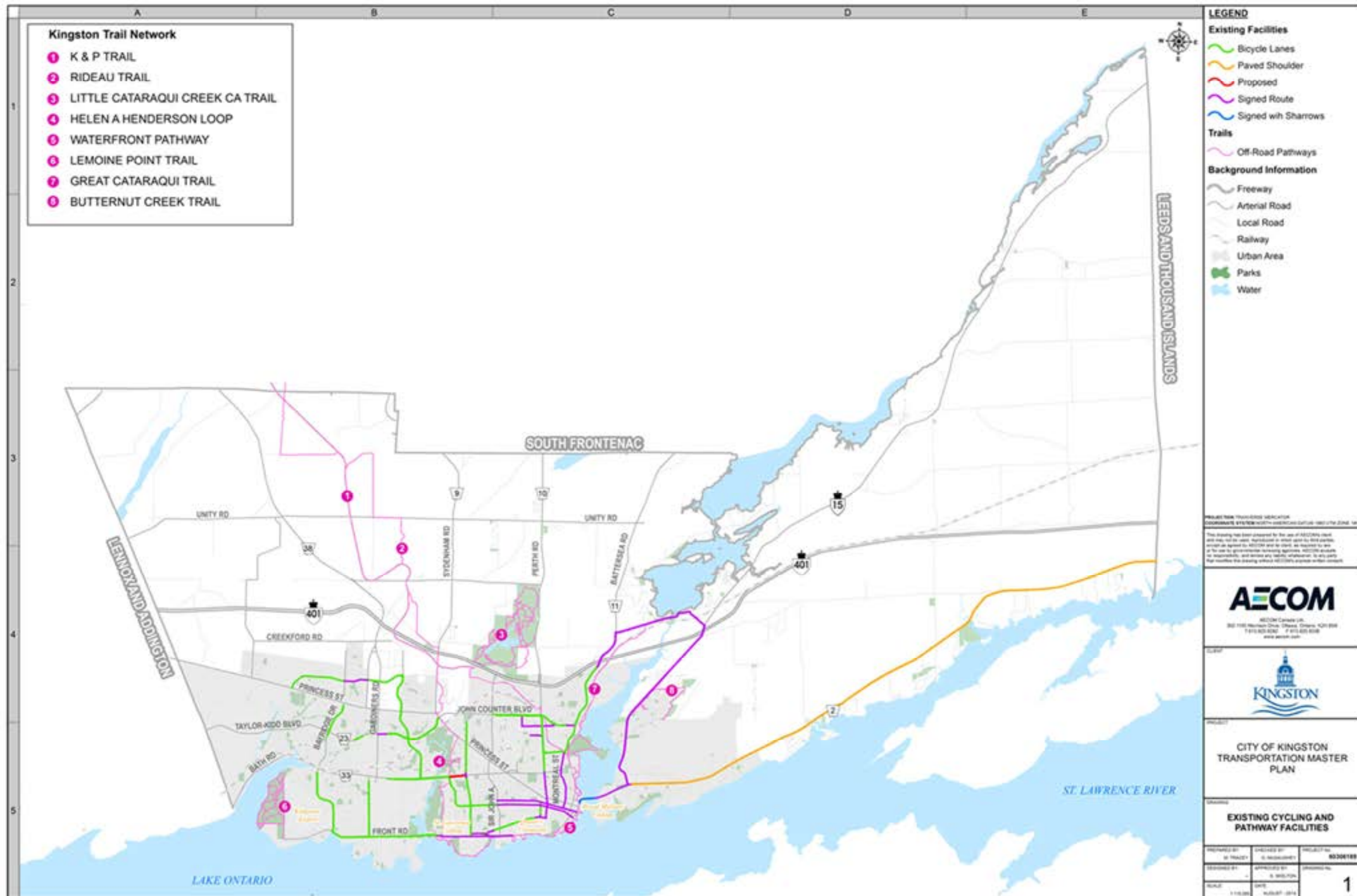
AADT	Annual Average Daily Traffic
ATMP	Active Transportation Master Plan
CMA	Census Metropolitan Area
EA	Environmental Assessment
GPS	Global Positioning System
KTMP	Kingston Transportation Master Plan
KTRP	Kingston Transit Redevelopment Plan
LOS	Level of Service
MOE / MOECC	Ontario Ministry of Environment, now Ministry of Environment and Climate Change
OP	Official Plan
TDM	Transportation Demand Management
TSM	Transportation Systems Management
v/c	Volume to Capacity

# Appendix A

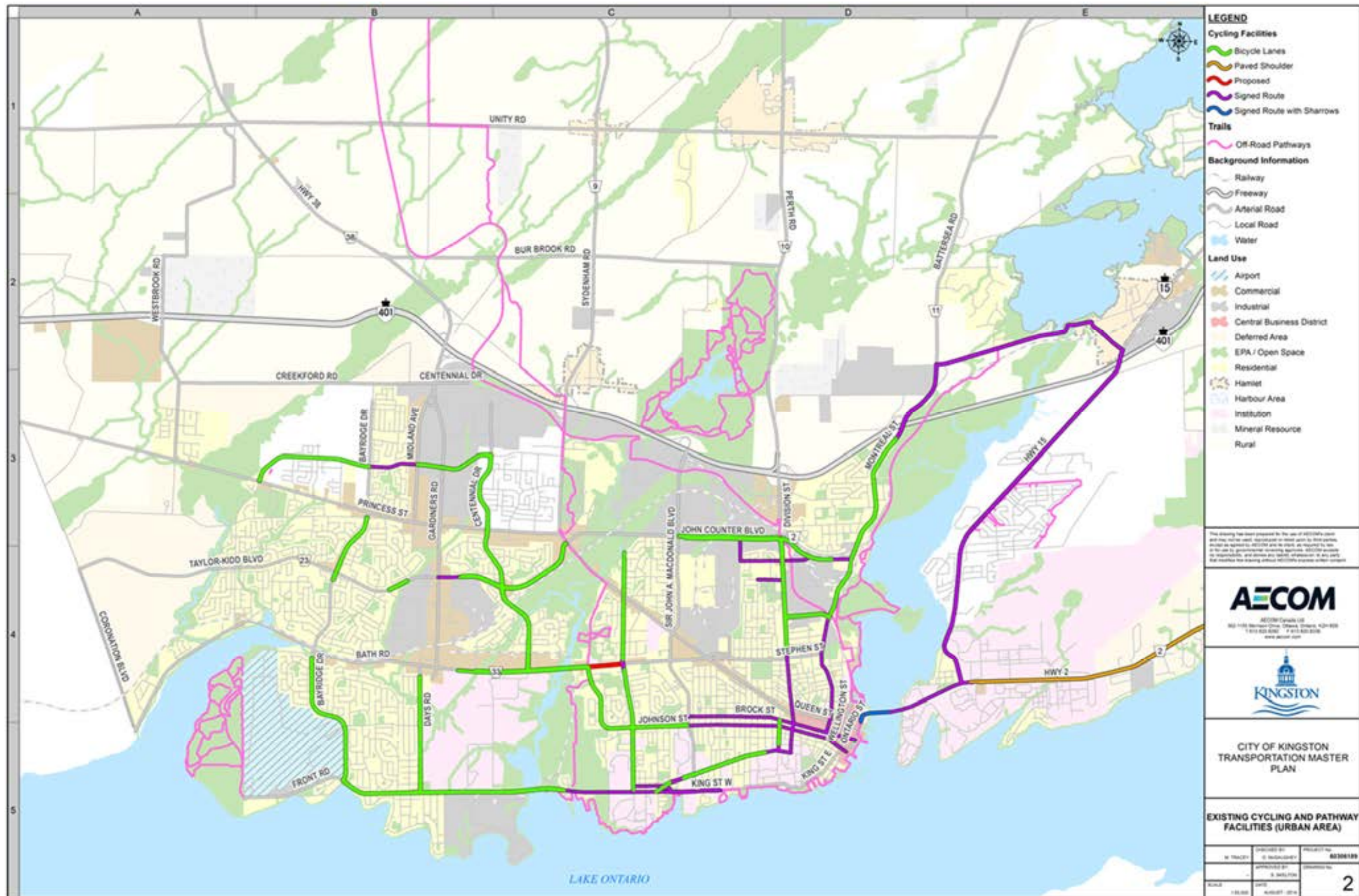
## 2015 Transportation Master Plan

- Maps and Figures

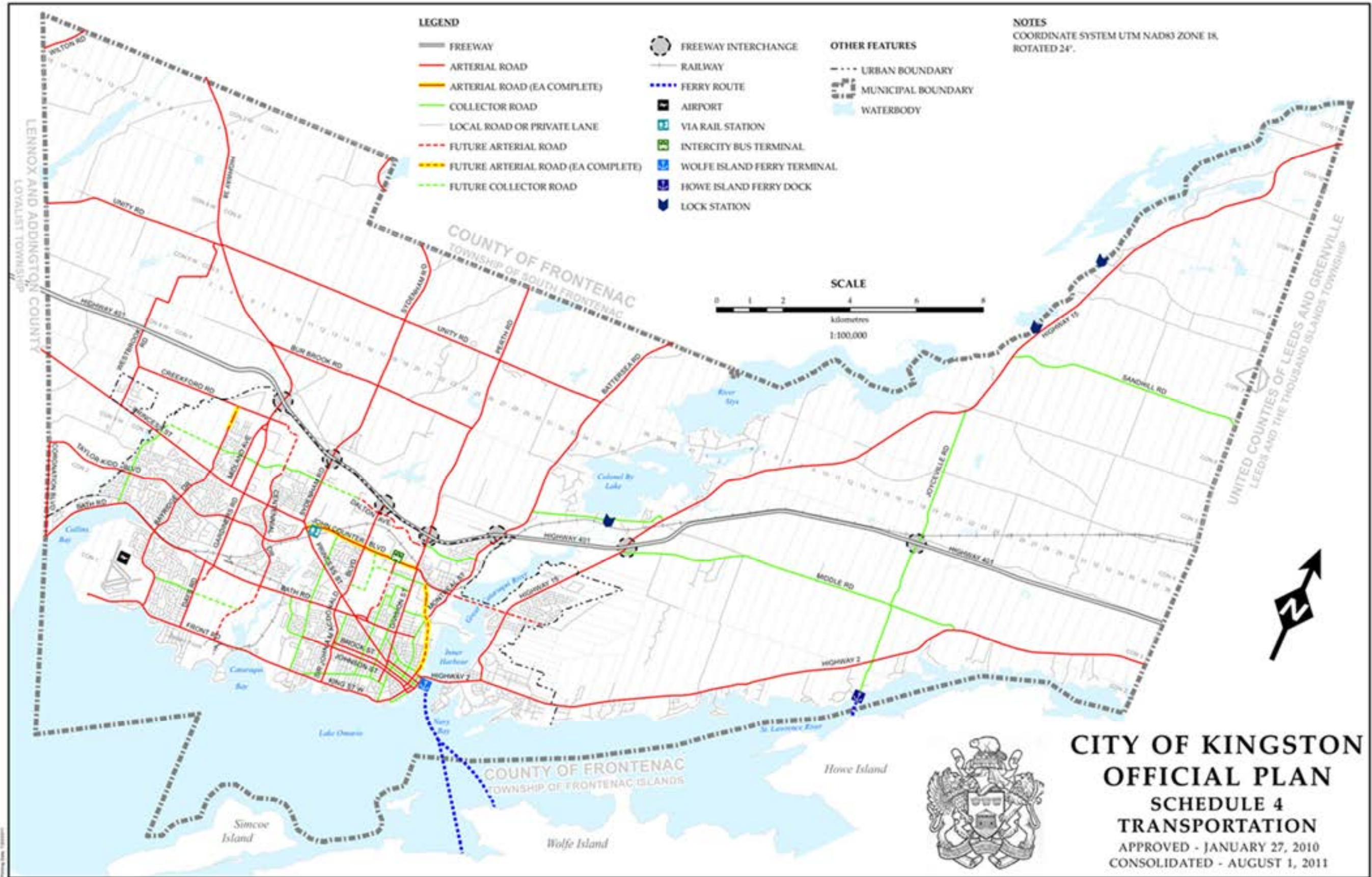
Map 1 Existing Cycling and Pathway Facilities



Map 2 Existing Cycling and Pathway Facilities (Urban Area)



Map 3 Kingston Road Network





Map 4 Cycling and Pathway Conceptual Network

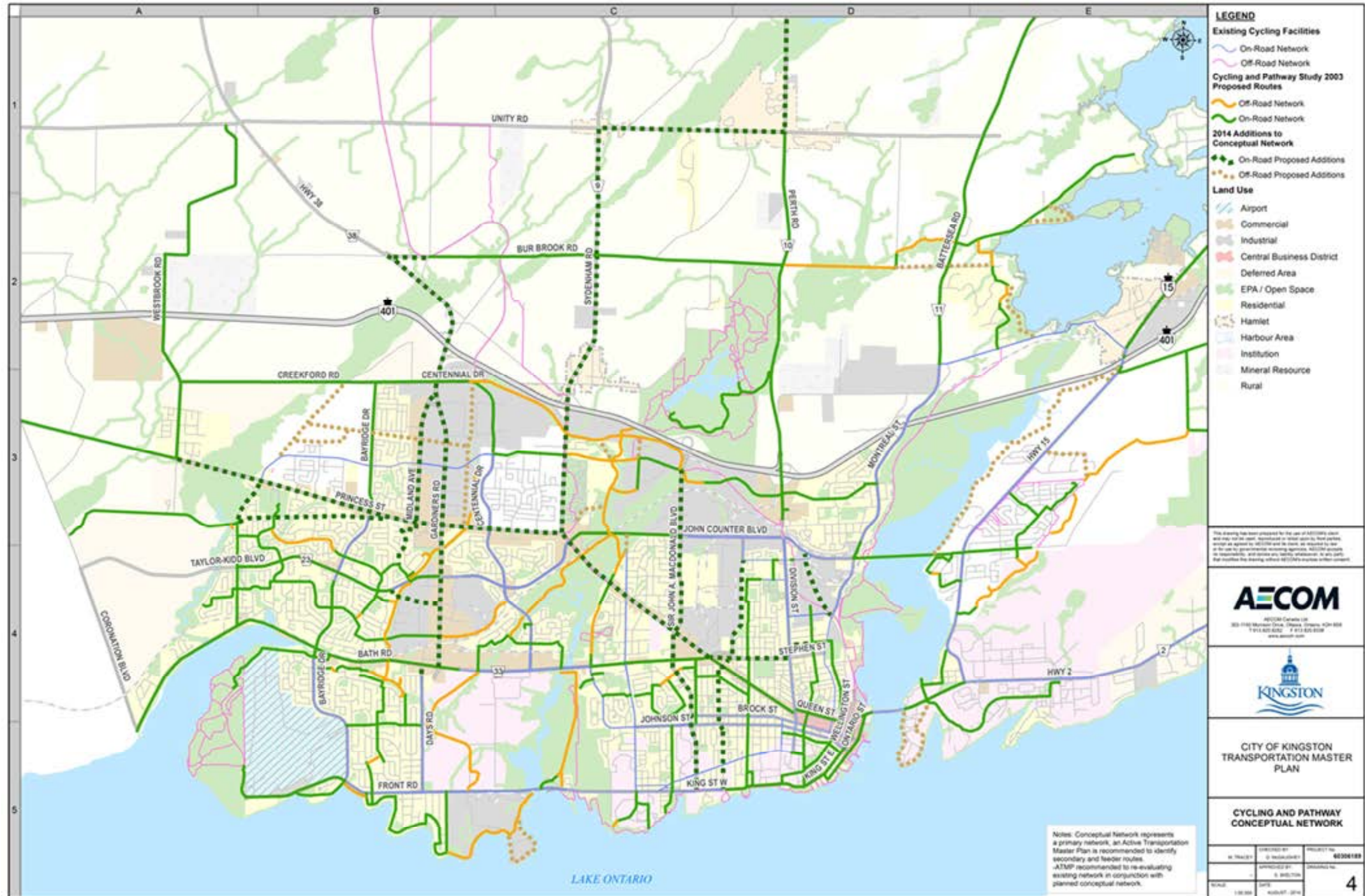
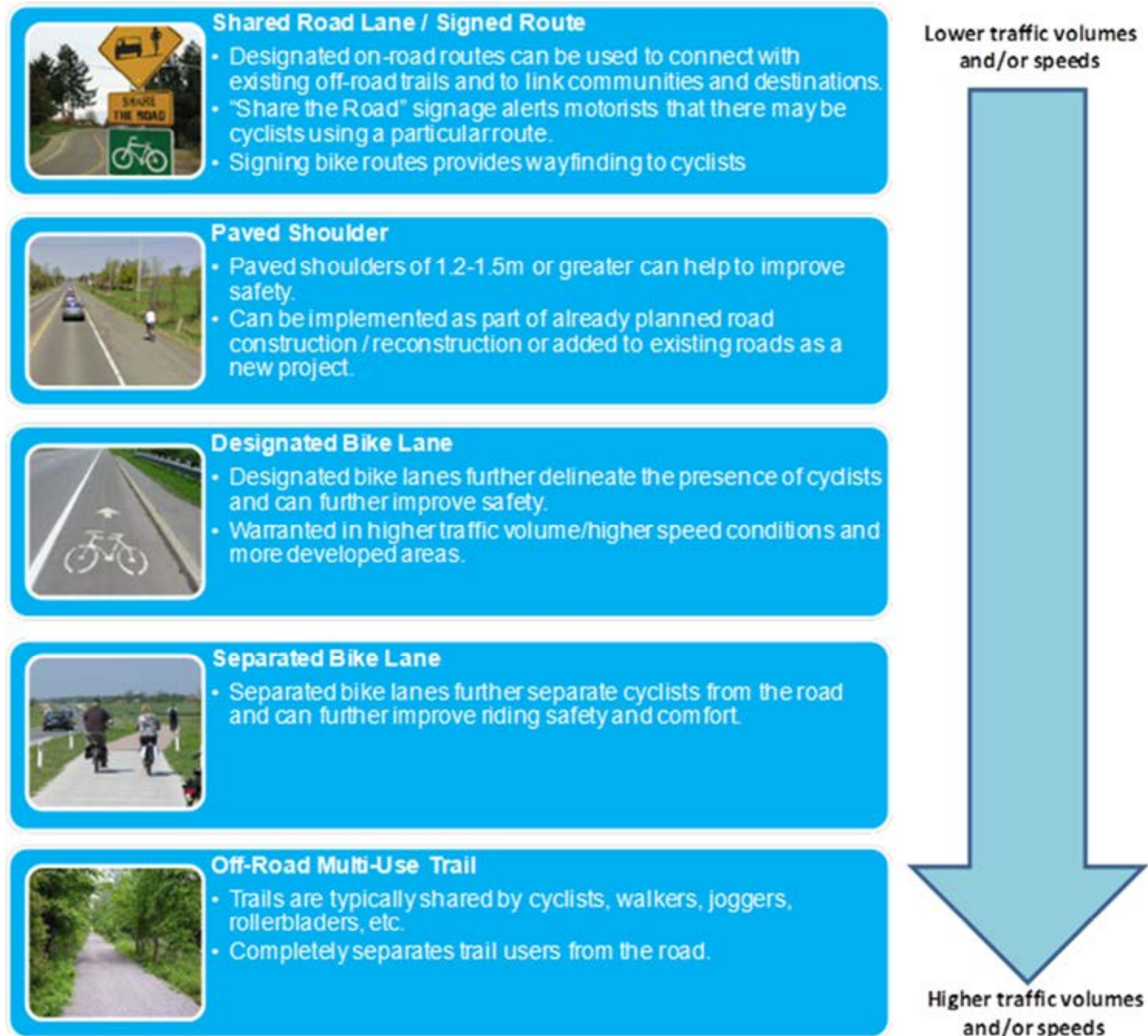


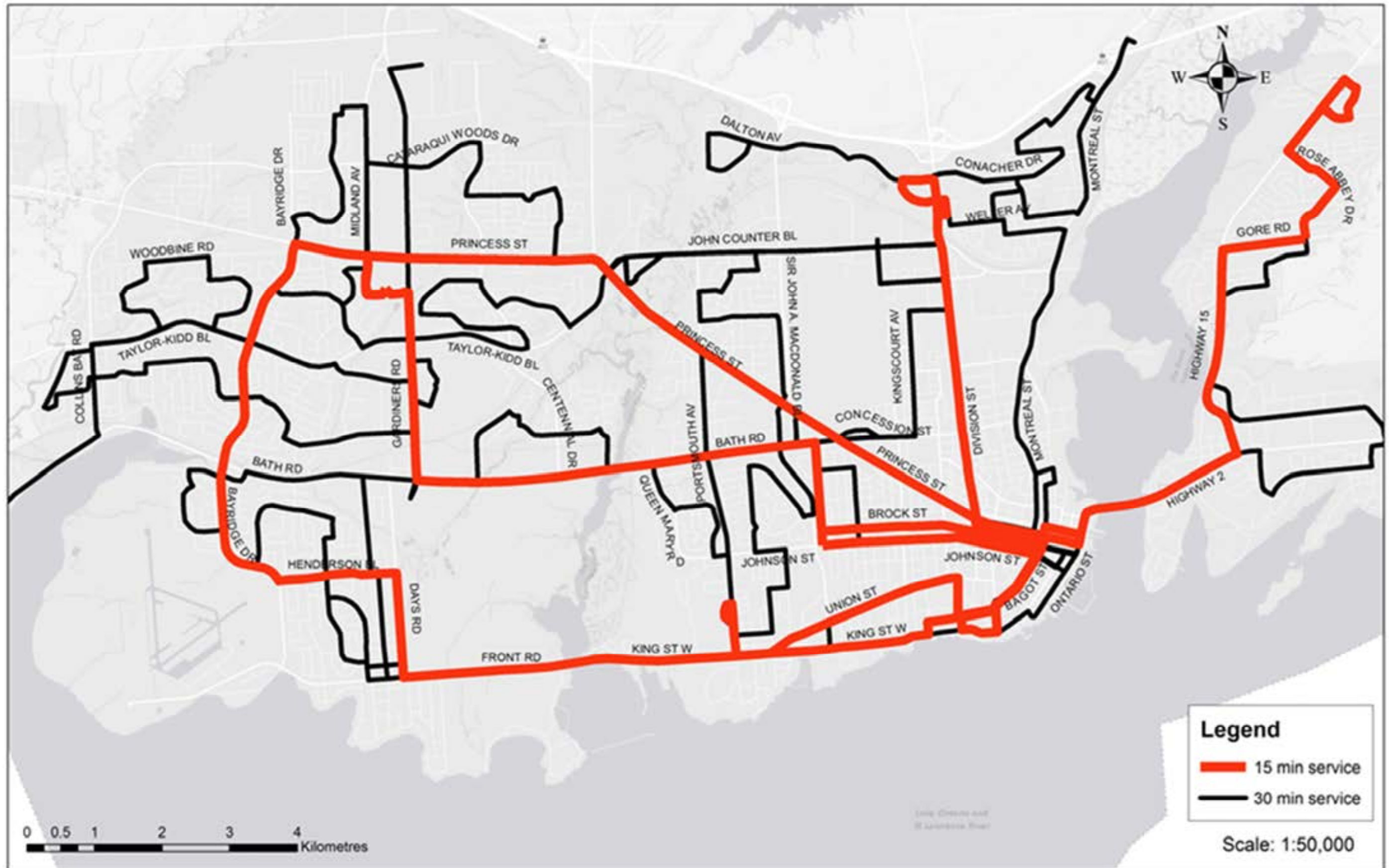
Figure 1 Cycling Facilities



Map 5 Kingston Transit Express Routes 2015



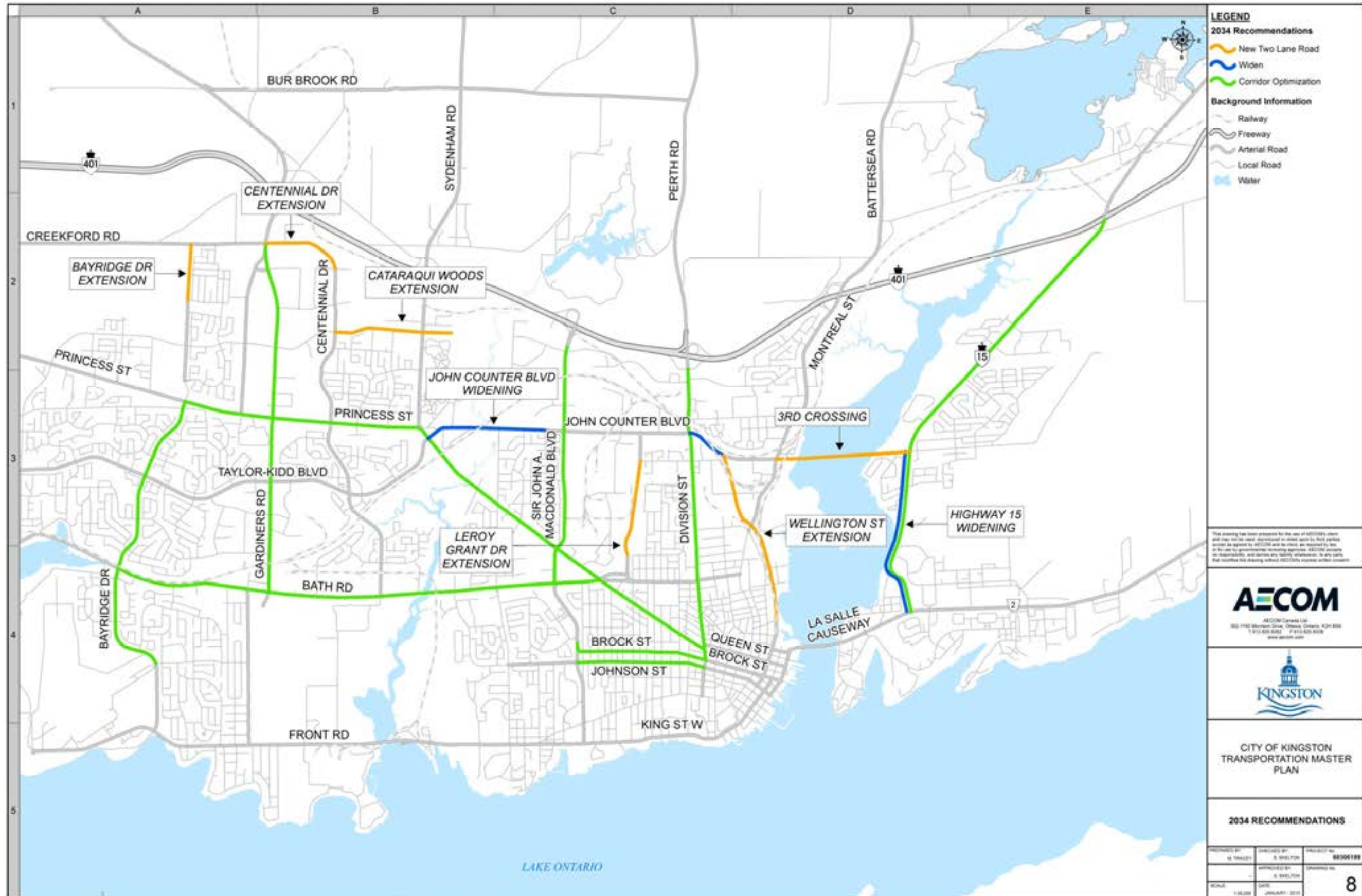
Map 6 Kingston Transit PM Peak Service Frequency 2015



Map 7 Future Kingston Transit PM Peak Service Frequency Targets



Map 8 2034 Recommended Road Network



# Appendix B

## 2015 Transportation Master Plan

- Consultation Material

## Appendix B

### Consultation during the 2015 KTMP Update

Throughout the 2015 KTMP Update, the public and various interest groups in addition to Provincial Ministries, Municipalities, Agencies and Authorities, had several opportunities to participate.

### Public Attitude Transportation Survey

A Public Attitude Transportation Survey gathered information from City of Kingston residents concerning their opinions on transportation. Data was collected from 846 respondents using a telephone survey and an on-line survey in November 2013. The survey questions focused on the user's transportation preferences, awareness and usage of Kingston transit, active transportation modes (walking/cycling), and the transportation needs that Kingston residents feel are important. Refer to the end of this report for the survey questions.

An advertising campaign to announce commencement of the KTMP update and to inform the public of the telephone and on-line survey included print ads in newspapers, messages on the City's Twitter feed and Facebook page and radio commercials.

### Travel Choice Influences

Overall, the most important factors influencing travel choices for Kingston residents were:

- convenience (38%)
- travel time (25%)
- cost (14%)

For auto drivers (both driving alone and with a passenger) the most important factors were convenience (41%) and travel time (34%). For auto passengers the most important travel choice factors were convenience (34%), travel time (24%) and weather (18%). For transit users the most important travel choice factors were cost (36%), convenience (31%) and travel time (16%). For respondents who walk, the most important travel choice factors were convenience (29%),



travel time (21%), cost (20%) and weather (13%). For cyclists the most important travel choice factors were convenience (29%), cost (15%), health (14%) and weather (14%).

**Transportation Mode Choice:**

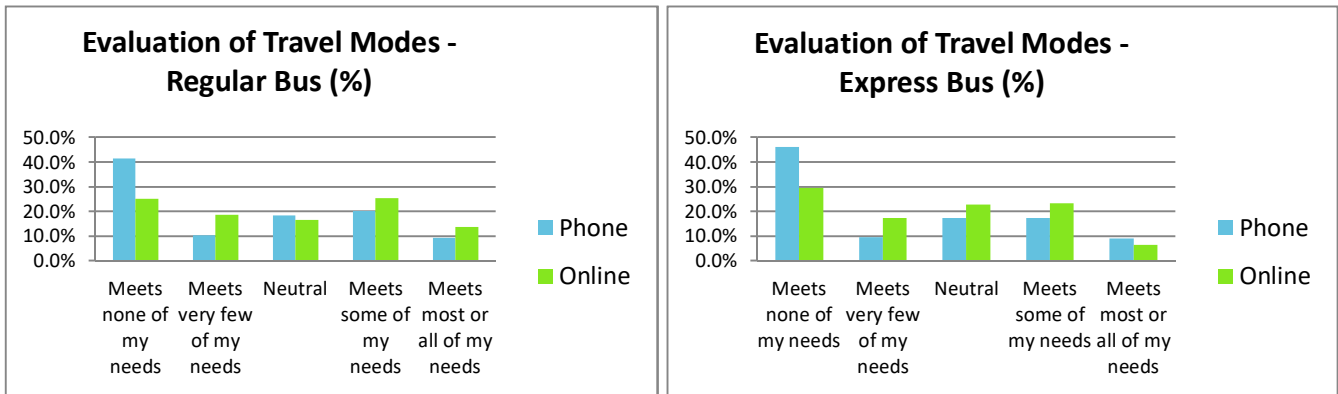
The public attitude survey also asked respondents about factors that may impact their future mode choices. Half of the respondents stated that the following improvements may encourage them to shift to transit:

- Better knowledge of the routes and schedules
- Improved transit frequency
- More Express Routes
- Reduced need to transfer

**Attitudes Toward Transit**

**Figure 2** summarizes respondents’ evaluation of current Kingston Transit services.

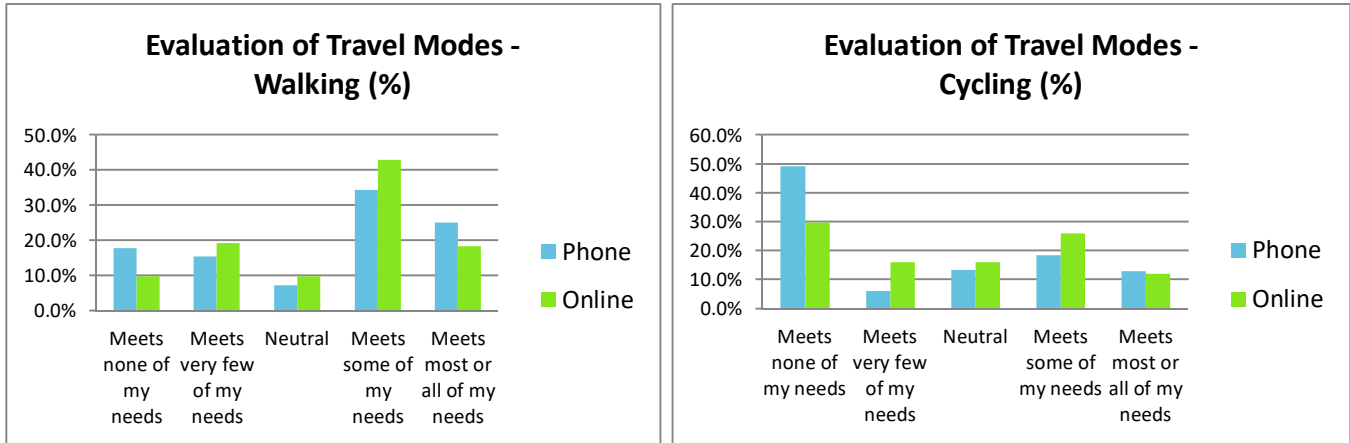
**Figure 2 Evaluation of Travel Modes - Kingston Transit**



**Attitudes toward Active Transportation**

Figure 3 summarized the respondents' evaluation of walking and cycling modes.

**Figure 3 Public Perception of Walking & Cycling (work and school trips)**



**Future Priorities for Transportation**

The Kingston public attitude survey asked respondents to prioritize future transportation-related improvements. In general, the following priorities were indicated:

- Regardless of travel mode they used, respondents felt that transit improvements, carpool lots/park and ride lots and cycle lanes and multi-use trails were important
- Auto and transit users felt that widening roads / building new roads was important, while those who regularly walk or cycle did not identify road improvements as important
- Reducing on-street parking downtown and allowing congestion to occur were not priorities.

**Public Open House**

A Public Open House was held in June, 2014 to provide the public with an opportunity to:

- Learn about the study scope and the need for an updated KTMP
- Review study issues and the scope of the KTMP
- Learn about the recommendations
- Ask questions and discuss the project with members of the study team.

Display panels included maps of the city, graphs and charts illustrating growth projections, and information on other transportation study components to explain the project progress and key issues. An overview of the project was provided in a presentation. The Public Open House was attended by 43 people and comments were received from four members of the public and the Kingston Coalition for Active Transportation. Display material from the Public Open House is included at the end of this report.

## **Presentations to City Council**

In May 2014, a presentation was given to the Environment, Infrastructure, and Transportation Policies Committee regarding the recommended transportation strategies that would be used to guide the KTMP update. The committee supported the recommended transportation strategies and the integration of the KTMP with land use planning and utilities planning policies.

**KINGSTON TRANSPORTATION SURVEY – Script for Interviewers**

Good Morning/Afternoon/Evening, my name is \_\_\_\_\_ from Verifact Research and I am calling on behalf of the City of Kingston. The City is updating their Transportation Master Plan and we would like to ask you some questions about transportation in the City. The interview will take around 10-15 minutes and all personal information will remain completely confidential. Are you interested in helping out?

Are you over the age of 19 years? (If not, ask for a parent or adult over 19 years.) (If no one is available, thank you and have a pleasant day/evening)

1. What is your current Street address? (with postal code)

2. Is that a house, apartment or townhouse?

- 1. House (Single, and Semi-detached)
- 2. Apartment (Condominiums, Duplexes, and Rooming houses)
- 3. Townhouse

3. How many people (#), including yourself, live in your household. \_\_\_\_\_  
*[If renting a basement unit of a house, tenants are a separate household]*

4. How many licensed automobiles including cars, light trucks, and small vans, are there in your household? \_\_\_\_\_

5. How many licensed drivers are in your household (including yourself)? \_\_\_\_\_

6. Please indicate which age category best describes you. *[record gender]*

Category	Age	Gender
1	19-24	M F
2	25-34	
3	35-44	
4	45-54	
5	55-64	
6	65-74	
7	75+	

7. Are you currently employed (or self employed) full-time, part-time, not employed, or a student?

- 1 EMPLOYED FULL-TIME
- 2 EMPLOYED PART-TIME
- 3 NOT EMPLOYED
- 4 POST SECONDARY STUDENT

8. What is the location of your normal place of work (or school)?

[If respondent works at more than one location, record location of main place of work. If respondent works from home record "home"]

STREET ADDRESS: \_\_\_\_\_ CITY/TOWN: \_\_\_\_\_  
POSTAL CODE: \_\_\_\_\_

**OR**

INTERSECTION: STREET A \_\_\_\_\_ / STREET B \_\_\_\_\_

CITY/TOWN: \_\_\_\_\_

**OR**

LANDMARK OR A BUILDING NAME: \_\_\_\_\_

CITY/TOWN: \_\_\_\_\_

9. How far do you live from your place of employment?

- 1. Work at home
- 2. less than 5 km
- 3. 5 to 15 km
- 4. Greater than 15 km

10. What is your normal means of transportation to:

	Walk	Bicycle	Public Transit	Auto Driver alone	Auto Driver with passenger	Auto Passenger	Taxi
...Work or school?	1	2	3	4	5	6	7
...Shopping ?	1	2	3	4	5	6	7
...Social Activities?	1	2	3	4	5	6	7

11. Is Kingston Transit service available at your work or school location?      Y   N   Unknown

12. Have you traveled by Kingston transit during past month?   Y      N      [IF NO SKIP TO 16]

13. [IF YES TO 12]....How many one-way transit trips did you make in the past 14 days? (Check one)

- 1. 10 or more
- 2. 5-10
- 3. 3-5
- 4. 1-3

14. [IF YES TO 12]....Have you used the new Kingston Transit Express Bus Routes that started in September?   Y  
N

15. [IF YES TO 14]....How many one-way transit trips did you make on the Express Routes in the past 14 days?

(Check one)

- 1. 10 or more
- 2. 5-10
- 3. 3-5
- 4. 1-3
- 5. None

16. [IF NO TO 14]....Are you aware of the new Express Bus Routes launched in September? Y N

17. How often would you say that...

	Every day	Few times/week	Few times/month	Few times/year	Almost never	Don't know
...you take a walk for pleasure	5	4	3	2	1	6
...you walk to get somewhere specific	5	4	3	2	1	6
...you ride a bicycle for pleasure	5	4	3	2	1	6
...you ride a bicycle to get somewhere specific	5	4	3	2	1	6
...you take a Kingston Transit bus	5	4	3	2	1	6
...you work from home	5	4	3	2	1	6

18. What 2 factors are the most important reasons that influence your current travel choices?

- 1. Convenience
- 2. Cost
- 3. Travel time
- 4. Family responsibilities
- 5. Weather
- 6. Concern for Environment
- 7. Other \_\_\_\_\_

19. Please rate how well you think each of these methods of travel can meet your needs in Kingston on a scale of 1 to 5, where 5 is excellent, 4 is good, 3 is average, 2 is below average, and 1 is poor.

If you are unsure select Unknown.

	Excellent	Good	Average	Below Average	Poor	Unknown
Walking	5	4	3	2	1	U
Bicycle	5	4	3	2	1	U
Express Bus	5	4	3	2	1	U
Regular Bus	5	4	3	2	1	U
Car	5	4	3	2	1	U

20. Please rank the following in terms of their importance to you from 1 to 5, with 1 being not at all important and 5 being very important. If there is an uncertainty please select Don't Know.

I think it is important to:	Not at all				Very Important	Don't Know
...allow some congestion instead of widening / building roads	1	2	3	4	5	U
...provide better Kingston Transit service	1	2	3	4	5	U
...build new roads and widen existing roads in order to make it easier and faster to drive in the City	1	2	3	4	5	U
...provide designated lots to encourage carpooling and park n ride	1	2	3	4	5	U
...provide more on road cycling lanes	1	2	3	4	5	U
...provide more off road multi use trails for pedestrians and cyclists	1	2	3	4	5	U
...reduce on-street parking in the downtown to provide wider sidewalks	1	2	3	4	5	U
...reduce on-street parking in the downtown to provide cycling lanes	1	2	3	4	5	U
...adjust traffic signal timings to give priority to Kingston Transit vehicles	1	2	3	4	5	U

21. Would you consider using a different mode of transportation to / from work or school?    Y    N

22. If answered yes to Q21.....Rate your agreement with the statements from 1 to 5, 1 being strongly disagree and 5 being strongly agree.

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree	Don't Know
I would take Kingston transit if I knew the routes and schedules better.	1	2	3	4	5	6
I would switch to transit if the frequency of service was improved	1	2	3	4	5	6
I would take transit if more express bus routes were provided.	1	2	3	4	5	6
I would take transit if I didn't need to transfer between routes.	1	2	3	4	5	6
If it cost more to park I would consider another mode	1	2	3	4	5	6
I would carpool if I could find someone to ride with.	1	2	3	4	5	6
I would carpool or take transit if I could find a ride home in case of emergency.	1	2	3	4	5	6
I would cycle to work if the City provided more on-street bike lanes or trails.	1	2	3	4	5	6
I would cycle or walk to work if my employer provided showers / bike racks, etc.	1	2	3	4	5	6
I would use a different mode of travel if my work schedule permits some flexibility in start time / quitting time.	1	2	3	4	5	6

On behalf of the City of Kingston, we would like to thank you for participating in this survey.



## Public Open House Display Material

# Welcome!

## Kingston Transportation Master Plan Public Open House



Monday, June 23, 2014  
6:30 P.M. to 8:30 P.M.  
City Hall

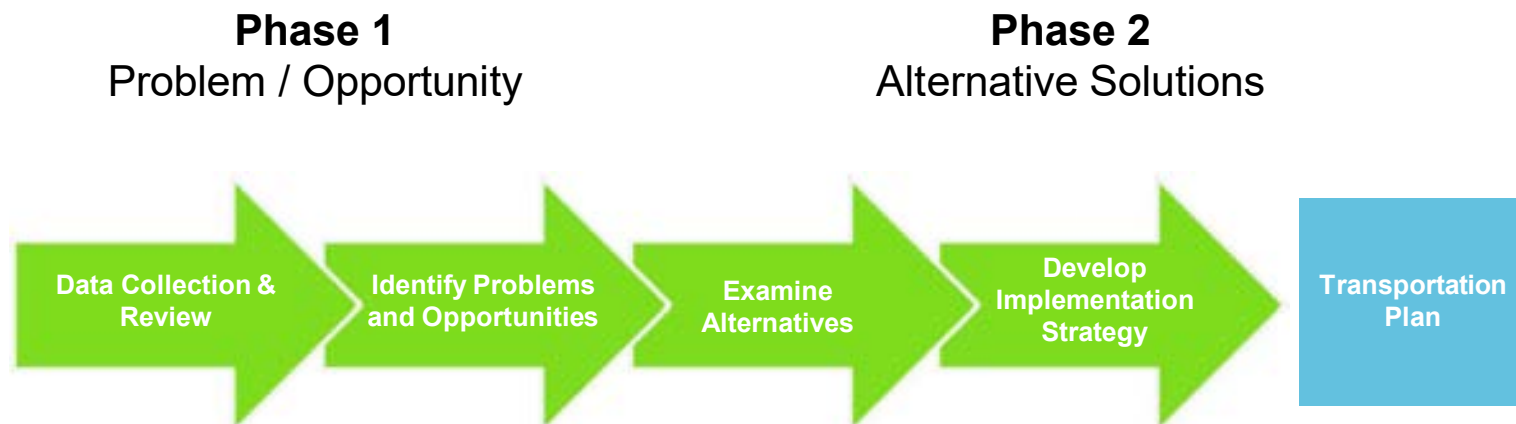


# AECOM

# Kingston Transportation Master Plan

The Kingston Transportation Master Plan (KTMP) provides a comprehensive assessment of the City's current and future transportation system improvement needs. The KTMP was last completed and approved in 2004.

The KTMP update is being developed in accordance with the Municipal Class Environmental Assessment and incorporates the key principles of environmental planning under the Ontario Environmental Assessment Act. The master plan study will follow Phases 1 and 2 of the Class Environmental Assessment process.



The master planning process identifies a recommended 'set' of proposed works and the rationale for their implementation. For some infrastructure projects identified in the Transportation Master Plan additional phases of the Municipal Class Environmental Assessment process will be required.

# Background and Current Assessment

The 2004 KTMP selected “A New Direction” strategy which changed the focus from priority on road projects and policies to emphasizing transit and active transportation.

The KTMP update will continue with “A New Direction” strategy. It will adjust the travel mode share targets (% of transit, walking and cycling trips) to reflect the current situation.

The foundational elements of the KTMP are shown in the figure to the right.

The elements are applied through policies, programs and services for the residents of Kingston.

The City monitors and evaluates the KTMP and adjusts the measures as needed.



# Emerging Trends and Changes

The trip-making patterns of City's residents, workers, and visitors are impacted by socioeconomic and demographic trends and changes such as:

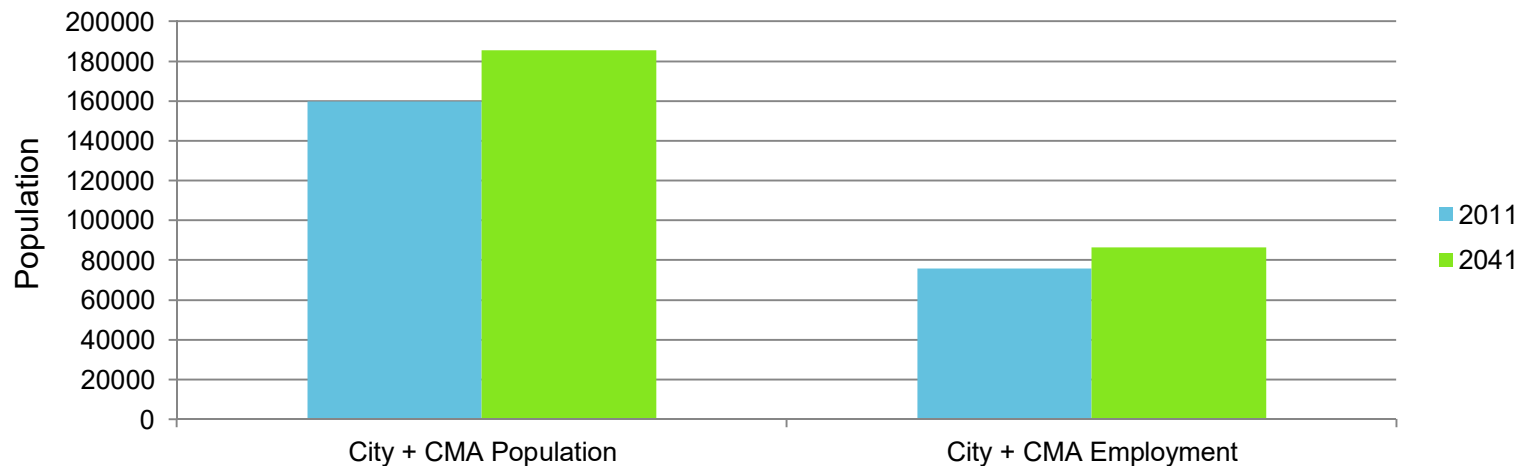
- Population growth
- An aging population
- Climate change & sustainability
- Communities designed around the auto
  - Changing economic climate
    - Energy supply & costs
    - Community health
    - Role of Technology

# Population Growth

Year	City Forecast	Census Metropolitan Area (CMA) Forecast	Combined City + CMA Population Forecast
2011	123,393	36,207	159,600
2041	142,850	42,680	185,530

# Employment Growth

Year	City Forecast	CMA Forecast	Combined City + CMA Population Forecast	City Employment (no fixed workplace)	CMA Employment (no fixed workplace)
2011	69,805	6,000	75,680	5,440	2,180
2041	79,870	6,710	86,475	6,298	2,570



# Scope of the KTMP Update

This 2014 KTMP update study is an opportunity to revisit and address the transportation challenges of the City and recognize changes that have taken place since the adoption of the 2004 KTMP.

The City is inviting the public and other stakeholder groups to participate in the study and to assist the team in updating the plan to address changing trends, emerging needs, and new opportunities. The review will focus on a review and update of:

- Infrastructure Needs – short and long term needs
- Network Analysis – what improvements best address needs?
- Policy & Standards – review and update
- Financial Plan – affordability, priorities, and funding opportunities



# Study Issues

## **The KTMP will identify long term (2034) improvement needs.**

- Development of various improvement scenarios for deficiency areas
- An evaluation of the potential impacts and benefits of each alternative

## **Summary of Public Attitudes on Transportation**

The Public Attitude Survey was administered to 846 respondents in the City of Kingston. The questions focused on the user's transportation preferences, awareness and usage of Kingston transit, active transportation modes (walking/cycling) and the transportation priorities for Kingston residents.

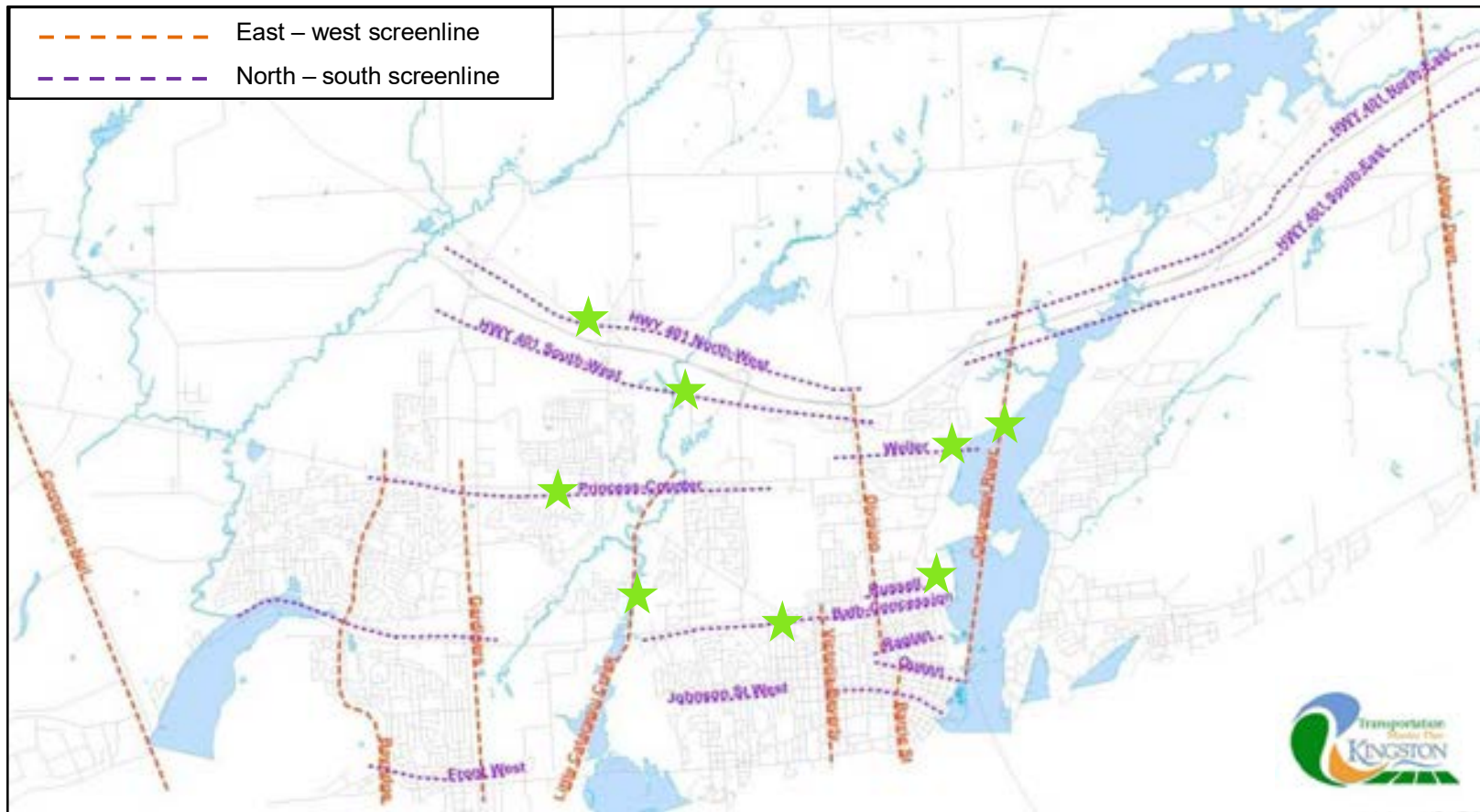
The survey was administered both over the phone and online. The survey results indicated the following:

- Convenience, travel time and cost are the three most important factors that influence travel mode choices.
- The “auto driver mode” is the most preferred mode choice for Kingston residents.
- The transit service and cycling each met the needs of approximately a third of the Kingston residents surveyed while walking met the needs of approximately 60% of the residents that responded to the survey.
- Widening roads or building new roads, improving Kingston Transit, providing carpool lots or park and ride facilities, and providing cycle lanes/multi-use trails were considered important to survey respondents (both phone and online). Respondents were less favourable toward the reduction of on-street parking in downtown Kingston for wider sidewalks or cycling lanes and allowing congestion instead of building road infrastructure projects.



# Needs Assessment

A key component of the study was to evaluate the need to provide transportation infrastructure in the study area to meet the current and future transportation requirements using forecasted trips across a “screenline”. A screenline is an imaginary or real boundary used to evaluate travel issues. Typically physical barriers (rivers/ highways) are used since they limit the number of crossing opportunities and needs were identified across several screenlines. These screenlines are marked with a star on the map below.



# Addressing Needs

The screenline deficiencies can be addressed through

- road widening or road building;
- a shift in travel mode from auto mode to transit or active transportation;
- transportation systems improvements; and
- the reduction in peak hour trips using transportation demand management programs such as teleworking and parking policies.

The volume to capacity ratio (v/c) is a tool used to identify the congestion level on a roadway. A v/c ratio of 0.90 indicates that 90% of the available capacity of a road is being used. The City of Kingston has currently set the LOS 'D' as the standard of acceptable service. Various v/c thresholds were evaluated during the PM peak hour in the City of Kingston for 2034.



The use of higher acceptable congestion thresholds can defer the need for costly infrastructure works. The City is suggesting the adoption of a v/c ratio of 1.0. From a sustainability perspective, use of a higher threshold to trigger the need for road improvements may encourage drivers to reconsider their travel options. They can choose to travel at a different time of day, use a different route or shift to a new mode of travel.

# Transportation Systems Management

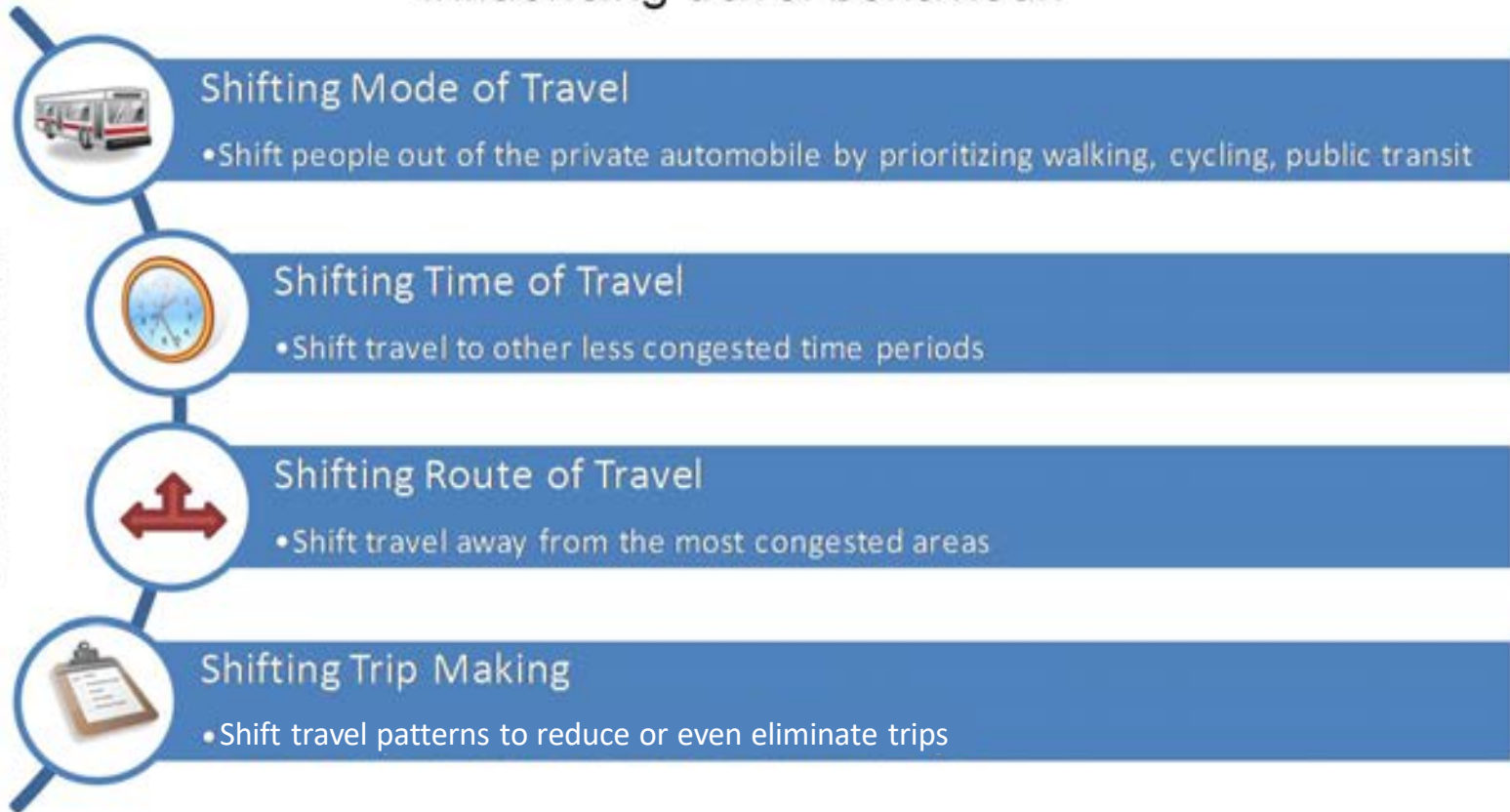
The updated KTMP is considering opportunities to defer or eliminate major new road improvements or road widening projects within the 20 year planning horizon by investing in improvements designed to optimize the capacity of the existing arterial road network. The corridors shown below are suggested candidates for optimization.



# Transportation Demand Management

Transportation Demand Management (TDM) is a series of specialized policies and programs that work to improve the efficiency of the transportation system by influencing travel behaviour.

## Goals of TDM



# Recommended Transportation Strategy

Based on the results of the individual strategies discussed, the following strategic direction is recommended for the updated KTMP.

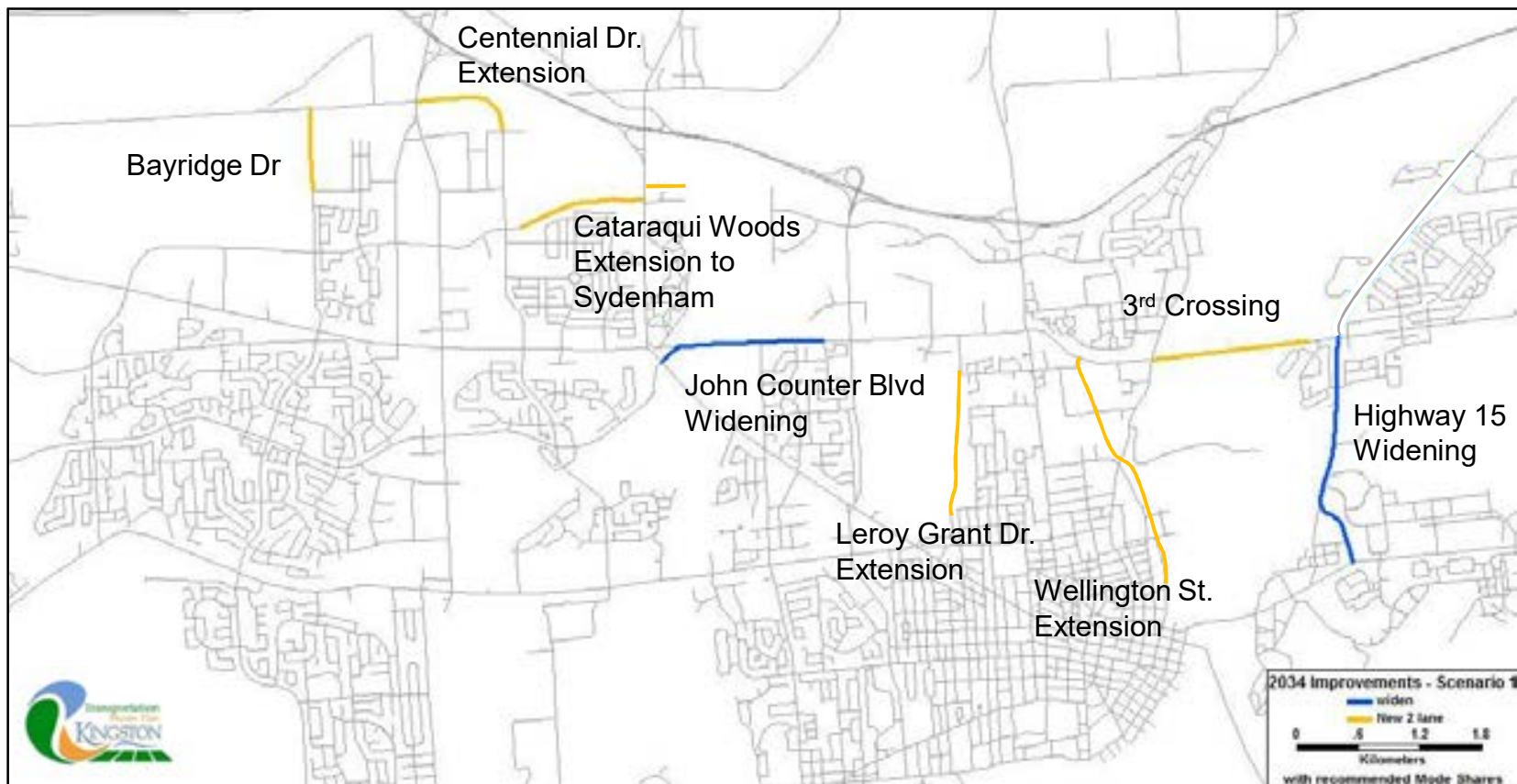
Measure	Target
Roadway volume to capacity Threshold	1.0 city-wide
Roadway Capacity Optimization	5%
Peak Hour Transit Mode Share	9 %
Active Transportation Mode Share	17 %
Auto Occupancy Rate	1.20
TDM Reduction in Peak Hour Traffic	5 %

The “New Direction” strategy will expand and accelerate the level of investment in transit / non-auto infrastructure in an effort to defer road improvements, improve the environmental footprint of the transportation system, and promote healthy and active lifestyles.

# Road Infrastructure Projects

The following projects are recommended:

- To address capacity deficiencies across screenlines
  - To address local congestion issues
  - To provide network connectivity
- To provide land access for development



# Next Steps

- Assessment of transportation strategies and recommended strategic direction will guide the next phases of the update to the KTMP.
- Strategies to achieve the recommended transit and active transportation mode share targets will be developed and an assessment of policies, infrastructure, and ongoing investment to achieve these targets will be identified.
- An implementation program will be prepared to align infrastructure needs with planned growth, and to focus and direct infrastructure dollars to maximize the potential for success in achieving the transportation vision outlined in the KTMP.

## Comments / Questions

Your comments are welcome and very important to this study.

Please fill in a comment sheet and deposit in the comment box.

Alternatively, you can send your comments by mail, fax or email to:

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**Comments are requested by July 14, 2013.**



# Appendix C

## 2015 Transportation Master Plan

- Transportation Demand Management  
Priority Actions



## Appendix C Transportation Demand Management Priority Actions

Timing for Implementation	Proposed Direction	Priority Action
<p><b>Short Term (2014-2020)</b></p>	<p><b>Direction 1:</b> Strengthen Policy Support</p>	Focus policy development on “Complete Streets”, Urban Design Guidelines and sustainable transportation
		Increase priority for TDM, in particular active transportation and transit, in planning for and funding transportation improvements
		Integrate TDM into the City development review and approval process through the inclusion of a TDM plan as a component of Transportation Impact Studies
		Include strong active transportation and TDM policies in the Official Plan and amend the Zoning by-law requirements for bicycle and vehicular parking
	<p><b>Direction 2:</b> Promote Sustainable Travel for All Time Periods</p>	Implement incentives to encourage sustainable travel for trips outside peak periods
		Strengthen partnerships with the health care sector to promote Active Transportation
		Provide a means for Active Transportation and TDM feedback (e.g. a website or forum)
	<p><b>Direction 3:</b> Target Commuter Travel</p>	Test TDM measures through City staff programs and distribute lessons learned
		Assess transit incentives for commuter travel
	<p><b>Direction 4:</b> Target School Travel</p>	Expand “Active and Safe Routes to School” program city-wide
		Develop and implement secondary school TDM projects
		Continue partnering with Queen’s University, RMC and St. Lawrence College to expand TDM programs, including transit usage
	<p><b>Direction 5:</b> Increase Investment in Active Transportation Infrastructure</p>	Expand and accelerate implementation of on-street bike lanes, focusing on gaps and links for key destinations
		Provide secure bike parking at City facilities, transit stops and major destinations in Kingston
		Continue investment in off-street multi-use pathways
		Address gaps in the sidewalk network and provide pedestrian amenities

Timing for Implementation	Proposed Direction	Priority Action
		Improve winter maintenance along key Active Transportation corridors
	<b>Direction 6:</b> Alignment with Express Bus Network	Plan for Active Transportation facilities to connect with express transit corridors where appropriate Provide secure bike parking at key growth nodes and plan for bike parking at transit stops within future express transit corridors
<b>Medium-Term (2021-2027)</b>	<b>Direction 7:</b> Finalize Urban Parking Strategy	Explore opportunities to increase City control of Downtown parking Work closely with Downtown Parking stakeholders to meet long-term parking needs, while supporting transit ridership Ensure that parking capacity is maintained where appropriate over the next 10 years to support the continued revitalization of the Downtown
	<b>Direction 8:</b> Use Parking to Support TDM incl. Transit and Active Transportation	Plan for municipal parking facilities at key development nodes on future rapid transit corridors, with parking charges
<b>Longer-Term (Beyond 2028)</b>	<b>Direction 9:</b> Monitor and Refine Urban Parking Strategy	Implement transit-supportive downtown parking strategies. Review parking pricing to align with parking supply management goals
	<b>Direction 10:</b> Use Parking to Support TDM incl. Transit and Active Transportation	Develop city-wide parking strategy. Focus Park and Ride lots at future transit nodes, corridors and locations where intensification is planned Partner with MTO to expand the network of carpool lots at Highway 401 interchanges

# Appendix D

## 2015 Transportation Master Plan

- Responses to Questions

## Appendix D

### General Questions

#### 1. How was the public input for the KTMP taken into consideration and reflected in the final plan?

All public input whether verbal or written was considered in the development of the KTMP. A document was produced that reflected the issues raised through the public consultation process. The report was revised several times and these changes reflect the comments received.

Specifically, the public indicated a desire to encourage other modes of transportation rather than the private automobile. The KTMP focused on transit, active transportation and recommendations for managing transportation demand and improving the existing transportation system before considering additional road infrastructure. The emphasis of the KTMP was on supporting a shift toward modes of travel other than the car.

Some of the other comments received related to active transportation. As a result, the Cycling and Pathway Conceptual Network included recommendations for additional connections between existing facilities. An analysis was included regarding modal split. Further explanation of walking and cycling modal splits was added that included mention of advancing technology and impact on road capacity and ideas for rural transit recommendations. Also, this appendix was added to provide answers to questions received.

#### 2. What value was there in the Public Attitude Survey?

The results of the survey were used in this study to indicate trends in opinion from the general population. Consultation is required as part of the Master Planning Process and the survey was one form of consultation undertaken as part of this study. The opinions from the Public Attitude Survey helped to develop the direction of the KTMP.

The Public Attitude Transportation Survey gathered information from City of Kingston residents concerning their opinions on transportation. Data was collected from 846 respondents using a telephone survey and an on-line survey. The survey collected information on the travel habits of Kingston residents from various age groups.

The survey questions focused on the user's transportation preferences, awareness and usage of Kingston transit, active transportation modes (walking/cycling), and the transportation needs that Kingston residents believe are important. The information from the survey provides opinions from the public regarding transportation in Kingston.

The survey results indicated the following:

- Convenience, travel time and cost are the three most important factors that influence the travel mode choices of Kingston residents. Health is another important factor as it was consistently identified by survey participants under the "other" category.
- While many respondents did report using alternative transportation modes, the "auto

driver mode” is still the most preferred mode choice for Kingston residents.

- The transit service and cycling each met the needs of approximately a third of the Kingston residents surveyed while walking met the needs of approximately 60% of the respondents.
- Widening roads / build new roads, improving Kingston Transit, providing carpool lots / park and ride facilities, and providing cycle lanes/multi-use trails were considered important to survey respondents (both phone and online). Respondents were less favourable toward the reduction of on-street parking in downtown Kingston for wider sidewalks or cycling lanes and allowing congestion instead of building road infrastructure projects.

### 3. What is the difference between the Household Travel Survey and the Public Attitude Transportation Survey?

The Household Travel Survey is used to measure travel mode share and to assess whether mode share targets have been met. The Kingston Transportation Model is updated after undertaking the household travel survey and it can help identify corridors with capacity problems.

The Public Attitude Transportation Survey is a poll of City of Kingston residents to collect information concerning their opinions on transportation.

### 4. What type of information was included in the Household Travel Survey? What were residents asked? How accurate is the survey?

During the 2008 Household Travel Survey, participants were asked questions about all of the trips made on the previous day by each household member over the age of fifteen, by any mode. Walking, cycling, transit and driving and even rollerblading were acceptable travel modes and each trip was counted as long as the trip has an origin, a destination, and a purpose. Walking around the block, or other trips classified as exercise, were excluded. Some statistical information was also sought, including age, gender, employment status, and number of vehicles available to the household. The sample size surveyed was 2.3% of the population over the age of fifteen, which is considered an acceptable sample size.

The survey expansion process used current estimates of population and households in the study area to expand the sample of survey trips up to represent the trip making patterns of all area residents. The base year population and dwelling units at the dissemination block level were obtained from Census data, which were aggregated to the traffic zone level. For each traffic zone, the surveyed number of households was compared to the census dwelling units and a “Dwelling Unit” expansion factor was derived. The survey data was expanded using the dwelling unit expansion factor so that the number of households within each traffic zone from the census matched the expanded number of households in the survey. The survey expansion resulted in a 2% difference in population when compared to the 2006 Census data.

Once the survey data was expanded based on the Census dwelling units, the expanded survey data was divided into different age groups and compared to the Census age profile in Kingston. An “Age-Population” expansion factor was derived for each age group and the trips made by each person surveyed were expanded according to their age group. This secondary expansion process corrected for any over or under sampling within different age categories so the total surveyed population and age distribution matched the Census population age

distribution.

Based on the expanded survey data it is estimated that on a typical weekday in Kingston, there are approximately 337,000 trips made, which is about 6% less than the results reported in the previous household survey from 2002. A comparison of daily trip rates was made with other communities of a similar size based on the 2006 Transportation Tomorrow Survey, undertaken in the Greater Golden Horseshoe Area. The observed trip rates show that Kingston residents make slightly fewer trips per day than residents in the communities closer to the GTA, however this is to be expected given the age profile in the City. The City of Peterborough, with a similar age profile to the City of Kingston has very similar daily trips rates to those observed in Kingston.

#### 5. Can the KTMP be revised as circumstances change?

The KTMP will be updated every five years. This will allow for adequate monitoring of travel mode share, transit ridership targets, and assist in identifying problems across screenlines. Updating the KTMP using a five year frequency will assist in identifying new problems and opportunities and maintaining the long term vision of the KTMP. The next KTMP update will be in 2019.

The Official Plan is a document that provides a 20-year blueprint for the future land uses and the development of a municipality. The Official Plan establishes goals and strategies that take into consideration important land use, social, cultural, economic and environmental factors. Under the requirements of the Planning Act, the Official Plan is required to be updated every five years. At the beginning of 2015, work began on the five year update of the City's Official Plan, a project which is being integrated with the development of the City's new Comprehensive Zoning By-law. In addition to the Planning Act requirements, the five year update incorporates results from City-led studies and policy reports, provisions from the 2014 Provincial Policy Statement, and consideration of planning issues raised by staff, citizens and stakeholders.

One of the foundational studies reflected in the Official Plan is the Kingston Transportation Master Plan (KTMP). The KTMP provides the long-term strategic direction for the development of transportation policies, networks, programs and priorities. The KTMP contributes to and is reflected throughout the Official Plan in its policies and schedules. The recommendations provided in the 2015 KTMP are consistent with the policies outlined in the existing Official Plan and have been confirmed through the draft of the five-year update to the Official Plan.

#### 6. Are we building the right type of infrastructure for an aging population? And for population growth that is predicted to decline in the future?

People of all ages need to be able to travel from place to place in Kingston. The recommendations in the KTMP related to infrastructure are part of the overall transportation network that will be used by all residents and visitors to Kingston, regardless of age. The KTMP discusses the aging population in Chapter 1 and discusses the impact that the aging population will have on peak hour demand.

“City of Kingston and Kingston Census Metropolitan Area (CMA) Population, Housing and Employment Projections Report”, by Meridian Planning<sup>1</sup> indicates that the population and employment is expected to peak in 2034. The KTMP provides recommendations based on a model of the transportation system with the population and employment projections for 2034. The KTMP is a document that is intended to be revised on a regular basis and predictions for population and employment statistics should be updated when the KTMP is revised. The recommendations in the KTMP are based on the best available data at the time of the production of the report. The decline in the population is expected to be slower than the population increase between today and 2034 and hence the transportation network is expected to serve the Kingston population effectively for the period beyond the population peak.

7. Given the uncertainty of population and traffic projections, would it be more prudent and cost-effective to invest in a more flexible and less costly mode of transportation such as transit instead of less flexible and costly road infrastructure?

Road infrastructure is required to support active transportation in the form of cycling lanes and sidewalks, transit and automobile travel. It is the most flexible type of infrastructure since all modes of travel can use road infrastructure.

8. Since the City’s Official Plan (OP) prioritizes walking, cycling and transit over cars, why doesn’t the KTMP recommend a budget that reflects the priorities of sidewalks, bike lanes trails, transit, shared cars, park and rides etc? Otherwise aren’t the KTMP and OP in conflict?

The 2015 KTMP prioritizes walking, cycling and transit over private automobiles and is consistent with the policies of the Official Plan. The study process considered first what would be aggressive but achievable targets for active transportation and transit modes and then what would be needed to help achieve these targets. Infrastructure improvements and policies to encourage these modes were identified. Once the targets were established for active transportation and transit modes, the travel demand forecasting model was used to complete the modelling for vehicles. The interpretation of the results further reflected the Official Plan priorities by increasing the level of congestion on the roads prior to consideration of road improvements. The budget for improvements recommended in the KTMP comes at the end of the process and is based on the needs identified. A specific proportion of the budget is not allocated to any particular mode but is estimated for the recommended projects and programs.

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<sup>1</sup>Meridian Planning Report: City of Kingston and Kingston CMA Population, Housing and Employment Projections. September 2013 (updated October 2013)

## Active Transportation Questions

9. Are the targets for Active Transportation too low given the City's expanded cycling facilities, pathways & sidewalks? If we consider the growth over the previous 5 years, are the targets realistic or should they be more aggressive?

Active Transportation mode share targets need to be set and embraced by the City Council and Administration. The choice of targets should represent a challenge to achieve, yet not impossible. A more aggressive mode share target would be difficult to achieve due to the future allocation of new residential land use in Kingston relative to established or emerging employment areas. The vast majority of new population growth is forecast to occur in the Cataraqui Woods area, north of Princess Street and east and west of Gardiners Road. While there is a large employment node just east of Gardiners Road along Centennial Drive, the bulk of the employment in the City will continue to be located downtown, which is over 9km away and it will be challenging to entice these commuters to choose walking or cycling modes of travel for work-related trip making.

According to the 2008 Household Travel Survey, walking and cycling account for about 14% of daily and PM peak period trips that originate from the City of Kingston (1% cycling and 13% walking). An additional 2,700 people will need to switch to active transportation to achieve the target of 17%. (3% cycling and 14% walking) After the next Household Travel Survey in 2017, the effects of the investment in facilities and programs to support cycling and pedestrians will be evaluated. The active transportation targets will be reviewed as part of the KTMP update in 2019 and adjusted if required based on the new data.

People are more likely to choose active forms of transportation as the length of their trip becomes shorter. An increase in shorter trips is critical for the overall mode share increase in active transportation. Achieving increases in the overall share of trips made by active transportation will require significant increases in the share of short trips choosing to walk or cycle.

10. How were the mode share targets selected? Other communities have considerably higher targets for AT and transit. Why not Kingston?

Possible mode share targets for active transportation trips were assessed using the average trip length of residents to estimate the market demand needed to encourage a shift in mode choice. Under base case conditions for 2034, it is expected that 26% of people with trips under 5km in length would use active modes of travel, while 11% of trips 5-10 km and 7% of trips over 10km in length would choose active transportation modes. Achieving increases in the overall share of trips made by active transportation will require significant increases in the share of short trips choosing to walk or cycle.

The table below highlights the active transportation and transit mode share targets from other municipalities of comparative size and characteristics. In some cases, other TMP's have set targets based on different scenarios that are described as moderate to aggressive approaches, which is why there is a range listed as targets.



Municipality	Transit Target	Active Transportation Target
City of Peterborough	6%	8%
City of Barrie	7-12%	12-20%
City of Belleville	4.5%	n/a
City of London	10-20%	15%
City of Kingston	9%	17%

Greater mode share targets can be tied to implementing infrastructure and policies such as cycling master plans, bicycle sharing programs, advisory committees on active transportation guidance to council, winter maintenance, and educational enforcement programs.

The cycling mode share target projects that cycling ridership will increase from 1% to 3% by 2034 in the City of Kingston which represents a 200% increase.

11. What is the split between pedestrians and cyclists for the AT target of 17%? Why are the pedestrian and cycling targets combined? With more cycling lanes, would we expect to see an increase in the 1% for cycling within the new target of 17%?

Pedestrian and cycling trips are grouped together in areas of the KTMP as they typically reflect shorter distance trips that are less than 10 kilometers. Both modes share many characteristics including cost/affordability, safety, design constraints, travel time, maintenance and directness. Many planning policies and supporting programs are also shared between the two modes including complete street designs, and wayfinding. The active transportation target of 17% was developed using a 14% walking and 3% cycling mode share target.

12. If Active Transportation is supposed to account for 17% of trips, why are we still spending so much on roads? Why aren't the funds proportional? How come funding for Active Transportation is so low if it targeted to reach 17% of all trips?

When the overall capital investment in transportation projects funded from both City taxes and Development Charges are considered, a more complete picture emerges than that available in the KTMP only.

The capital investments listed in the table below account for new infrastructure and related transportation services required to support growth within the City over the next 20 years as well as the replacement and rehabilitation of existing transportation infrastructure over the same time period. The capital investment in active transportation is slightly lower than the corresponding mode share target, the investment in transit is higher than the corresponding mode share target and the investment in roads is essentially the same as the mode share target.

### **Capital Investments (2014 dollars) Transportation Infrastructure and Related Services (2014 - 2034)**

Transportation Program	Development Charges	Tax-based Funds	Total Investment	%Total Capital Investment	2015 KTMP Mode Share Target
Active Transportation	\$34,000,000	\$62,000,000	\$96,000,000	14%	17%
Transit	\$13,000,000	\$72,000,000	\$85,000,000	12.5%	9%
Roads	\$195,000,000	\$305,000,000	\$500,000,000	73.5%	74%
<b>Sub-Total</b>	<b>\$242,000,000</b>	<b>\$439,000,000</b>	<b>\$681,000,000</b>	<b>100%</b>	<b>100%</b>
TDM	\$1,000,000	\$17,000,000	\$18,000,000		
TSM	\$12,000,000	\$29,000,000	\$41,000,000		
<b>Sub-Total</b>	<b>\$13,000,000</b>	<b>\$46,000,000</b>	<b>\$59,000,000</b>		
<b>TOTAL</b>	<b>\$255,000,000</b>	<b>\$485,000,000</b>	<b>\$740,000,000</b>		

When the investments in TDM and TSM are combined with the investments for active transportation, transit and roads, the total capital cost in 2014 dollars needed to implement the recommendations of the 2015 KTMP over the next 20 years is \$740 million.

As illustrated in the table, the capital funding for active transportation is about 14% of the total capital investment. This reflects the investment needed to improve the existing active transportation network to encourage more people to choose to walk or cycle.

Progress will be monitored as part of the regular update of the KTMP and the planned Active Transportation Master Plan. Adjustments will be made to the capital investment strategy as the program evolves in response to changes to actual mode share and input from the public.

### 13. Was KCAT consulted and were their comments included in the KTMP?

The Kingston Coalition for Active Transportation (KCAT) was consulted.

In April 2014, KCAT provided a detailed summary of potential improvements to the 2004 KTMP. These comments and the related supporting programs were incorporated into the KTMP where applicable.

City staff personally met with representatives from KCAT to discuss the KTMP and opportunities to enhance pedestrian and cycling facilities. KCAT was also invited to the June

2014 KTMP Open House. KCAT provided a summary of comments which were forwarded to the consultant and remain in the KTMP file. The KCAT comments were carefully considered during the development of the KTMP Update and within the final recommendations.

#### 14. How does the KTMP impact pedestrians?

A mode share target of 14% for walking was established in the KTMP. To achieve this target, infrastructure, maintenance policies, education and enforcement is required. Infrastructure is needed to expand the walking and cycling network and provide connections to create direct routes, increase safety and comfort. Education and enforcement are needed to strengthen the safety and comfort of active transportation users. A cycling and pathway network, building on previous work, is recommended with details on the network to be developed as part of an Active Transportation Master Plan (ATMP). The ATMP is scheduled to be completed in 2016/2017.

#### 15. Why aren't trails included within the KTMP?

The existing trail network and on-street cycle routes are illustrated in map 2 in Appendix A of the KTMP report. The 2015 Recommended Cycling and Pathway network is illustrated on Map 4 in Appendix A and includes an on-road and off-road network. A more comprehensive study of specific on and off-road facilities for pedestrians and cyclists will be included in the 2016/2017 Active Transportation Master Plan (ATMP).

#### 16. Why isn't there more connectivity for cycling throughout the City between recreational trails and on-street facilities?

The 2015 Recommended Cycling and Pathway network is illustrated on Map 4 in Appendix A. This network builds on the existing network of bicycle lanes and routes that have already been implemented in Kingston. The utilitarian-focused and recreational-focused networks previously recommended in the 2003 Study have been added to the network, as well as the pathway network described in the Official Plan.

There are some areas of Kingston that have fewer cycling routes and pathways such as:

- Princess Street corridor
- Employment and retail along the Gardiners Road corridor
- Dalton Avenue employment area
- Rural areas
- Inner city residential areas west of downtown

To better serve these areas, additional links have been added to the network. A more comprehensive study of specific on and off-road facilities for pedestrians and cyclists will be included in the 2016/2017 Active Transportation Master Plan (ATMP).

The expanded network connects to all residential, commercial, and industrial areas within the urban area of Kingston. It also connects to all major institutions in the urban area, such as Queen's University. The network includes most arterials and major collector roads in the urban area, which provides direct routes between many areas of Kingston. The proposed cycling and pathway network forms a primary network for Kingston and is supported by connections to

many trip generators using more minor streets.

17. Why isn't the City progressing in a more "green" way by viewing the downtown as a pedestrian area?

Kingston has progressed to providing more of the right-of-way to pedestrians in the downtown area over the years and will continue to do so where it is feasible. Businesses and residents rely on the road network for goods movement, property access and customer access. This must be maintained to keep our City and our economy vibrant. To encourage walking in the downtown area, enhanced crosswalk markings have been installed at key intersections along with pedestrian countdown devices. The City is also currently considering a pedestrian only area on Sydenham Street between Princess and Queen Street.

18. What about improvements for pedestrians through improvements to the traffic signals?

Traffic signal timing includes pedestrian phases that give pedestrians time to cross the street. The time given to the pedestrian phase is divided into 'walk' and 'don't walk' time. The 'walk' and 'don't walk' times in the City are calculated according to the Ontario Traffic Manual Book 12. The calculation of the pedestrian phase takes into account the width of the roadway, as well as the walking speed of pedestrians. The City of Kingston has recently reduced the walking speed used for the design of the pedestrian timing from 1.2 metres per second (m/s) to 1.0 m/s throughout the downtown since this provides additional time for pedestrians to cross the street.

Traffic signal timing improvements are recommended in the KTMP in order to minimize delays for all users. It is recommended that traffic signals continue to be retimed and optimized throughout the City. When the traffic signals are retimed, the pedestrian timing will also be reviewed to determine if it meets the needs of pedestrians at that intersection.

Some signalized intersections in the city include pedestrian push buttons. Locations that have a push button require pedestrians to push the button to display the 'walk' signal. In the City of Kingston, pedestrian push buttons are installed where the minimum 'green signal' time for vehicles is less than the pedestrian crossing time. The need for pedestrian push buttons will also be reviewed during the traffic signal timing improvements.

From 2016 onward, pedestrian countdown devices and audible signals for visually impaired pedestrians will be installed at all new traffic signals or where signals are being rebuilt.

19. Can the KTMP address Active Transportation for the ageing population that includes scooters, e-bikes, wheelchairs, golf carts?

The City of Kingston By-law No. 2004-190 defines a pedestrian as "an individual with a disability who is using a wheelchair or other remedial appliance or device, as well as an individual who is on foot". The KTMP follows the same definition when referring to pedestrians.

Golf carts are considered motor vehicles by the same by-law: "motor vehicle" includes an automobile, bus, truck, motorcycle, motor assisted bicycle and any other vehicle propelled or driven other than by muscular power, but does not include a traction engine, farm tractor, other farm vehicle, or machine used for road construction or maintenance". Therefore, motorized vehicles are considered in the KTMP to be served by road network improvements. (Chapter 9)

## 20. Can the KTMP be more inclusive of engaging the Active Transportation Master Plan (ATMP)?

The KTMP recommends the preparation of an ATMP in the future the scope and budget of the current KTMP does not include an ATMP. There are plans to complete the ATMP in 2016/2017 with approved development charges funding.

## Transit Questions

### 21. Even though Express Transit is being implemented, why does it look like there are no gains in percentage of overall ridership? Were the existing and proposed Express routes considered for future ridership?

The ridership numbers are the count of people that ride the bus. The mode share is calculated based on the ridership numbers and the total number of trips by all modes taken by the population of Kingston.

The 2014 PM peak mode share is 5.2%. With a target of 9% PM peak hour transit mode share in 2034, the PM peak hour riders are projected to increase from 4,450 to 9,250, which is more than double the number of existing transit riders in the PM peak.

Express routes implemented in September 2013 (the route 501 and 502) were included in the analysis of the 2014 PM peak mode share with ridership information from October 2014. The entire Express routes plan was considered in the development of the future ridership projections.

### 22. Why does the mode share target for transit decrease to 9% in the 2015 KTMP when the previous target was 11%? Where is the cost-benefit analysis? Can the cost-benefit analysis include consideration of reduced emissions and delays due to less congestion and analysis of the positive health, energy and environmental impacts of increasing transit mode share over time?

The 9% transit mode share target was selected because it provides a realistic target that has the lowest cost while balancing the need for road capacity with the desire for reduced congestion and emissions.

A methodology was developed to compare the different the transit mode share targets. The traffic model was used to estimate the reduction in auto traffic as a result of the increase in transit use. For each scenario, evaluation measures were generated from the modelling work including estimates of peak hour transit ridership; increased transit operating costs and transit capital costs for new buses; the extent of road network congestion and associated road widening costs; estimated greenhouse gas emissions; and user delay savings due to reduced congestion.

The table below summarizes the model results for various mode share targets based on the 2034 horizon year.

The PM peak ridership growth required for the 9% transit mode share is a reasonable

expectation for transit growth. The lowest costs for road infrastructure and transit are at the 9% transit mode share target and the benefits of reduced emissions and congestion delay at this level are similar to the benefits for the 11% transit mode share. For this reason, the 9% transit mode share target is the optimal scenario for transit mode share.

<b>Overall Mode Share -&gt;</b>	<b>5%</b>	<b>8%</b>	<b>9%</b>	<b>11%</b>	<b>15%</b>
<b>Evaluation Statistics</b>					
Required PM peak ridership growth (2014-2034) to achieve targets	15%	84%	108%	153%	245%
Estimated new buses required in 2034	0	30	38	55	91
Km of road at / over capacity	49 km	42 km	39 km	37 km	30 km
Estimated additional cost for road construction and transit as compared to least expensive option	2%	2%	Lowest cost	4%	6%
Estimated emission reduction	0	3%	4%	5%	8%
Congestion delay reduction (annual veh-hours)	0	13%	17%	23%	34%

23. Could any road projects be eliminated from the KTMP if the transit target were increased to 11%?

If the only recommendation carried forward was to increase the transit target to 11%, the need for additional roadway capacity across various screenlines would not be solved. The road network recommendations listed in the KTMP would still be required.

24. Do the transit costs within the KTMP up to 2034 include all capital plus ongoing operational expenses? Can more details be provided on all additional total costs required to increase the transit target from 9 to 11%?

The costs listed in Table 10-1 in the KTMP are capital costs. The estimated operating costs at a 9% transit mode share for the year 2034 are \$33M in 2014 dollars. This is the cost for a single year. The operating costs for a single year of operations at an 11% transit mode share for the year 2034 is \$39M in 2014 dollars. The estimated annual operating budget increase for each year from 2015 to 2033 has not been calculated however it should be assumed that the operating budget would increase incrementally in each of those years to build capacity that

would accommodate a 9% or 11% mode share.

25. Would more frequent transit service, especially along corridors such as Montreal Street help reach the optimal transit target?

Service frequency requirements to achieve the 9% mode split for transit by 2034 has been modeled in Appendix A – Map 7. This frequencies envisioned in this high level model would be refined as part of the regular service reviews completed by Kingston Transit however a higher transit mode share would not be expected to significantly change Map 7 but rather expedite the implementation.

26. Since intensification is replacing some parking lots and parking rates are increasing, why aren't we seeing more aggressive transit ridership targets in the forecasts?

The transit ridership target was identified in the KTMP by taking into account the reduced driving demand and by considering the expected available parking supply/rates.

“Reducing the need to drive will reduce the need for parking and appropriate parking supply management will encourage drivers to choose other options.”

27. Why isn't the City considering free public transit?

The impact of costs to the rider were not considered as part of the KTMP analysis.

Transit staff are aware of a number of jurisdictions in North America where free transit has been provided City-wide to all users.

Fare revenue (including revenues from the various agreements in place with institutions and employers in the City) represents approximately \$6M of the current annual transit budget. City staff have not considered the budget implications of this revenue loss or the potential capacity issues associated with the expected ridership increase.

28. Why doesn't the City provide low-cost or free public transit to low income users and special groups?

The City has an affordable transit pass program that provides riders that demonstrate financial need with a 32% reduction off monthly passes. Transit rates for Seniors (over 65) and Youth (under 18) are also reduced.

The City also has agreements with employers and student associations to allow for lower cost transit rides. The pilot program that allows high school students (Grade 9 – 12) to use transit for free has recently been extended through August 2016.

29. If transit share was 5% in 2009, and the target is 9% over next 20 years, what is it today?

The transit share in 2014 was 5.2%.

30. Are there higher targets for transit in certain parts of the City? If targets were higher in certain parts of the City, could this eliminate the need for some of the future road projects?

Yes, there are higher targets for different parts of the City and the need for future road projects was still identified.

A series of transit mode share targets were assessed for the City of Kingston, using the transportation model to estimate the number of transit trips that would be generated at each level of use. To achieve the overall transit mode shares, a higher transit use is required in the downtown area to compensate for typically lower transit use in suburban areas. The split between downtown area targets and suburban targets is shown in the table below.

<b>Required Mode Share by Area to achieve Overall Mode Share</b>					
Overall Mode Share	5%	8%	<b>9%</b>	11%	15%
Downtown Mode Share	6.5%	12.0%	<b>14.0%</b>	18.0%	24%
Suburban Mode Share	3.1%	3.9%	<b>4.1%</b>	4.4%	6.2%
			<b>recommended</b>		

**31. Can the KTMP address transit service in the Countryside District?**

The KTMP includes a discussion of rural transit in Chapter 6. Specifically it states:

“Currently, there is no transit service in rural Kingston, which is generally located north of Highway 401 and east of the Cataraqui River/Highway 15 development. Park and Ride lots are provided to give rural residents access to express and local transit in several locations near the rural/sub-urban boundary including locations at the Highway 401 interchanges.

Generally, the provision of rural transit is designed to increase equity in the overall transportation system and cost-recovery is typically low. Rural transit service is not expected to contribute to the City transit mode share target. As the population ages, more people will become dependent on other means of transportation. Without transit or driving, many rural residents rely on carpooling with friends or family. Provision of a basic level of transit service over the horizon forecast in this KTMP Update can help this population stay independent.

Opportunities may exist to link service operating in rural areas of the City and County, such as small community shuttles, vans and other specialized services, to the Kingston Transit transfer points to allow rural residents to transfer onto the conventional transit system. Programs such as the Community Transportation Grant Program, administered by the Ontario Government, may be beneficial in coordinating existing community-based rural transportation resources to provide a more meaningful rural transportation option.

Rural service levels will be considered as part of the service review and operations plan that will be developed by Kingston Transit in 2016.”

As noted by the KTMP, options for rural transit will be considered as part of the ongoing service reviews. The service reviews are the most appropriate mechanism to consider specific service level changes as the process allows for more detailed review of specific areas. The KTMP provides the direction to complete this review.



32. How accurate are the Kingston Transit ridership counts? If bus drivers use “clickers” to count large number of riders during busy times, how accurate are the counts and how do inaccurate “clicker” counts impact ridership numbers? How do the “Smart Cards” work?

There will always be some error associated with any type of fare box however this can be minimized through technology, operator training, and data monitoring.

The smart card farebox system currently installed in the Kingston Transit fleet provides data that is more accurate than the previous manual farebox system as the instances in which the bus operator must manually enter data is minimized.

The Smart Cards store the rider’s pass information that is read and validated when the card is tapped at the fare box. For riders that board the system and use a smart card at the fare box there is minimal error in recording their ride. All of the monthly pass, employer pass, and multi-ride pass riders on the system use a smart card.

Similarly riders that board using a cash fare are validated at the fare box and only require manual intervention if they are not paying a full adult fare. Typically the error associated with the ridership data in this instance would be in the type of rider who boarded (adult, youth, or senior) and not in the actual ridership number.

Manual counting of riders is limited to the Queen’s University and St. Lawrence College students who board using their student id cards. Bus operators are trained to count the number of students boarding and enter this information into the farebox. There is some error associated with this method however it also allows for more efficient operation of the service when moving large volumes of students.

## Transportation Demand Management (TDM) Questions

33. How does the KTMP address Park ‘n Ride lots and Smart App Car Sharing?

The KTMP recommends an increase to park and ride services / lots in the City’s rural/suburban areas to encourage transit and carpooling. As part of the strategy for increasing TDM, it is recommended that park and ride lots are included at transit nodes, at Highway 401 interchanges and at intensification areas. Park and ride lots (new and expanded) are recommended in the short term, medium term and long term implementation plans for the KTMP.

Car sharing services, such as Virtucar or Zipcar, are not addressed in the KTMP, since car sharing does not reduce the number of vehicular trips on the road network.

34. To actually change motorist behaviour, are we going far enough by shifting the trigger for roadway improvements from a volume/capacity ratio (v/c) of 0.90 (LOS D) to a v/c of 1.0 (LOS E)? Would a LOS F, encourage people to find alternative methods of transportation and alternative solutions to building a new road?

LOS F indicates that the roadway is over capacity and vehicles experience forced flow conditions with severe congestion, long queues and significant delays.

A LOS F on the roadways may encourage drivers to reconsider their travel options; however, the roadway would be operating in gridlock for automobiles, transit vehicles and commercial trucks. There would be an impact on the economy if the road network was to experience delays and queues on a regular basis. An assessment of capacity thresholds is provided in the KTMP in Chapter 4.

35. Do we have information about other cities using LOS E and how will this revised target impact Kingston?

A recommended target of Level of Service E, which corresponds to a v/c ratio of 1.0, means that there will be more congestion in Kingston during the peak hour of travel. Drivers will experience more delay on the main streets and at intersections.

From EITP-14-007 (May 13, 2014, Table 3):

MUNICIPALITY	LEVEL OF SERVICE	VOLUME / CAPACITY RATIO
City of Kingston	D (current) E (recommended)	0.9 (current) 1.0 (recommended)
Region of Halton	N/A	0.9 -1.0
City of London	E	1.0
City of Ottawa	D-E	0.9 -1.0
Region of Peel	D	0.9
City of Windsor	E	0.9 -1.0
Region of Waterloo	E	0.9 -1.0
City of Burlington	E	N/A
Region of York	N/A	0.8 - 0.9

36. Why aren't we considering fees to single occupant vehicles to discourage driving?

The cost to implement and enforce a single occupancy vehicle toll in a city street network is prohibitive.

High Occupancy Toll (HOT) lanes are lanes where single occupancy vehicles pay a toll fee and high occupancy vehicles ride for free. To collect a toll, the roadway would need to be designated a "toll highway" under the Highway Traffic Act (Part X.1), R.S.O. 1990. Ingress and egress to the HOT lanes needs to be restricted to collect and enforce the toll.

**37. Why does the KTMP recommend a target of 1.2? What is it now? How are we going to measure this? Is this appropriate?**

The average auto-occupancy for the City of Kingston is 1.14 based on the results of the 2008 Household Travel Survey. The 1.20 auto occupancy rate was selected as the optimal and realistic scenario. The City of Waterloo also plans for auto-occupancy of 1.2 by 2031.

For the updated KTMP three potential auto occupancy targets were evaluated (1.17, 1.20, 1.23) using the Travel Demand Model. The relative benefits of each alternative were assessed in terms of the ability to remove vehicles from the network during peak periods; the ability to reduce capacity deficiencies and hence the need for improvements; estimated greenhouse gas emission reductions; and savings in delay and user costs.

<b>Auto occupancy targets</b>	<b>1.14</b>	<b>1.17</b>	<b>1.20</b>	<b>1.23</b>
Reduction of Auto Vehicle Trips in PM peak hour to achieve target	No change	891	1,739	2,545
km of road at/over capacity	49 km	48 km	45 km	39 km
Estimated road widening cost savings	0	2%	8%	20%
Estimated Emission Reduction	0	2%	4%	6%
Congestion Delay Reduction	0	9%	16%	22%
			recommended	

As summarized in the table above, when the auto occupancy rate increases, fewer automobiles are on the road network. This reduces the need for road widening.

With the auto occupancy target of 1.20, there is the potential to remove 1,700 vehicles from the road network during the PM peak hour. This is the equivalent to two arterial lanes of traffic. The achievability of the highest level of auto-occupancy, and hence a high level of carpooling in a city the size of Kingston, would require a strong policy framework, which would need to include increased costs for all-day parking in major employment areas to encourage commuters to look for alternative means of travel.

Recent changes to parking pricing policy in the City have been implemented and this type of policy change can have an impact on mode choice. Providing carpool parking infrastructure to support the highest level for auto occupancy targets could be a challenge. While not all carpoolers will require dedicated parking spaces, assuming that 40% will use a carpool lot; the 1.23 auto occupancy target would translate into a need for up to 1000 carpool parking spaces around the City by 2034. Some of these spaces could be allocated from existing underutilised parking lots. Some communities have partnered with institutions, such as churches, that have sporadic need for parking spaces in order to provide weekday carpool parking. Other spaces will need to be created to serve a higher demand for carpooling.

Costs for carpool lots can vary quite substantially based on the availability of land the integration of other services such as bus bays and turn around loops, security features,

lighting, etc.,

A measure of the auto occupancy rate will be taken in the next Household Travel Survey to determine if the goal of a 1.20 auto occupancy rate is being met.

### 38. Why isn't the City pushing harder to disadvantage motorists and make cycling more attractive?

Active Transportation mode share targets need to be set and embraced by the City Council and administration. The choice of targets should represent a challenge to achieve, yet not impossible. A more aggressive mode share target would be difficult to achieve due to the future allocation of new residential land use in Kingston relative to established or emerging employment areas. The vast majority of new population growth is forecast to occur in the Cataraqui Woods area, north of Princess Street and east and west of Gardiners Road. While there is a large employment node just east of Gardiners Road along Centennial Drive, the bulk of the employment in the City will continue to be located downtown, which is over 9km away and it will be hard to entice these commuters to choose walking or cycling modes of travel for work related trip making.

People are more likely to choose active forms of transportation as the length of their trip becomes shorter. An increase in shorter trips is critical for the overall mode share increase in active transportation. Achieving increases in the overall share of trips made by active transportation will require significant increases in the share of short trips choosing to walk or cycle.

### 39. Why are we building new roads when we want to support TDM?

Businesses and residents rely on the road network for goods movement, property access and customer access. Transit, pedestrians and cyclists must also make use of roads and the associated infrastructure. Roads are needed to serve new development.

### 40. Why are we trying to equally accommodate cars and AT? How can we see positive change unless automobiles are further disadvantaged?

Active Transportation mode share targets need to be set and embraced by the City Council and Administration. The choice of targets should represent a challenge to achieve, yet not be impossible. A more aggressive mode share target would be difficult to achieve due to the future allocation of new residential land use in Kingston relative to established or emerging employment areas. The vast majority of new population growth is forecast to occur in the Cataraqui Woods area, north of Princess Street and east and west of Gardiners Road. While there is a large employment node just east of Gardiners Road along Centennial Drive, the bulk of the employment in the City will continue to be located downtown, which is over 9km away and it will be hard to entice these commuters to choose walking or cycling modes of travel for work-related trip-making.

People are more likely to choose active forms of transportation as the length of their trip becomes shorter. An increase in shorter trips is critical for the overall mode share increase in active transportation. Achieving increases in the overall share of trips made by active transportation will require significant increases in the share of short trips choosing to walk or cycle.

#### 41. Did the KTMP consider fuel costs for automobiles?

The KTMP discusses energy costs as part of the emerging trends in Chapter 1.

The KTMP model does not consider fuel costs. The model is based on the population and employment data in City of Kingston and Kingston Census Metropolitan Area Population, Housing and Employment Projections Report (September 2013) by Meridian Planning and the Pending and Committed Urban Residential Subdivisions Report (December 2014) by the City of Kingston.

### Transportation Systems Management (TSM) Questions

#### 42. Why doesn't the City operate traffic signals on a "smart grid"?

The City is evaluating the feasibility of connecting traffic signals to a centralized system that would allow intersections to be monitored and traffic signal timing changes to be made on a real-time basis. The proposed project would include the installation of the required software and traffic cameras at 10 initial pilot intersections in the City. City staff will continue to work with Utilities Kingston on this project as schedule and budget permits.

#### 43. Did the KTMP consider driverless cars, technology and size of cars?

The KTMP discusses the role of technology as part of the emerging trends in Chapter 1.

The KTMP does not consider driverless cars or connected vehicle technology. While the project team is aware of the advances in technology, the technologies are still in their infancy. For example, the first driverless car testbed is expected to be in the United Kingdom and will operate with autonomous vehicles for the first test on the roadway in 2017.

Connected vehicle technology is also still in the testing phase. The ACTIVE-AURORA research circuit (Canada's first testbed for connected vehicles) was launched in October 2014. ACTIVE-AURORA is a three year project to collect and analyze connected vehicle data along the Asia-Pacific Gateway.

#### 44. How come the KTMP does not address the use of one-way streets and traffic circles as traffic management techniques?

Traffic management techniques, such as one-way streets and roundabouts, are typically assessed for specific locations in the city and are related to detailed traffic studies. The KTMP is a large scale review of transportation across the City and considers recommendations that impact the entire City, rather than specific issues at particular locations.

The decision to implement one-way streets and roundabouts are transportation planning and traffic operational decisions that would typically be made during the detailed design phase or as a result of a specific traffic operations study. Since one-way streets can limit access to properties, be confusing for motorists unfamiliar with the City and can result in higher vehicle speeds, the City would carefully consider any decision to change a street from 2-way to 1-way to ensure that the change would be of benefit to all road users.

#### 45. Why aren't we removing traffic signals and stop signs and embracing the "Shared Spaces" concept?

The shared space concept is a road design approach that is used in some communities in Europe but is not common in North America. The concept removes traffic signals and road signs and integrates features for vehicles, pedestrians and cyclists into the same road space. It is a traffic calming technique that encourages communication between the various road users, especially in areas with high pedestrian volumes. It could be considered as part of the City's Traffic Calming Policy but is not part of the mandate of the KTMP to evaluate traffic calming policies and techniques.

## Roads Questions

#### 46. Why are Development Charges (DC) fees collected for road building? Can't we use DC's to make improvements to the existing transportation system in areas where they are needed most?

In Kingston, development charges are used for projects related to active transportation, transportation demand management, and transportation systems management as well as for future KMTP and transportation model updates. There are specific requirements regarding the use of development charges funds under the Development Charges Act. The Ministry of Municipal Affairs states the following:

Development charges are charges imposed by municipalities on developers to pay for increased capital costs related to growth. Development charges provide municipalities with a tool to help fund the infrastructure needed to serve new growth. They help finance the growth-related capital costs of providing important services like roads, water and wastewater services, police, fire and transit. Development charges can only be used to finance growth-related capital costs.

The Development Charges Act, 1997 requires municipalities to complete detailed background studies. These studies must include, among other matters, estimates of projected growth, estimates of new services necessitated by that growth, and estimates of the capital costs of infrastructure projects required to meet the increased need for services.

- A municipality must pass the development charge by-law within one year of the completion of the background study on which the by-law is based.
- A development charge by-law is in force for a maximum of five years, unless repealed or replaced earlier. A new background study must be completed and a new by-law must be passed in order for a municipality to start levying development charges again.

#### 47. Can the KTMP better explain the process to get from the "base case" to the list of recommended road improvements?

The evaluation of 2034 future conditions was completed using a forecasting model network that included all transportation-related projects completed up to 2013 as well as planned/approved improvements to roadways external to the City, known as the "Do Nothing" or "base case" scenario. The future travel demand is based on the population and employment growth

expected for the City. The City's observed transit, auto, and non-auto mode shares from the updated travel survey were also incorporated into the modelling. Using the Kingston Model, PM peak hour future traffic forecasts were developed and assigned to the 2034 "Do Nothing" road network. By evaluating the future traffic conditions on the "Do Nothing" network, areas that will be congestion can be identified, thereby isolating segments of the network that may require improvements.

To interpret the results of the modelling, the City uses a series of screenlines to examine the extent of capacity deficiencies and the need for improvements. These screenlines were established as part of the 2004 KTMP and have been maintained in this current model update. Screenlines are imaginary lines, the locations of which are chosen strategically to capture traffic that crosses major arterial roads, rivers, or other major physical boundaries in an area. Several roads cross each screenline and motorists can be expected to distribute between the roads, making best use of the available capacity.

Traffic forecasts from the Kingston Transportation Model can be summarized at the screenline level to determine if the available capacity over the screenline is adequate to accommodate the predicted traffic flows, and can help indicate where new arterial lanes are needed to achieve a Level of Service D over the screenline during the PM peak hour. The screenline deficiencies can be addressed through road widening or road building, through a shift in travel mode from auto mode to transit or active transportation, from transportation systems improvements and through the reduction in peak hour trips through the implementation of various transportation demand management programs such as teleworking and parking policies. The KTMP study identified the different strategies that the City can use to address the transportation needs.

Under 2034 base conditions it is estimated that approximately 81 km of the Kingston road network is forecast to be operating at a volume to capacity (v/c) ratio of 0.90 or worse (Level of Service (LOS) D or worse). Major arterial roads such as John Counter Boulevard, Princess Street, Division Street, LaSalle Causeway, Sir John A. MacDonald Boulevard, Montreal Street, Highway 15, Sydenham Road, and sections of Bath Road are all expected to be operating at a Level of Service D.

By adopting the acceptable congestion threshold v/c ratio of 1.0, the model results revealed that some of the previously established deficiencies at the screenline level had been addressed. However, several screenlines have a v/c ratio greater than 1.0 and thus may require road network improvements.

Three proposed long term road network improvements have had Class Environmental Assessment studies performed and are now considered projects that are ready to proceed. These projects are:

- John Counter Boulevard widening from two lanes to four lanes
- Two lane Wellington Street extension
- Third Cataraqui River crossing

With capacity optimization options and committed road network projects established, additional road network improvements were identified through analysis of the 2034 "Do Nothing" Kingston Model traffic simulation. While some of the potential improvements are intended to address future traffic congestion issues, other road improvements considered are intended to provide network connectivity and access for future growth areas/ and developments. The road network improvements that were evaluated and then recommended are:

- Bayridge Drive: A two lane extension of Bayridge Drive from Sierra Avenue to Creekford

Road. This extension will provide improved access for the forecasted population growth allocated in the area. The connection to Creekford Road can also help distribute traffic over the adjacent road network by providing an alternate route to the Highway 401/Gardiners Road interchange.

- **Cataraqui Woods Drive:** A two lane extension of Cataraqui Woods Drive from Centennial Drive to Sydenham Road. This extension will provide improved access for the forecasted population growth allocated to the area. The connection also provides a through-traffic route from Gardiners Road to Sydenham Road, thereby providing additional route options for residential areas that abut Cataraqui Woods Drive.
- **Centennial Drive:** A two lane extension of Centennial Drive from Cataraqui Woods Drive to Gardiners Road. This extension will help distribute traffic to/from the Highway 401/Gardiners Road and the residential and employment areas near the Gardiner Road corridor. Along with the proposed Cataraqui Woods Drive extension, this connection may also help reduce congestion on Princess Street.
- **Highway 15:** A widening of Highway 15 from 2 lanes to 4 lanes between Highway 2 and Gore Road. This improvement addresses forecasted congestion on Highway 15. Additionally, with the Third Crossing project implemented, widening Highway 15 may provide relief for Montreal Street congestion by shifting through-traffic across the river.
- **Leroy Grant Drive:** A two lane extension of Leroy Grant Drive from Elliott Avenue to Concession Street. This extension will provide improved access to the adjacent residential areas and address congestion over the Russell Street screenline. This new connection may also improve access to the downtown core.

48. Do the road costs within the KTMP consider capital plus ongoing operational and maintenance expenses?

The costs listed in Chapter 10 in the KTMP are capital costs and consider funds required for new roads as well as the replacement and rehabilitation of existing roads.

49. Why isn't Highway 401 considered as a viable east/west option for Kingston drivers?

The Kingston Transportation Model considered Highway 401 as an option for Kingston drivers. The continued congestion across the LaSalle Causeway indicates however, that few drivers are willing to travel the extra distance to use Highway 401. Many residents have also stated that they feel more comfortable driving on urban City roads where vehicle speeds are lower and traffic volumes, especially truck volumes, are less than on Highway 401.

50. Why is 80% of the KTMP budget being spent on roads?

The capital investments listed in the table below account for new infrastructure and related transportation services required to support growth within the City over the next 20 years as well as the replacement and rehabilitation of existing transportation infrastructure over the same time period. The capital investment required for roads is 73.5% of the \$681 million budget that includes active transportation, transit and roads which aligns with the 2015 KTMP mode share target of 74% for automobiles. When the investments in TDM and TSM are combined with the cost of active transportation, transit and roads, 67.5% of the total KTMP cost of \$740 million can be attributed to roads.



**Capital Investments (2014 dollars)  
Transportation Infrastructure and Related Services (2014 - 2034)**

Transportation Program	Development Charges	Tax-based Funds	Total Investment	%Total Capital Investment	2015 KTMP Mode Share Target
Active Transportation	\$34,000,000	\$62,000,000	\$96,000,000	14%	17%
Transit	\$13,000,000	\$72,000,000	\$85,000,000	12.5%	9%
Roads	\$195,000,000	\$305,000,000	\$500,000,000	73.5%	74%
<b>Sub-Total</b>	<b>\$242,000,000</b>	<b>\$439,000,000</b>	<b>\$681,000,000</b>	<b>100%</b>	<b>100%</b>
TDM	\$1,000,000	\$17,000,000	\$18,000,000		
TSM	\$12,000,000	\$29,000,000	\$41,000,000		
<b>Sub-Total</b>	<b>\$13,000,000</b>	<b>\$46,000,000</b>	<b>\$59,000,000</b>		
<b>TOTAL</b>	<b>\$255,000,000</b>	<b>\$485,000,000</b>	<b>\$740,000,000</b>		

**51. Why is the City considering building new roads instead of fixing existing roads?**

The KTMP considers both new roads and maintaining/rehabilitating existing roads. When forecasting future transportation deficiencies within the City, lack of road connectivity is an ongoing issue. With much of the population growth allocated to areas outside of the downtown core, road network connectivity is essential between growth areas and commercial areas, employment areas, provincial highways, and the downtown core. Addressing gaps in the network is critical for maintaining the City's economy.

The KTMP also recommends upgrading several corridors through widening and capacity optimization. These potential projects are intended to alleviate congestion through intersection improvements such as centre turning lanes, right turn lanes, signal co-ordination strategies, and transit priority measures such as High Occupancy Vehicle (HOV) lanes and queue jump lanes at intersections.

52. If the screenline that incorporates the Wellington Extension has a volume capacity ratio (v/c) =1.03, what are the v/c's across the screenlines that support the other road projects recommended within the KTMP?

The results of the 2034 “Do Nothing” screenline analysis are provided below. The table provides the v/c ratio for the screenlines with capacity issues, other than the screenline that includes Wellington Street extension, and a description of potential improvements to improve traffic operations. Not all potential improvements were carried forward to the recommended plan.

Screenline	Crossing Roads	v/c Ratio	Potential Improvements
Victoria Street-Beverley Street	Concession Street	1.03	With corridor optimization along Princess Street, Brock Street and Johnson Street, the capacity for the screenline would increase and the v/c ratio would be reduced to less than 0.95.
	Princess Street		
	Brock Street		
	Johnson Street		
	Union Street		
	King Street West		
Catarauqui River	Kingston Mills Road	1.11	The construction of the 3rd Crossing of the Catarauqui River would relieve congestion across the screenline.
	Highway 401 (Eastbound)		
	Highway 401 (Westbound)		
	LaSalle Causeway		
Little Catarauqui Creek	John Counter Boulevard	1.11	The widening of John Counter Boulevard will address the capacity issues across the screenline.
	Princess Street		
	Front/ King Street West		
	Highway 33 (Bath Road)		
Highway 401 South-West	Gardiners Road	1.25	Widening Sydenham Road and optimizing Division Street will increase capacity across the screenline, and allow the screenline to operate below a 1.0 v/c ratio. Widening Gardiners Road could be considered to reduce congestion further.
	Sydenham Road		
	Sir John A. Macdonald		
	Division Street		
Highway 401 North-West	Gardiners Road	1.09	Widening Sydenham Road will increase capacity across the screenline, and allow the screenline to operate below a 1.0 v/c ratio. Widening Gardiners Road could be considered to reduce congestion further.
	Sydenham Road		
	Perth Road		
Highway 33 (Bath Road)	Collins Bay Road	1.07	A corridor optimization plan along Gardiners Road would encourage
	Bayridge Drive		

	Gardiners Road		more people to use Gardiners Road and relieve the capacity pressures on Bayridge Drive.
Weller Avenue	Division Street (north leg)	1.15	Corridor optimization along Division Street will increase capacity. The construction of the 3 <sup>rd</sup> Crossing will also modify travel patterns across the screenline.
	Montreal Street (north leg)		

53. What does “LOS” mean in terms of time? Can we quantify the difference in LOS to something more easily understood like “an additional 2 to 3 minutes in difference of someone’s trip?”

Level of Service (LOS) at an intersection can be quantified as a measure of time in terms of delay experienced by a driver. For a roadway, the LOS is a measure of how many vehicles are on a section of roadway. To add a component of time value to the measure of congestion, the model results were used to compare a 0.9 maximum v/c ratio (LOS D) to a 1.0 maximum v/c ratio (LOS E) for the City of Kingston in 2034. There would be 45% more delay due to congestion with the selection of LOS E instead of LOS D. The increased delay will affect commuters by adding time to their trip. For example, for an average commuting time of 20 minutes, the trip will take an additional 9 minutes. The adoption of a higher acceptable v/c ratio means that fewer kilometres of the road network need to be improved which would reduce road construction costs but increase delay to users.

## Transportation Model Questions

54. Can more detail about the model and modelling results be included in the appendix to the final KTMP report? Are there other transportation models available and how do they differ?

In 2009, AECOM was retained by the City to complete an update of the City’s TransCAD Transportation Model. This work incorporated the results from the 2008 Household Travel Survey and recalibration of the model with updated traffic data. The resulting 2009 Model Development Report is an update to 2004 KTMP Appendix IV (Modelling) and could be included as an appendix to the updated KTMP.

The Federal Highway Administration (FHWA) published the Traffic Analysis Tool Primer ([http://ops.fhwa.dot.gov/trafficanalysistools/tat\\_vol1/vol1\\_primer.pdf](http://ops.fhwa.dot.gov/trafficanalysistools/tat_vol1/vol1_primer.pdf)) which provides a description of the various types of models and a list of available modelling software. In general, “Travel demand models have specific analytical capabilities, such as the prediction of travel demand and the consideration of destination choice, mode choice, time-of-day travel choice, and route choice, and the representation of traffic flow in the highway network. These are mathematical models that forecast future travel demand based on current conditions, and future projections of household and employment characteristics.

55. Can the screenline information and analysis that justify the Wellington Street Extension, John Counter Boulevard and the Third Crossing be provided somewhere in the KTMP?

The results of the 2034 “Do Nothing” screenline analysis are provided below. The table provides

the v/c ratio for the screenlines with capacity issues and a description of potential improvements to improve traffic operations.

Screenline	Crossing Roads	v/c Ratio	Potential Improvements
<b>Cataraqi River</b>	Kingston Mills Road	1.11	The construction of the 3 <sup>rd</sup> Crossing of the Cataraqi River would relieve congestion across the screenline.
	Highway 401 (Eastbound)		
	Highway 401 (Westbound)		
	LaSalle Causeway		
<b>Little Cataraqi Creek</b>	John Counter Boulevard	1.11	The widening of John Counter Boulevard will address the capacity issues across the screenline.
	Princess Street		
	Front/ King Street West		
	Highway 33 (Bath Road)		
<b>Russell Street</b>	Division Street	1.03	The construction of the Wellington Street extension will address capacity issues across the screenline.
	Montreal Street		
	Rideau Street		
<b>Weller Avenue</b>	Division Street (north leg)	1.15	Corridor optimization along Division Street will increase capacity. The construction of the 3 <sup>rd</sup> Crossing will also modify travel patterns across the screenline.
	Montreal Street (north leg)		

56. Why wasn't the 2008 Household Travel Survey updated to obtain current modal splits for all modes of transportation?

The Household Travel Survey is typically updated in advance of an update to the travel demand forecasting model to provide input to the modelling process. This is done at the start of the TMP update process. Since significant upgrades to pedestrian and cycling facilities as well as the introduction of Express Transit have only occurred recently, another travel survey at the start of this study would likely have yielded similar results to the 2008 Household Travel Survey. To capture the changes due to the recent service and facility upgrades, there are plans to update the Household Travel Survey in 2017 and this will provide an opportunity to review the mode share targets for the 2019 KTMP.

57. What is the margin of error in the KTMP model for future predictions of traffic and population? How well has the City's transportation model performed so far for projecting traffic growth (measured versus modelled)?

The model is a tool that helps with assessing needs and comparing scenarios. There is an

inherent margin of error in modelling and forecasting horizon year volumes. Future year forecasts depend on the uncertainty in the forecasts of future year population and employment numbers and in other future year assumptions (e.g. transit mode splits, active transportation mode splits, TDM). Model forecasts represent the expected results given the inputs on future year land use and assumptions. These inputs will not be known for certain until these future years occur but the data that is input into the model represent the current best reasonable estimates.

As a first step in the modelling process, the Model is calibrated to the current traffic conditions based on traffic data collected at different locations in the City. The City has an annual traffic data counting program that counts the number of vehicles, bicycles and pedestrians at intersections in the City. The Model is adjusted to match the situation that is observed on the existing road network and using the calibrated Model, the future traffic conditions are then projected. The Transportation Model uses forecasts of population and employment growth to forecast the growth in travel demands. Using the updated population and employment forecasts and the updated Transportation Model, future road network operations were assessed for the 2019 and 2029 horizon years. Since we have not yet arrived at 2019, we have not been able to compare the model to the actual situation in 2019.

The difference between the observed condition and the existing conditions model can help with providing the expected magnitude of error for a given forecast. Typically, models aim to be within a +/-15-20% validation target in existing conditions. The 2014 Model has a margin of error of 10% and the 2009 Model had a margin of error of 7%.

58. How valid can the model be if the population forecasts do not include the 30,000 students in the downtown area? Can the numbers be adjusted to reflect actual growth in the downtown core?

Population and employment growth projections completed by Meridian did not include student populations. Student enrolment numbers for these institutions were however used along with household travel survey information pertaining to students in order to account for student trips within the transportation model for the KTMP.

59. How were large student populations (Queen's/SLC/RMC) factored into the KTMP and transportation model?

The household survey contained trips made by students and based on this, a separate trip generation category was included in the model for student trips. In the absence of specific forecasts of post-secondary student enrollment, it was assumed that student trip making would grow at the same rate as population growth.

It is also worth noting that higher tourist trips during the summer months were generally offset by the reduction in student trips during the summer months.

60. What is the role of road classification as it pertains to the model? Can we expand upon Montreal, Patrick and Rideau Streets with respect to how these roads are treated in the TransCAD model?

Roadway classifications are coded into the model with different speeds and capacity / operating characteristics. Generally speaking, arterials roads would have a higher speed and capacity

relative to a collector or local road.

The Kingston Transportation Model assumes the following classifications and capacities for the identified roads.

Road	From / To	Classification	Capacity
Montreal Street	Railway Street – Hwy 401	Urban Arterial	900
	Stephen Street – Railway Street	Urban Minor Collector	500
	Brock Street - Stephen Street	Urban Minor Collector	500
Patrick Street		Local Road	350
Rideau Street	Railway St – River Street	Urban Collector	750
	River Street – Ordnance Street	Local Road	350

#### 61. How does the Transportation Model use traffic counts?

Traffic counts are used to calibrate and validate the Model. The City has an annual traffic data counting program that counts the number of vehicles, bicycles and pedestrians at intersections around the City. Once the Model has been set-up, the observed volumes from existing count data are compared with the simulated volumes and the model is adjusted to match the situation that is observed on the existing road network.

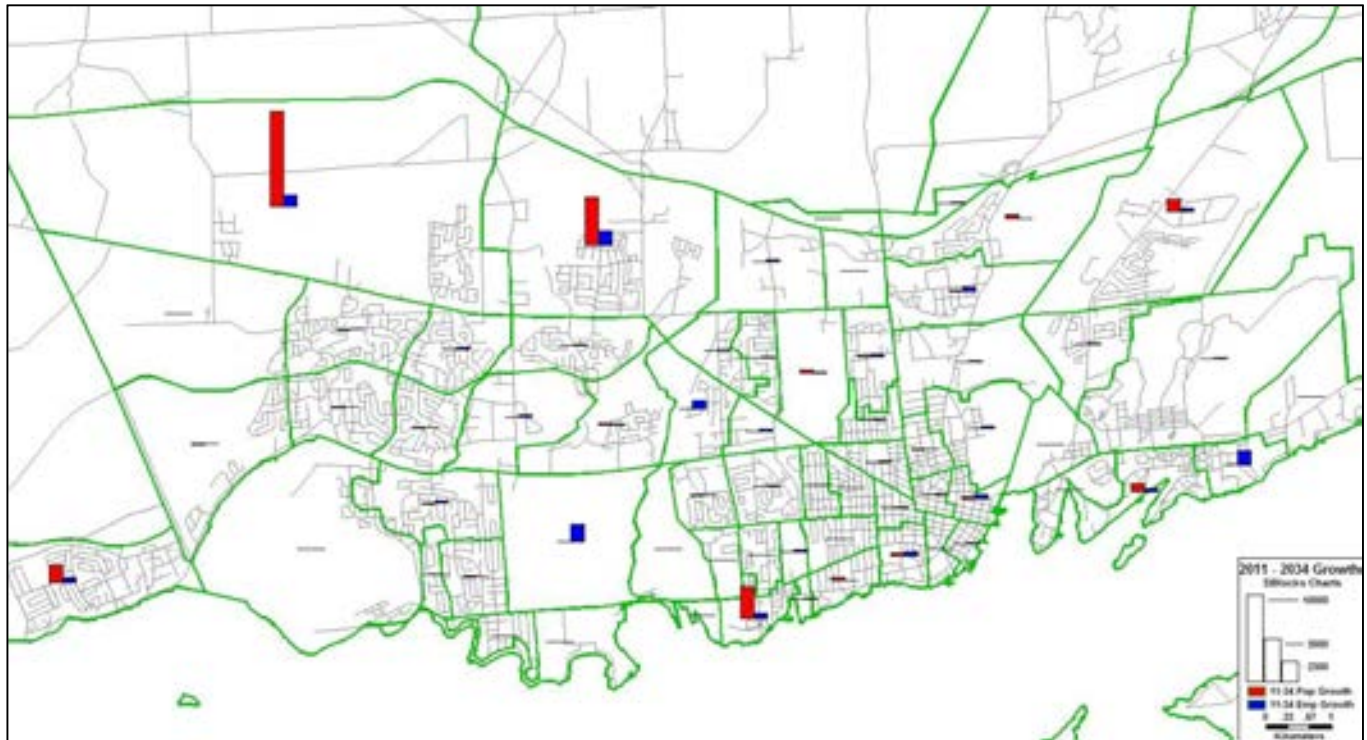
#### 62. What is the correlation between population growth projected to 2031 when it starts to decline and the trip modelling to 2034 and road structure improvements to 2034?

“City of Kingston and Kingston Census Metropolitan Area (CMA) Population, Housing and Employment Projections Report”, by Meridian Planning<sup>2</sup> indicates that the population and employment is expected to peak in 2034. The KTMP provides recommendations based on a model of the transportation system with the population and employment projections for 2034. The KTMP is a document that is intended to be revised on a regular basis and predictions for population and employment statistics should be updated when the KTMP is revised. The recommendations in the KTMP are based on the best available data at the time of the production of the report. The decline in the population is expected to be slower than the population increase between today and 2034 and hence the transportation network is expected to serve the Kingston population effectively for the period beyond the population peak.

<sup>2</sup>Meridian Planning Report: City of Kingston and Kingston CMA Population, Housing and Employment Projections. September 2013 (updated October 2013)

63. How is the growth in the west distributed in terms of employment and residential?

Population and employment growth in the west is shown in the map below with population growth in red and employment growth in blue. The highest population growth is expected north of Princess Street and west of Gardiners Road with high growth also in the area between Sydenham Road and Gardiners Road and north of Princess Street.



64. Does the traffic volume modelling take into account structural differences in the emerging distribution of traffic for different areas of the City?

The traffic modeling takes into account the differences between the different types of growth (population and employment) in different areas of the City. Population and employment growth for different areas is shown in the map above.

65. Does the predicted population growth in the west end increase employment downtown such that there would be a relatively significant increase in downtown peak hour traffic? Is this what the Model assumes?

Population and employment growth between 2011 and 2034 is shown in the map above with population growth in red and employment growth in blue. Population and employment growth is higher in the west area of the City than in the downtown area. The Model used the distribution of population and employment growth as shown in the map.

66. Does the Model assume a relatively stable increase over time (2014-2034) in population and traffic growth for the downtown area? Is this a correct assumption? Or does the Model make linear (straight line) projections into the future?

The Model provides travel information for a snapshot in time for the population and employment

data that is the input information. The Model does not develop growth projections. The population data and all growth projections are from the *City of Kingston and Kingston Census Metropolitan Area Population, Housing and Employment Projections Report* (October 2013) by Meridian Planning and the *Pending and Committed Urban Residential Subdivisions Report* (December 2014) by the City of Kingston.

The projections were created using a modified age-cohort model using the 2011 Census data and a series of assumptions detailed in the projections report. The report notes the foundation of the model relies on projections of the population by age and gender, households by age of head, dwellings by structural type, the labour force and the number of employed, etc. all starting with base year data for each of these concepts and on assumptions regarding future rates by age of fertility, mortality, migration, household headship, dwelling occupancy and labour market participation. The Model also considers that future migration flows into and out of a community are driven by local labour market requirements and that the future need for workers is driven by the potential for employment growth in the area's key economic sectors.

67. Since the downtown is largely built out with respect to employment lands and commercial/industrial build-out, does this lessen the future need for new roads in the downtown area?

There is still employment growth expected in the downtown area – shown in the figure above. If there is a need for new roads in the downtown area, the lack of available right-of-way will be an issue. Alternatives to new roads in the downtown area are included in the KTMP (Section 4): Active Transportation, Public Transit, and Transportation Demand Management.

68. Does the Model account for the slow growth in downtown employment with respect to traffic flow? Does it take into account the future increased likelihood/necessity of active transportation by the inner city population?

The Model accounts for the employment growth in the downtown core as described in the *City of Kingston and Kingston Census Metropolitan Area Population, Housing and Employment Projections Report* (September 2013) by Meridian Planning. The employment and population growth accounted for in the Model are mapped in Figure 2-1 of the KTMP Strategies Report. The active transportation mode share assumed by the KTMP is 17% (KTMP, Chapter 4).

69. How has the Model accounted for the future declining and aging population combined with transit growth?

The growth forecasts from the *City of Kingston and Kingston Census Metropolitan Area Population, Housing and Employment Projections Report* (September 2013) by Meridian Planning assume that the population will increase 2011 to 2034 when the population is expected to peak, then gradually decline to 185,530 by 2041.

The Model uses the population projections from the *City of Kingston and Kingston Census Metropolitan Area Population, Housing and Employment Projections Report* (September 2013) by Meridian Planning.

The 2014 transit mode share is 5%. The Model that incorporates the mode share targets uses the recommended transit mode share of 9% (KTMP, Chapter 4).



## 70. How does the Model account for decreased SOV (single occupant vehicle) trips?

The Model incorporates the recommended auto-occupancy target of 1.20 people per vehicle (KTMP, Chapter 4). The current auto-occupancy is 1.14 people per vehicle.

## Wellington Street Extension (WSE) Questions

### 71. What is the purpose of the WSE? Is it necessary? What problem is it trying to solve?

The extension of Wellington Street provides an alternative north-south route between Division Street and the Cataraqui River. It helps to reduce growing congestion on Division Street and Montreal Street, which results in traffic using other local residential streets. The City's Transportation Model forecasts a need for additional north-south traffic capacity in this area. Capacity improvements will help support transit service as well as private vehicles. In addition, the WSE provides an opportunity to provide cycling and pedestrian facilities in the area.

### 72. Is it possible to do a new EA for Wellington Street from scratch that would incorporate Council's new strategic priorities? Would the updated EA yield different results from 2008 EA?

It is important to note that any alternative transportation solution in place of the Wellington Street Extension (WSE) will require the completion of an EA ranging from Schedule A to Schedule C depending upon the nature, complexity and dollar value of the alternative being considered. Given the requirement to complete an EA for an alternative solution to the WSE, City staff has recommended that an update to the current EA for the WSE would be the most appropriate course of action. An update to the current EA would avoid problems such as public uncertainty that would be created by developing a new and separate EA for an alternative solution without a clear and defensible means to deal with the current approved EA for the WSE.

An update to the existing EA would provide a transparent and traceable process to appropriately consider ALL reasonable alternative solutions alongside the WSE, which was the preferred solution in the 2008 EA.

### 73. What is the final cost of the WSE? Why has the cost suddenly decreased?

Cost estimates for WSE were prepared as part of the Environmental Study Report completed in 2006. The preliminary (planning level) cost estimates to complete the detailed design, acquire property and construct the new road were approximately \$16 million. This estimate excluded any costs for management of soil or groundwater that may have been contaminated along the Inner Harbour waterfront.

Project cost estimates prepared for the 2009 Development Charges By-Law provided a total cost estimate of \$31.5 million for the Wellington Street Extension. This 2009 estimate, which attempted to conservatively reflect clean-up costs for site contamination, included a very conservative estimate of \$10 million for environmental management including landfilling of contaminated soils and management of contaminated groundwater and a conservative cost inflation factor from the 2006 cost estimate.

The project cost estimate included in the 2014 budget for long-term forecasts was \$35 million, which included an additional inflationary increase over the 2009 cost estimate. In advance of the 2014 Development Charges By-Law, a more detailed review of project cost estimates was completed in consultation with Morrison Hershfield engineering consultants. The updated cost estimate considered construction unit rates for 2013 applied to the original quantity estimates developed as part of the 2006 EA study. This work identified the cost for the northern section (from John Counter to Railway) at \$7.05 million and the southern section (from Bay to Railway) at \$11.85 million, for a total of \$18.9 million excluding any costs for management of adverse environmental conditions. The total project cost estimate provided in Council Information Report 15-187 (March 3, 2015) of \$20.7 million reflects a significantly reduced estimate for potential clean-up costs.

74. Why isn't Council exploring alternative solutions to the WSE as opposed to updating the EA? Wouldn't a full traffic study be more relevant?

A traffic study is only one of the key components of an EA Study. Exploring alternative solutions is another key component of an EA Study. Provincial legislation requires completion of an EA Study for road and other municipal infrastructure improvements. The word "environment" under the legislation is defined broadly, requiring consideration of a wide range of factors such as the social environment, the natural environment, the cultural environment, the economic environment, the physical environment and the transportation environment. The Municipal Class EA process requires examination of alternative solutions, which are functionally different ways of addressing the problem(s), such as through using other modes of travel, building a new road or widening existing roads. Once the alternative solution is determined, alternative methods of implementing the solution must be examined. For new roads, this could be alternative horizontal and vertical alignments, cross-section components like sidewalks, boulevards, bike lanes and travel lane widths, and intersection designs such as roundabouts and traffic signals. For road widening this could be widening to one side or the other or to both sides as well as cross-section components and intersection designs.

75. If the KTMP notes public concern about the WSE, why does it remain in the Plan and in the budget? Why isn't stronger language being used to show that an updated EA will be more successful?

The proposed Wellington Street Extension (WSE) has generated considerable discussion in recent months. The general public discourse can be characterized by uncertainty with the needs justification for the WSE, concern with the impacts of the proposed WSE on the surrounding natural, social, cultural and economic environment, and the desire to develop a long-term vision of the Inner Harbour and Old Industrial Areas that promotes a sustainable, healthy, vibrant and liveable community. In consideration of the foregoing, there is a demonstrated need to tie together the element of land-use planning and transportation planning in a manner that appropriately reflects a long-term vision for this area of the City.

As a result, staff have recommended a two-part approach to consider alternative transportation solutions in place of the WSE. The work would include (1) the preparation of a secondary plan for the Inner Harbour and Old Industrial Area and (2) an update to the current Environmental Assessment (EA) for the WSE. Kingston City Council has provided approval to proceed with secondary planning work. This holistic approach provides an opportunity to receive community input to assist in the development of a long-term vision for the Inner Harbour and Old Industrial

Area, which in turn will provide information to help to guide a comprehensive review and evaluation of alternative transportation solutions within the study area. Moreover, this approach will also provide an open, traceable and systematic means of developing sufficient supporting rationale in the event that the WSE is no longer the preferred transportation solution and is removed from all municipal policy and strategic planning documents.

76. If the transit target was increased from 9 to 11%, would this eliminate the need for the WSE?

A review of traffic flow in the area was completed under the assumption of 11% transit mode share. The need for additional capacity in the north-south direction was still required with an 11% transit mode share.

77. Since the WSE area is “precious and unique”, why are we considering adding cars to the area? Why aren’t we viewing this area and the downtown as a pedestrian area?

Kingston City Council has provided direction to staff to prepare “an exceptional, forward-thinking, livable, green and innovative” secondary plan that will be undertaken in 2016 for the Inner Harbour and Old Industrial Area which encompasses the WSE corridor.

Secondary plans establish local development policies to guide growth and development in defined areas of a city where major physical changes are expected and desired. Secondary plans are developed for parts of the city that include large areas of underutilized land that would benefit from suitable redevelopment, areas targeted for major public or private investments, and areas where development is occurring, or proposed, at a scale, intensity or character which necessitates a reconsideration or reconfiguration of local streets, blocks, public works, open spaces or other public services or facilities.

A secondary plan also contains the land-use planning policies which are incorporated as an amendment to the Official Plan. The City of Kingston Official Plan identifies both future and completed detailed planning areas. Two of these identified areas are the Inner Harbour Area and the Old Industrial Area. In the 1980’s both of these areas had secondary plans completed which were never fully implemented. Given the recent public input related to the WSE, the expressed desire to create a long-term vision of this area of the City and the age of the past planning studies undertaken for both the Inner Harbour and Old Industrial Area, it is the intention of the City to advance the secondary planning effort for this combined area.

As a result, the secondary planning work will produce a concept plan and vision for the future development/redevelopment of the area. The vision will form the framework for the secondary plan and identify the locations of specific land uses and policies that will provide direction for further detailed planning through zoning by-law amendments and site plans. In addition to providing further detail, analysis and recommendations regarding specific land uses, the secondary plan will identify infrastructure requirements. There will also be a high level review of the financial impact of the development of the plan on the municipality, including development charges and other associated financing requirements.

Public consultation will be a critical part of the secondary planning process and there will be multiple opportunities and a cross section of innovative techniques used for gathering input. The secondary plan will also provide recommendations regarding the revitalization of the area, including, but not limited to, economic development mechanisms, potential planning tools, heritage conservation tools, and community organizations and partnerships, and public services

and utilities.

**78. What would be the impact of the increased volumes of vehicles from the WSE on the downtown area?**

The impact of the Wellington Street Extension was studied in the EA study.

From the Wellington Street EA: "It should be noted that improving access to the downtown core does not necessarily imply that there will be an increase in cut-through traffic in the downtown neighbourhoods. The majority of the vehicles using the Wellington Street Extension do not travel west of Barrie Street, and are therefore unaffected by the adequacy of other access routes into/out of the downtown". "The proposed Wellington Street Extension will not cause a significant increase in traffic through neighbourhoods south of Princess Street."

There are sufficient road choices in the downtown area that will assist in spreading the traffic between several options.

The EA also acknowledged the community concerns regarding the potential for cut-through traffic and recommended that a community traffic monitoring study be undertaken to collect baseline information on traffic volume and vehicle speed. The City continues to collect traffic data for streets in this area as part of regular traffic monitoring/counting program. If/when the Wellington Street extension project moves forward to next phase of detailed design work, staff will evaluate the need to supplement with additional traffic monitoring in this area to form sufficient baseline information.

**79. Is the WSE a conflict between the encouragement and use of increased use of public transit?**

The 2015 KTMP prioritizes walking, cycling and transit over private automobiles. The study process set aggressive but achievable targets for active transportation and transit modes. The KTMP relies on increased transit use to minimize the requirement for road improvements. To discourage use of private vehicles for peak period trips, the level of congestion on the roads that would trigger consideration of road improvements was increased. A need for additional north-south capacity in the downtown area was still identified.

The updated EA study can consider transit options as part of the evaluation of alternative solutions.

**80. Why doesn't the KTMP include additional data on the WSE to allow the public an opportunity to review and analyze?**

The analysis of the WSE was provided in the EA that was completed in 2006 and is available on the City of Kingston website. The KTMP does not replace the previous study and does not review the project in the same detail as the EA.

**81. Is an EA the only way to explore alternatives for new road infrastructure such as the WSE?**

Ontario legislation requires completion of an EA Study for road and other municipal infrastructure improvements. The word "environment" under the legislation is defined broadly, requiring consideration of a wide range of factors such as the social environment, the natural environment, the cultural environment, the economic environment, the physical environment and

the transportation environment. The Municipal Class Environmental Assessment is an approved process under the Ontario Environmental Assessment Act for studying municipal infrastructure.

## 82. What is the relationship between an updated EA for Wellington Street and the updated KTMP?

Transportation Master Plans such as the KTMP are updated on a periodic basis so that the changing needs and characteristics of a community can be assessed at a macro-level with respect to the transportation network. The updated KTMP reconfirms the need for additional transportation capacity within the study area that was examined in the 2008 EA. It was determined in the 2008 EA that the WSE was the preferred solution. Since construction will not occur within 10 years of the minister's decision (2018), a review of the EA is required. The review would include the following activities:

- Establish Public and Technical Advisory Committees with agreed upon mandate.
- Develop a transportation micro-simulation model for the study area.
  - Validate need for transportation capacity improvements within the study area.
  - Assess if operational improvements can address transportation deficiencies.
- Coordinate with secondary planning work for the Inner Harbour and Old Industrial Area.
- Re-visit alternative solutions to identify any other reasonable alternative solutions that would be added to the original list of alternative solutions.
- Re-visit evaluation criteria to add/delete factors that will appropriately reflect current environmental setting.
- Re-visit weighting factors for evaluation criteria that will appropriately reflect current environmental setting.
- Re-score each alternative to determine preferred alternative.
- Report to committee/council.
- Update supporting studies as required.
- Update mitigation measures for preferred alternative as required.
- Prepare preliminary/conceptual design and cost estimates.
- Prepare addendum to the ESR.
- Report to committee/council.
- Prepare notice of Filing of Addendum.

**83. Will the WSE be difficult to remove from the approved KTMP if an alternative solution is discovered?**

No. The presence of the WSE or any other individual project in the KTMP does not necessarily mean that it will be constructed. Given that the WSE is not planned for construction in the near future, an update to the 2008 EA Study for the WSE, as proposed by the City, will be required. If at that time another solution is preferred and approved, then it would be carried forward and included in the subsequent KTMP update.

**84. Could an alternate solution to the WSE include a traffic circle and Rideau/Railway/Montreal and conversion of Montreal and Rideau Street to one-way streets?**

A one-way street system was one of the alternative solutions assessed in the 2008 WSE. The feasibility of this one-way pair was examined with consideration for street spacing, function and character, adjacent land use and the ability to provide additional road capacity. The full discussion starts on page 27 of Appendix B of the ESR. The conclusion was that Rideau and Montreal Streets are not suitable candidates for one-way conversion. Rideau functions as a local road close to downtown with reduced capacity.

A roundabout was one of the alternatives considered in the Wellington Street EA Study (page 49) but it was not the preferred alternative.

**85. What are the traffic volumes for the WSE screenlines for modeling work completed in 2004, 2009 and 2014?**

Traffic Volumes for the for the WSE screen line in the NB direction which include Division Street, Montreal Street, and Rideau are as follows:

Year	Streets	Projected Volumes	Network properties
2004	Division	1008	Model year: 2026 3% transit No road improvements
	Montreal	514	
	Rideau	345	
	Total	1867	
2009	Division	744	Model year: 2029 9% transit No road improvements
	Montreal	525	
	Rideau	390	
	Total	1659	
2014	Division	709	Model year:

	Montreal	493	2034 9% transit Includes road improvements
	Rideau	452	
	Total	1654	

Volume/capacity ratios are available for screenlines that are part of the Wellington Street Extension in work that was completed in 2004, 2009 and 2014. The Wellington Street Report 15-208 (page 13 of 37) provides a range of v/c ratios for the screenlines that are part of the future WSE. This information is provided to demonstrate that v/c ratios generally exceed the established LOS.

86. The WSE consultant undertook the assessment work related to the natural environment during the winter. Is this not problematic in terms of having limited findings due to time of year for field work?

Some components of the natural environment are seasonal in nature such as bird nesting and fish spawning. Depending on the availability of relevant studies by others, seasonal work may or may not be important to an EA Study. While the area affected by the WSE alternatives was generally disturbed, potential impacts on the natural environment were considered. The evaluation of the alternative alignments resulted in the selection of the alternative having fewer potential impacts on the natural environment than the other alternatives. An update of supporting studies including the natural environment would be undertaken as part of an EA update.

87. Staff have suggested that costs for the WSE can be lowered with new technologies to minimize environmental cleanup costs. What are the specifics?

The reduced estimates for clean-up costs associated with the WSE reflect potential cost savings that may be achievable due to changes to the Ontario Ministry of the Environment and Climate Change policies with respect to:

- contaminated soils management that may allow for reuse of soils that are marginally impacted on commercial/industrial properties rather than landfilling
- a potential for reducing quantities of soil requiring landfilling through soil washing technologies
- a potential for groundwater management through in-situ (on site) approaches that have been applied on other infrastructure projects (i.e. construction of in-situ groundwater treatment within Emma Martin Park)
- the potential for changes to road design that would limit the amount of excavation required, thus reducing quantities of contaminated soils and groundwater that would require management

The effectiveness of the reduction in environmental management contingencies will need to be confirmed through detailed testing of soil and groundwater conditions along the proposed route

prior to finalization of project designs and budgets. Staff appreciates that the variability in project cost estimates can be problematic for planning and decision-making purposes. As additional project information becomes available through the advancement of more detailed design and accompanying field studies (i.e. detailed environmental site assessment), staff will be better able to provide project cost estimates with an elevated level of certainty.

88. The AECOM TransCad Model runs for the 3<sup>rd</sup> Crossing Project (provided in the Support Report) says top 3 scenarios do not need WSE. Please explain why it is still included in the 2015 KTMP?

The intent of the AECOM work and the associated report was to undertake a series of TransCad model runs to test various road network improvement scenarios associated with implementation of the 3rd Crossing and assess the potential traffic impacts on roadways in neighbourhoods adjoining the 3rd Crossing. The assessment provided input to the 3rd Crossing Environmental Assessment Study, to assist with determining longer term travel lane requirements crossing the Cataraqui River screenline (Lasalle Causeway, Highway 401, Kingston Mills Road). This assessment utilized measures of volume demand compared to available capacity on various existing and future roadways and more specifically to determine whether the 3<sup>rd</sup> Crossing should be carried forward with 2 lanes or 4 lanes in conjunction with other potential road network improvement scenarios. Model runs that excluded the WSE should not be interpreted as justification to remove the project since the WSE addresses capacity constraints along other screenlines beyond the influence of this project on the Cataraqui River screenline.

89. What are the consequences of letting the existing EA for the Wellington Street Extension expire?

If a project has not proceeded to implementation within 10 years following an EA approval, the EA process requires the proponent (municipality) to review the planning and design process and the current environmental setting of the project. The proponent is also responsible to ensure that the project and mitigation measures are still valid given the current planning context. Upon completion of this work, the project review is recorded as an addendum to the Environmental Study Report. Once again, the minimum requirements for public notification include a 'Notice of Filing of Addendum' and a 30-day review period. In addition, the Notice also includes the right of members of the public to request a Part II Order (bump-up) within the 30-day review period.

90. How could the targets for the 6 demand-related strategies be revised such that the WSE would not be identified as a future requirement?

Changes to the demand-related strategies as model inputs do not necessarily result in a corresponding change to the traffic volumes on any given road. The likelihood of vehicles using a specific road link is related to the origin and destination of the trip as well as the congestion levels on the road network. While the volumes on some road links in the model will change as a result of the demand-related strategy inputs, other roads will see little effect from the changes.

For example, with a City-wide transit mode share target of 9%, 11% and 15%, there is a lack of roadway capacity across the screenline that contains the Wellington Street Extension. A specific set of targets has not been assessed that would eliminate the requirement for the WSE, however, the transit mode share would need to be greater than 15% during the PM peak hour,



which means that transit usage would need to more than triple from the existing transit use.

91. If the KTMP considered a range of PM peak hour transit mode share targets for 2034, from 5% to 15%, what is the target at which the Wellington Street Extension would no longer be needed?

Even with a City-wide transit mode share target of 15%, there is a lack of roadway capacity across the Russell Street screenline that includes the Wellington Street Extension. Based on Transportation Model results, a City-wide transit mode share target of 24% would be required to remove the need for additional roadway capacity in this area. The overall transit mode share target of 24% corresponds to a transit mode share of 38% in the downtown area.

# Appendix E

## Transportation Master Plan Update

- Technical Appendix-Transportation Model

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## 1. Introduction

The Kingston Transportation Master Plan (KTMP) update assesses the City's transportation needs for the next 20 years. The KTMP takes into account updated growth forecasts, emerging trends, needs and opportunities that have occurred since the plan was created in 2004. The end result of this process will be an updated KTMP document that identifies a recommended set of proposed works / improvements and the rationale for their implementation.

The City of Kingston initiated an update to their Kingston Transportation Model developed in 2004 as part of the Kingston Transportation Master Plan (KTMP) Study. The original model was based on the 2002 Household Travel Survey undertaken as part of the KTMP study and is a representation of the PM Peak Hour travel in the Greater Kingston Area (Kingston CMA).

Forecasting future travel demands and road network capacity deficiencies is an important step in determining the need for transportation projects and programs in the City. A travel forecasting model is used to assign traffic to the road network in the region. The model is based on a software platform and uses a multi-step approach to calculate travel demand and distribute vehicular volumes to the roadways. The model results are then used to review the predicted levels of congestion in the future.

The Kingston Transportation Model has been used to update forecasts of future travel demands on key City road corridors, assess future road network deficiencies, and assess future road network improvement needs.

## 2. Objective

To support the KTMP, an update to the model was completed based on a travel survey completed in 2008 and this update incorporates current travel patterns in the City, development areas that have been built since 2002 and improvements to the transportation network that have occurred in the City. The scope of the model update included a Household Travel Survey of Kingston area residents, a review and confirmation of the traffic zone system used in the model, refining the model road network, and recalibrating the model with updated base year data. The

updated data used in the model development process includes recent traffic volume counts, current population and employment data, updated forecasts of future population and employment growth, and household survey data that were collected as part of the model update process.

The Kingston Transportation Model has been used to update forecasts of future travel demands on key City road corridors, assess future road network deficiencies and assess future road network improvement needs at the screenline level. A screenline is an imaginary line established throughout the City to measure traffic volumes and traffic patterns. The screenlines are usually established at physical barrier locations (rivers, railroads, limited access highways) where the number of crossing points is limited. The results of the model are best viewed at a screenline level as the macro-modelling approach is not appropriate for a street by street analysis.

### 3. Model Overview

The forecasting of future travel demands and road network capacity deficiencies was undertaken using the City of Kingston's transportation demand model, which was designed to provide PM peak hour forecasts of future volumes on the City and surrounding County Road network under various land use, growth and transportation network improvement scenarios. The City's model is a four stage travel demand model that incorporates the following standard practise components:

**Trip Generation:** Forecasting the number of trips that originate from or are destined to a given area.

Land use is the key determinant in trip making and the type of land use pattern of an area will have an influence on the trip generation to/from traffic zones within the area. Population and employment is used to represent land use in an area. Existing population and employment data for each traffic zone was estimated based on the 2006 Census data and this data was combined with the household survey data to develop trip production and attraction rates for different trip purposes.

Trip generation rates were developed from the Household Travel Survey data for the PM peak period (3:00 - 6:00 pm) representing total person trips (independent of the mode of travel). Trip

generation equations for both productions and attractions were formulated for four different trip purposes, including:

- Home-based work (HBW) trips, which include any trip with an origin or destination to or from home and work;
- Home-based Other (HBO) trips which include any non-work trips having an origin or destination to or from home;
- Home-based school (HBS) trips which include any trips with an origin or destination to or from home and school, and
- Non-home based (NHB) trips which have neither an origin nor destination to or from home.

**Trip Distribution:** Forecasting the number of trips that travel between areas.

The Kingston model uses a doubly constrained “Growth Factor” method (except for school trips which are singly constrained), often referred to as a fratar balancing approach, to predict future trip patterns between zones. The fratar method uses the existing origin-destination patterns as a basis for forecasting the future patterns and develops growth factors for total trip productions and attractions by traffic zone to scale the values in the matrix.

The methodology uses an iterative process that alternates between factoring the productions and then factoring the attractions to match the total forecast productions and attractions for each zone, with a pre-set convergence factor. For zones with zero trips in the base year, common for new growth areas, seed values were used in the matrix based on the trip distribution patterns for adjacent zones that have values in the base year.

**Mode Choice:** Forecasting the transportation modes used to travel between areas.

The City model uses a policy mode split approach to estimate the number of trips that will be made by transit, walk-cycle, and auto modes of travel. For the base case scenario, the existing area-based observed mode shares from the household travel survey are used. For future scenarios, these mode share estimates are applied to the various areas based on the expected

attractiveness of attracting trips to transit in each area respectively either through improved service or prevailing levels of congestion on the road network.

**Trip Assignment:** Forecasting the paths used to travel between areas and the resulting traffic volumes on the transportation network.

The model uses an iterative approach to determine the best routes to use between each origin and destination and the number of vehicles that will be assigned to each road link by comparing the travel times of the various routes and assigning vehicles to the routes that provide the best travel time. As the most attractive routes approach their capacity, the next iteration will re-route trips to paths with better travel times, and so on. One hundred iterations were used in each model run. When the trips cannot change their route to save time, the model has reached equilibrium which is viewed to represent an approximation of how motorists drive in real life. When a new road link is added to the model or a road is widened to provide new capacity, the same traffic assignment process is used to determine how many trips will use this route for part or their entire journey.

## **4. Modelling Software**

TransCAD is the software used for the Kingston Transportation Model. The software is used to predict adjustments in travel patterns due to changes in development areas, population and the transportation network. It is software based on a GIS platform (Geographic Information Systems) that integrates travel demand modelling capabilities with the power of mapping tools. The GIS based modelling system provides accurate road distances when calculating travel times and the results of the model can be easily viewed on a map.

## **5. Data Collection**

### **5.1 Review of Background Documents**

The following documents were obtained from the City and reviewed to provide background information for the development of the model:



- City of Kingston, Cycling and Pathways Study (2003)
- City of Kingston, Transportation Master Plan (2004)
- John Counter Boulevard Improvements, Environmental Study Report (2005)
- Wellington Street Extension Environmental Assessment (2006)
- City of Kingston Official Plan (2011)
- Kingston Transit Redevelopment Plan (2011)
- City of Kingston, Transportation Demand Management Strategy (2011)
- Third Crossing of the Cataraqui River Environmental Assessment (2012)

## **5.2 Collection of Traffic Data**

The City of Kingston provided traffic volume data for the years preceding the study, including turning movement counts from 2008 and 2013.

## **5.3 Kingston 2008 Household Travel Survey**

The Household Travel Survey is used to measure travel mode share and to assess whether transit ridership targets have been met. The survey is completed every 5 years. The Kingston Transportation Model is updated after undertaking the Household Travel Survey and it can help identify corridors with capacity problems.

During the survey, participants were asked questions about all of the trips made on the previous day by each household member over the age of fifteen, by any mode. Walking, cycling, transit and driving and even rollerblading were acceptable travel modes and each trip was counted as long as the trip has an origin, a destination, and a purpose. Walking around the block, or other trips classified as exercise, were excluded. Some statistical information was also sought, including age, gender, employment status, and number of vehicles available to the household. The sample size surveyed was 2.3% of the population over the age of fifteen, which is considered an acceptable sample size.

The survey expansion process used current estimates of population and households in the study area to expand the sample of survey trips up to represent the trip making patterns of all area residents. The base year population and dwelling units at the dissemination block level were obtained from Census data, which were aggregated to the traffic zone level. For each traffic zone, the surveyed number of households was compared to the census dwelling units and a “Dwelling Unit” expansion factor was derived. The survey data was expanded using the dwelling unit expansion factor so that the number of households within each traffic zone from the census matched the expanded number of households in the survey. The survey expansion resulted in a 2% difference in population when compared to the 2006 Census data.

Once the survey data was expanded based on the Census dwelling units, the expanded survey data was divided into different age groups and compared to the Census age profile in Kingston. An “Age-Population” expansion factor was derived for each age group and the trips made by each person surveyed were expanded according to their age group. This secondary expansion process corrected for any over or under sampling within different age categories so the total surveyed population and age distribution matched the Census population age distribution.

Based on the expanded survey data it is estimated that on a typical weekday in Kingston, there are approximately 337,000 trips made, which is about 6% less than the results reported in the previous household survey from 2002. A comparison of daily trip rates was made with other communities of a similar size based on the 2006 Transportation Tomorrow Survey, undertaken in the Greater Golden Horseshoe Area. The observed trip rates show that Kingston residents make slightly fewer trips per day than residents in the communities closer to the GTA, however this is to be expected given the age profile in the City. The City of Peterborough, with a similar age profile to the City of Kingston has very similar daily trips rates to those observed in Kingston.

## **6. Traffic Analysis Zone System**

A traffic zone is the unit of geography most commonly used in conventional transportation planning models, and is used to break down a community into a series of areas with similar land uses and travel patterns. The size and structure of the zone system has a definite impact on the degree of accuracy of the travel demand forecasting model.

The previous traffic zone system within the City and in the outlying areas has been kept the same to maintain consistency with previous studies and ongoing monitoring within the Planning Department. External traffic zones are added outside and around the City which represent major arterial roads and highways that carry traffic into, out of, and through the City.

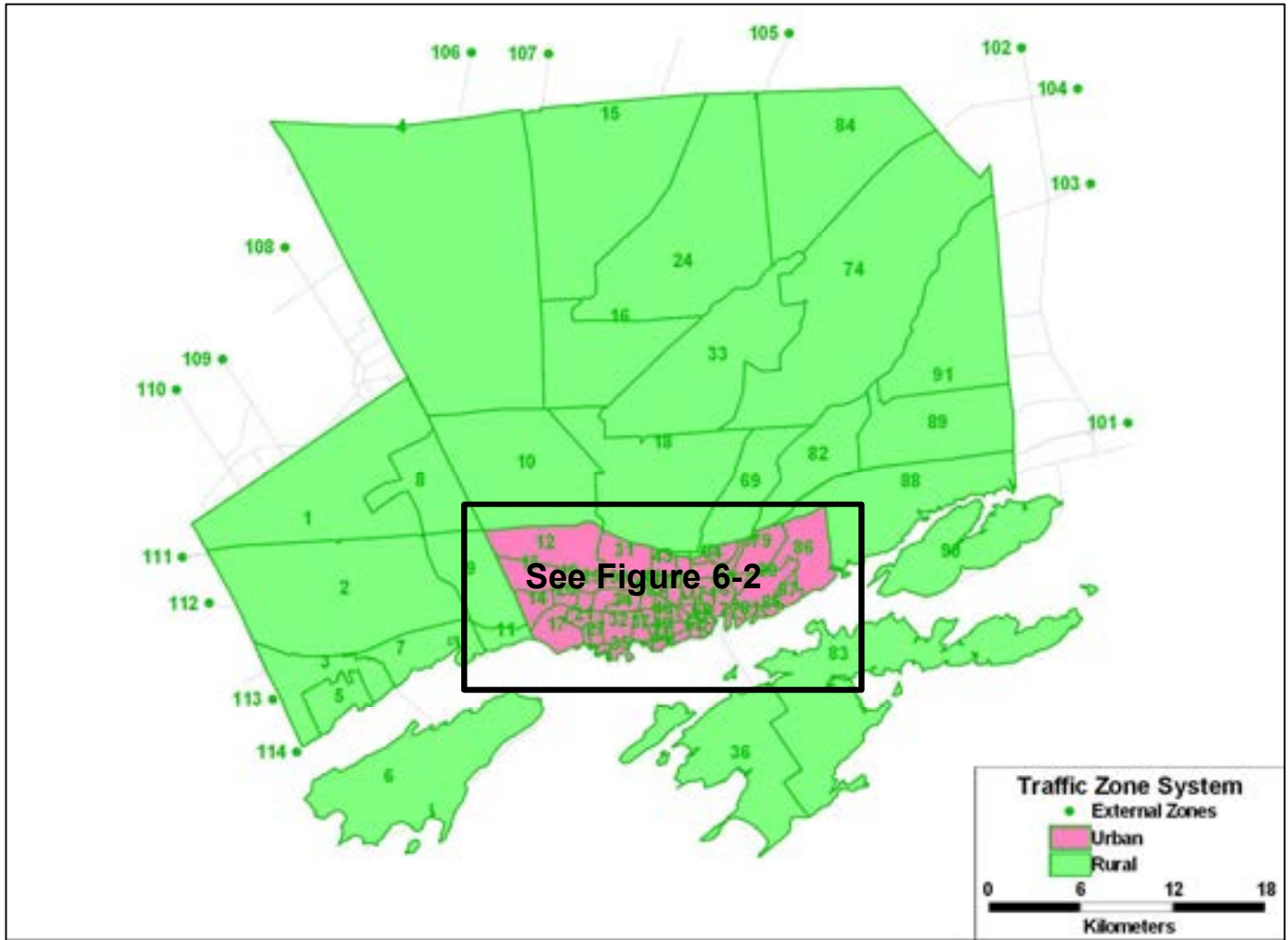
The Traffic Zone system for the City is divided into 91 internal traffic analysis zones (TAZ), which are based on previous transportation studies for the City. The boundaries of the 91 traffic zones within the City are established by taking into consideration the Federal Government’s census zones, the City’s planning areas, and the City’s current geographic / physical boundaries. **Table 6-1** shows the numbering system for the Traffic Zones and the corresponding system used to identify them.

**Table 6-1. Traffic Zone Numbering System**

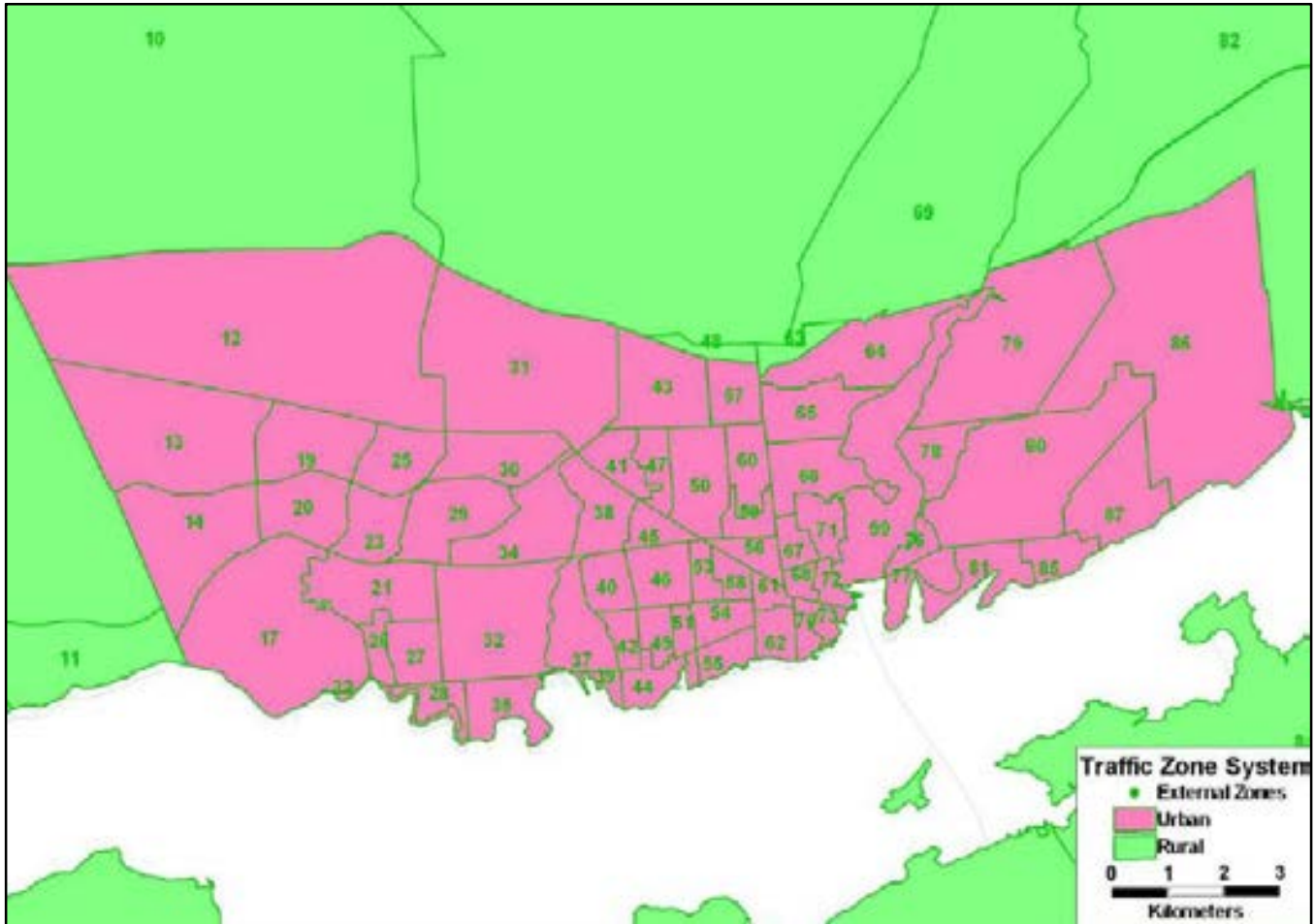
Areas Covered	New Traffic Zone Number	Previous Traffic Zone Number
Urban	12 - 14	12 - 14
	17	17
	19 - 23	19 - 23
	25 - 32	25 - 32
	34 - 35	34 - 35
	37 - 47	37 - 47
	49 - 62	49 - 62
	64 - 68	64 - 68
	70 - 73	70 - 73
	76 - 81	76 - 81
	85, 87	85, 87
Rural	10, 18, 48, 63, 69, 82, 86, 88, 89, 91	10, 18, 48, 63, 69, 82, 86, 88, 89, 91
External	100 - 114	121 - 123

**Figure 6-1** and **Figure 6-3**, below, illustrate the traffic zone boundaries and the external traffic zones used in the model.

Figure 6-1. Kingston CMA Traffic Zones



**Figure 6-2. Kingston City Traffic Zones**



## 7. Model Road Network

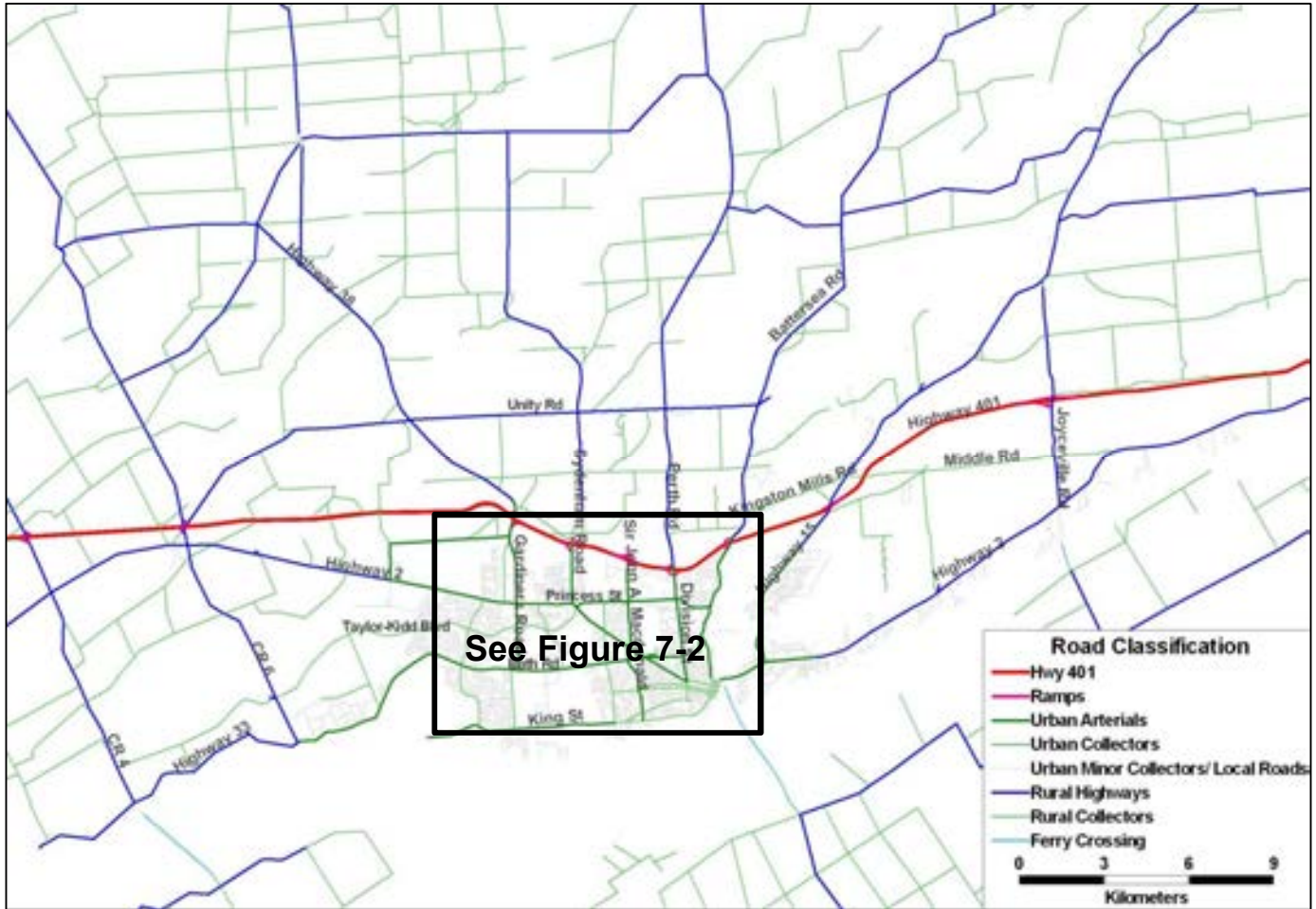
The road network in the transportation model is represented by a series of links and nodes, which reflect lines of travel and points of intersection of roadways. Typically, links represent roadway segments and nodes represent intersections.

### 7.1 Road Links

The transportation model for the City includes all collector and higher class roadways within the City. In addition, new local roads have been added to the model to reflect updated road improvements since the last model, or where required to improve the accuracy of how traffic

loads onto the major road network. Outside the City, only rural highways/county roads and rural collector roads are included in the model. The functional road classifications for the roads within the city and the outlying areas as they are coded within the model are shown in **Figure 7-1** and **Figure 7-2** below.

**Figure 7-1. Kingston CMA Road Network**



**Figure 7-2. Kingston City Road Network**



The functional road classifications in the model are used to characterize each roadway based on how it operates and the role it serves in the transportation network. The following planning capacities, summarized in **Table 7-1** have been used for Kingston Transportation Model.

**Table 7-1. Roadway Capacity by Type**

Roadway Type	Capacity Per Lane / Direction (vehicles/ lane/ hour)
Freeway (Hwy 401)	1800
Freeway ramps	1300
Urban Arterials	900
Urban Collectors	750
Urban Minor Collectors	500
Local Roads	350
Rural Highways/ County Roads	1100
Rural Collectors	600
Ferry Crossing	55

The capacities for each road classification used in Model were adopted from the model developed for the 2004 TMP. A review of the planning capacities used confirm that they are comparable to the assumed planning capacities used in a number of other jurisdictions in Ontario. **Table 7-2** provides a comparison of the planning capacities used in the City of Kingston Transportation Model compared to models used in other jurisdictions in Ontario.

**Table 7-2. Roadway Capacity Comparison with Other Jurisdictions**

Road Type/Jurisdiction	City of Kingston	City of Brantford	City of Peterborough	City of Greater Sudbury	MTO GTA Model
Freeways	1800	1800	1800	1800	1800
Highway/Expressway/Controlled Access or Rural Highway	1100	1000	1000		1200
Major Arterials/Rural Highways	900	900	800-900	900 - 1000	900
Medium Capacity Arterials	-	-	700-800	800	700
Minor Arterials/Urban Arterials	900	700- 800	600	700	500
Major Collectors/Collectors	600-750	650	500	500	400
Minor Collector/Local	350-500	500	400/300	-	



## 7.2 Nodes

Nodes typically represent intersections in the model, and are basically used to join links together. TransCAD, the software used for the City's Model, has the capability to assign attributes to all nodes or a series of nodes in the model to reflect intersection operations at a more detailed level, but this degree of detail is typically only used for detailed local area studies. The City's Model does not currently use special intersection attributes, although this flexibility is available if required for future studies.

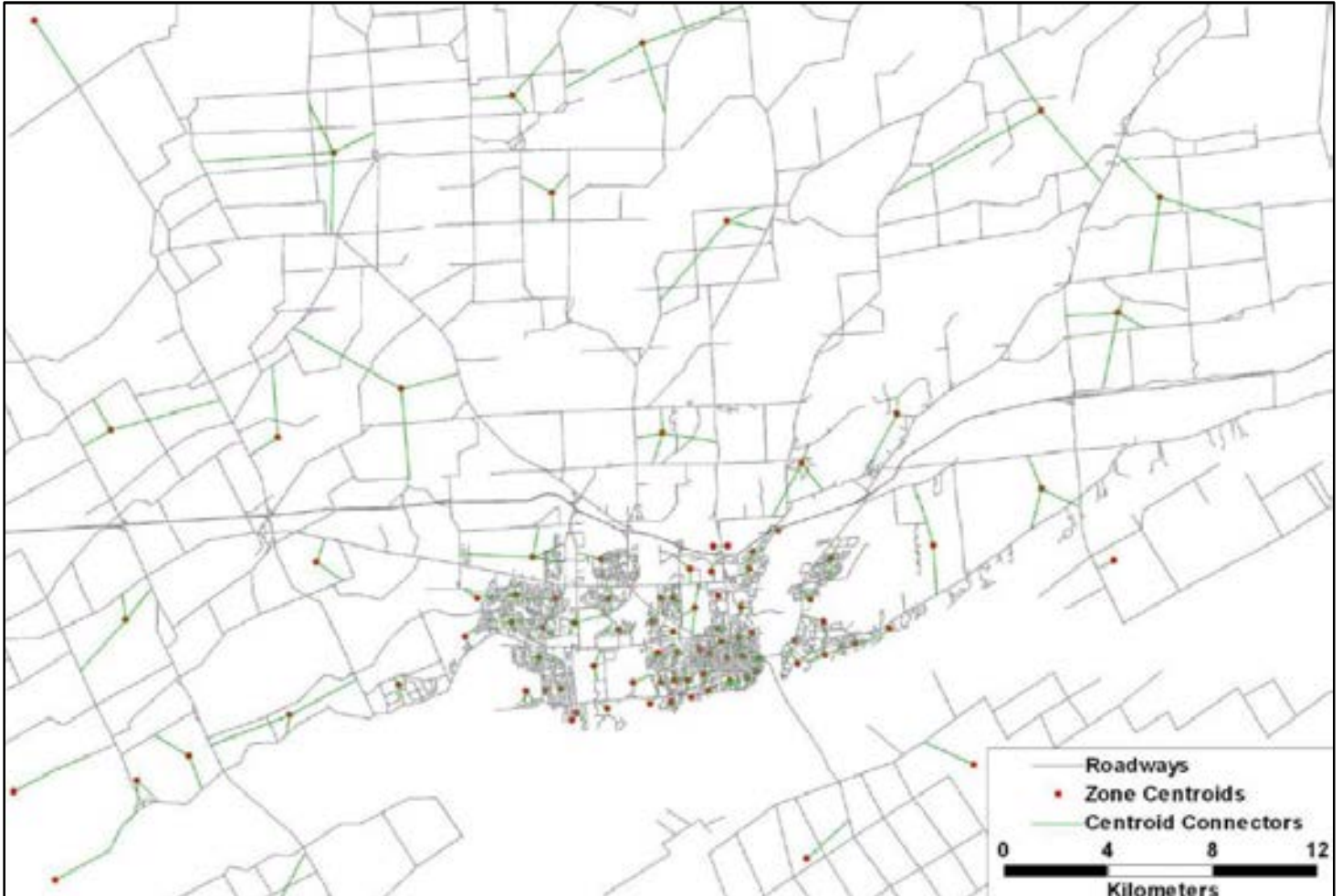
The planning capacities used for the links in the model already account for the influence of stop signs and traffic signals on the through movement of traffic, which is one reason why roadways with higher classifications typically have higher planning capacities.

For example, a typical arterial roadway has a saturation flow rate of 2200 veh/lane/hour of green at a traffic signal. For a typical intersection of two major arterial roads, the available green time is roughly split 50/50. After reducing the time required for the amber and all-red signal phases, approximately 41% of the available time within an hour is used for the green phase on each road. Thus, 41% of a base capacity of 2200 veh/lane/hour of green translates into a planning capacity of 900 veh/hour/lane. Roadways with a lower functional classification typically intersect with the major arterial road network, although they are not typically assigned the same share of the available green time as the major road, thus the lower planning capacities are used to reflect the delays that would be experienced on these roads compared to major arterial roads.

Some nodes in the model are classified as zone centroids. The centroid for a zone is the location where all trips to and from the zone either start or terminate. They are therefore treated as an imaginary location within a neighbourhood (usually around the center of the zone). Centroid numbers coincide with the numbering system for the Traffic Analysis Zones.

Centroids are connected to the transportation network by a series of special links called centroid connectors, which are imaginary road links that vehicles use to enter or exit the road network. Centroid connectors are usually laid out to try and emulate the loading pattern provided by the local street network, and often connect directly into major intersections or at mid-block locations

along streets. Trips are prohibited from using a centroid connector unless they are originating or destined to the zone that it is connected to. The centroid connectors used in the model and within the City are shown in **Figure 7-4** below.



**Figure 7-3. Centroid Connections**

**7.3 Volume Delay Functions**

Based on the road type, capacity and posted speed, a volume-delay function is used to describe how each road segment in the model behaves as traffic volumes grow. These functions are required by the equilibrium assignment technique used by TransCAD, for updating travel times in response to traffic volumes. As the volume using a road begins to approach the capacity of that road, the vehicle speeds will tend to drop and delays will increase the travel time on that route.

The equilibrium assignment uses an iterative process whereby trips are assigned and re-assigned to the road network until the paths between specific traffic zones converge to the same travel time (i.e. no traveler can improve their travel times by shifting routes). The “loaded” travel times are determined by the link performance functions assigned to each link.

The link performance functions used in the model are based on the Bureau of Public Roads (BPR) formulation, which is as follows:

$$tc = tff (1 + \alpha (v/c)^\beta)$$

where: tc = travel time based on volume

tff= free flow travel time on the link

v = link volume

c = link capacity

$\alpha/\beta$ = calibrated link performance parameters

The  $\alpha$  and  $\beta$  values are applied based on the functional classification for each of the different roadway types in the model, and are shown in **Table 7-3** below:

**Table 7-3. Volume-Delay Functions by Road Type**

Roadway Type	Parameters	
	$\alpha$	$\beta$
Freeway (Hwy 401)	0.720	6.14
Urban Arterials/Collectors	0.507	4.96
Urban Minor Collectors	0.507	4.96
Local Roads	0.507	4.96
Rural Highways/County Roads	0.597	5.87
Rural Collectors	0.507	4.96
Ferry Crossing	0.507	4.96

**Figure 7-5**, below, illustrates the how the volume delay function simulates the typical volume-speed relationship and volume-delay relationship for each of the different roadway type. As can be seen on the graphs below, as the ratio of a link’s volume to its capacity (known as the volume-capacity ratio) increases, the speed on the link will drop as vehicles become more closely

spaced, lane changing becomes more difficult, and the impacts of vehicles slowing to turn into driveways and entrances becomes more pronounced. This in turn, increases the amount of delay that drivers experience on this link and increases the travel time that a motorist will experience. As a link reaches its planning capacity, the link speeds drop significantly and delay increases exponentially. The model uses these relationships to determine the best routes to travel between trip origin zones and destination zones, which in turn determines the total amount of traffic that will use each link in the network.

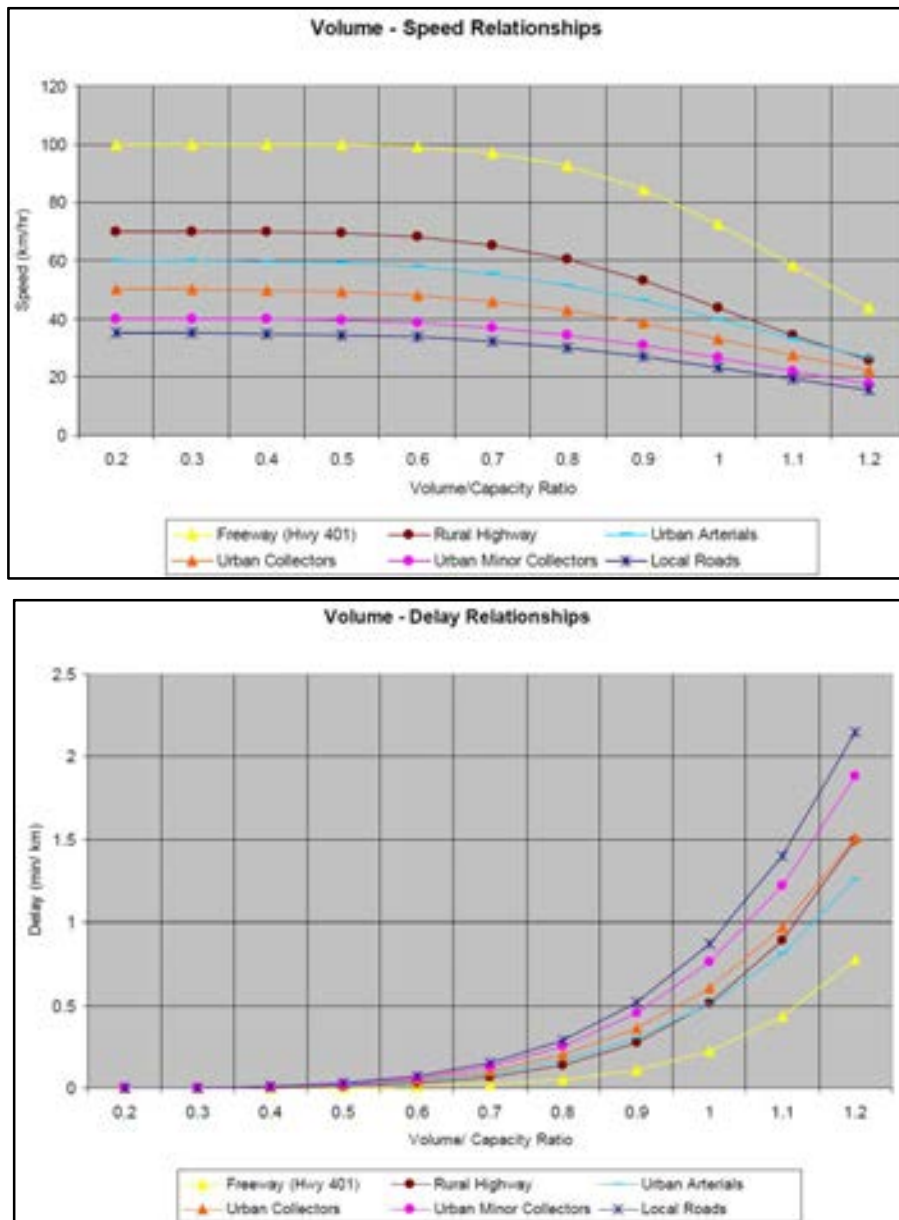


Figure 7-5. Volume-Speed/Volume-Delay Relationships for Road Types

## 8. Travel Demand

### 8.1 Travel Demand from Household Survey

The new household travel survey provides updated information on current travel demand patterns in the city and surrounding areas. The expanded household survey data was used as a basis for the development of the base year traffic demands used by the transportation model; which includes trips made by City of Kingston residents from:

- Internal origins to internal destination (trips within the City)
- Internal origins to External destinations (trips originating from City to outside City)
- External origins to Internal destinations (trips returning from outside City)

However, the household survey data does not capture the full external travel demands using the City road system. These are trips made by people who reside outside the survey coverage area and travel into/ out of the City, and trips that travel through the City (external through traffic). MTO traffic counts and Census Place of Work Data are used to estimate external traffic to/from Kingston and through traffic.

### 8.2 External Traffic To/From Kingston

The 2006 Census Place of Residence/ Place of Work data provides information on commuting flows for the employed labour force 15 years and over, having a Usual Place of Work in Kingston and living outside Kingston. The daily work trips made by people living outside Kingston and traveling to Kingston for work (external home - internal work) are obtained from the Census Place of Work data. The share of external home to internal work trips that occur during the PM peak period were estimated based on the percentage of Home to Work trips occurring in the PM peak period from the household survey data. Since the majority of trips to work occur in the AM Peak period, the estimated PM peak period external home to internal work trips represents only 1,054 person trips in the base year.

For work trips that travel from the City to the homes outside the City (internal work to external home) during the PM Peak period, the following assumptions were used:

- From the Household Travel Survey, it has been observed that 96% of the daily Home to work trips will return home (become work to home trips, 4% represent trips from work to other destinations other than home) and 64% of the work to home trips occur in the PM Peak Period.
- These observed relationships are applied to the Census Place of Work data although for the PM peak Period the trip patterns were transposed to represent flows from work origins to home destinations. For the base year it was estimated that 7,280 internal work to external home trips occur in the PM Peak Period.

By combining the travel survey data (auto driver trips only) and external work trips estimated based on the Census Place of Work, an updated base year PM Peak Period traffic demand matrix was developed. Applying the PM Peak Hour factor observed from the survey data (0.418 of PM Peak Period trips) the PM Peak Period matrix can be translated into a PM Peak Hour matrix.

### **8.3 External Through and Other External Traffic**

External through traffic and other external traffic was estimated based on assigning the updated base year PM Peak Hour traffic demand matrix to the base year road network and comparing the assigned traffic flow on the major highways leading to the external zones to the MTO counts / City counts at these locations. The difference between the MTO counts and the simulated traffic volume at these extremities was assumed to represent external through traffic or external-other trips. External through trips, particularly along the Highway 401 corridor, were estimated based on observed mainline volumes from MTO counts, combined with on and off ramp counts at the various interchanges within the model area. For external through trips to/from Highway 15, travel patterns from a survey undertaken by MTO in 2002 were used to estimate the origin –destination patterns for trips using Highway 15, to the north of Highway 401. The remaining external trips not accounted for by the assessment of through trips were assumed to represent the other trips

made by non-City residents that are not for work purposes. These other external trips were distributed to zones within the City based on the observed distribution pattern for non-work trips observed in the travel survey. A total of 4,965 external through/ external other (a.k.a. External Other) trips were estimated to occur during the PM Peak Hour.

**8.4 Seasonal Traffic Demand**

In many areas of the province traffic demands are observed to increase in the summer season, due to tourism and recreational travel patterns. Some jurisdictions in high tourist areas have used summer adjustment factors to account for the additional traffic generated during these peak times. At the same time, however, there is generally a reduction in school enrolment (i.e. College/ University) during the summer. To determine if it would be appropriate to consider a summer traffic demand adjustment factor in the City of Kingston model, an assessment of these two factors was undertaken at a City-wide level. The analysis was based on information obtained from the Ministry of Tourism and enrolment information obtained from major education institutions (St. Lawrence College, Queen’s University).

**8.4.1 Tourist Traffic Demand**

Based on Ministry of Tourism data the estimated the number of tourists visiting the City of Kingston throughout the year is summarized in **Table 8-1** below.

**Table 8-1. Person Visits: Calendar Quarter**

	<b>Total Visits (000s)</b>			
<b>Origin</b>	Q1	Q2	Q3*	Q4
<b>Total</b>	487	623	827	556
<b>Ontario</b>	449	512	614	474
<b>Other Canada</b>	16	34	29	35
<b>U.S.</b>	16	57	134	36
<b>Overseas</b>	7	21	50	10

*\*Summer months from July – September, total of 92 days*

**Table 8-2. Summer vs Fall Tourist Traffic Demand**

	Visits/Quarter	Estimated Daily Tourist Visits	*Estimated Daily Tourist Trips	Increase in Summer Tourist Trips/day
<b>Summer (Q3)</b>	827,037	8,990	47,465	15,551
<b>Fall (Q4)</b>	556,076	6,044	31,914	

*\*Assuming tourists make more daily trips than the average resident, daily tourist trips based on a 5.28 trips per person, which is twice the average trip rate of 2.64 observed in Kingston;*

Since the Household Travel Survey was conducted in the fall of 2008, and the external-internal travel demands were based on traffic count data, it was assumed that the external demands already include some tourism demand to a from the area. To assess the increased demand during the summer months, the tourism data for the summer period was compared to the tourism visitation for the fall period to estimate the extra summer tourist traffic demand on a City-wide basis. From the tourism information, 8,990 tourist visits per summer day are estimated to generate approximately 47,465 daily trips. When compared to the 6,044 tourist visits per average fall day, which generates approximately 31,914 daily tourist trips, an increase of 15,551 tourist trips per summer day was estimated as shown in **Table 8-2**.

8.4.2 Summer Reduction in School Related Trips

From St. Lawrence College and Queen’s University enrolment information, it was estimated that the total enrolment during the summer months is reduced by 14,406 students compared to level experienced in the fall. Based on the observed trip rates for students from the household travel survey this translates into a reduction of 28,754 school related trips per summer day, as summarized in **Table 8-3**.

**Table 8-3. Estimated Reduction in Summer Student Trips**

	Full-Time Enrolment			Summer Reduction	
	St. Lawrence College (Kingston Campus)	Queen’s University	Total	Enrolment	*School related trips
<b>Summer</b>	316	6,000	6,316	-14,406	-28,754
<b>Fall</b>	3,573	17,149	20,722		

*\*Based on the household survey data, a school related trip rate of 2 trips/day/person is estimated*



Based on the estimated increase in tourist traffic and reduction of school related trips in the summer, it appears that the reduction in school related trip making during the summer offsets the increase in tourist traffic at an overall City wide scale. However, it should be noted that the trip patterns and activity areas for tourists are likely very different than that of students. Therefore, if the City wishes to assess the impacts of tourist traffic on road network deficiencies, it is recommended that this be done on a corridor basis rather than through the model itself. For example, corridors such as LaSalle Causeway that lead to tourist attractions in the downtown area and at Old Fort Henry are expected to have more noticeable increase in summer traffic than other roads in the City. To account for these variations it is recommended that the City undertake summer and fall counts on key roadways of interest that can be used to generate corridor specific adjustment factors to adjust the model outputs to reflect the potential impacts of tourist traffic on these roads.

## **9. Trip Generation**

### **9.1 Trip Generation Rates**

Land use is the key determinant in trip making. The type of land use pattern in an area will have an influence on the trip generation to/from traffic zones within the area. Traditionally, population and employment have been used to represent land use in an area. Existing population and employment data for each traffic zone was estimated based on the 2006 Census data. This data was combined with the household survey data to develop trip production and attraction rates for different trip purposes.

Trip generation rates have been developed from the travel survey data for the P.M. peak period (3:00 - 6:00pm) representing total person trips (independent of the mode of travel). Trip generation equations for both productions and attractions were formulated for four different trip purposes, including:

- Home-based work (HBW) trips, which include any trip with an origin or destination to or from home and work;

- Home Based Other (HBO) trips which include any non-work trips having an origin or destination to or from home;
- Home-based school (HBS) trips which include any trips with an origin or destination to or from home and school, and
- Non-home based (NHB) trips which have neither an origin nor destination to or from home.

Regression analysis was used to estimate the relevant variables used for each trip purpose.

## 10. Trip Distribution

Trip distribution is a process used to determine the destination choices for trips generated by trip makers. There are two basic types of trip distribution models currently in use:

**Growth Factor Methods** – which involve factoring an existing matrix based on projected productions and/or attractions generated by each zone in the matrix using an iterative process. This method is often referred to as an unconstrained approach, since the capacity and performance of the transportation network is not considered in forecasting the number of trips that will travel between zones.

**Gravity Model** – which predicts the flows between zones based on the impedance of travel between these zones, usually determined by network travel times or other costs to travel between zones and the total number of trips produced and attracted by each zone. This approach explicitly relates the flows between zones to the difficulty of traveling between them.

The Gravity model is based on Newton's Laws of gravitational attraction, in that the closer two objects (zones) are together and the larger they are (the larger the number of trips they produce and attract), they will have a larger attraction, and the more likely it is that trips will occur between them. This approach has good technical merits and is widely used in transportation planning models throughout North America, but requires extensive base data to calibrate the equations for each individual trip purpose, since the willingness to travel longer distances is highly influenced by trip purpose.

For the purpose of this model development process, we utilized a doubly constrained “Growth Factor” method (except for HBS trips which are singly constrained), often referred to as a fratar balancing approach, to predict future trip patterns between zones. The fratar method uses the existing trip matrix as a basis for forecasting the future patterns, and develops growth factors for total trip productions and attractions by traffic zone to scale the values in the matrix. The equation for the growth factor method is shown by:

$$T_{ij} = t_{ij} * a_i * b_j$$

Where  $T_{ij}$  = forecast flow between zone i and zone j

$t_{ij}$  = the base year flow between zone i and zone j

$a_i$  = balancing factor for row i

$b_j$  = balancing factor for row j

The methodology uses an iterative process that alternates between factoring the productions and then factoring the attractions to match the total forecast productions and attractions for each zone, with a pre-set convergence factor. For zones with zero trips in the base year, common for new growth areas, seed values were used in the matrix based on the trip distribution patterns for adjacent zones that have values in the base year.

## 11. Calibration/Validation

Once the updated model was calibrated to predict base year trip generation, the model was tested to determine if the trip assignment process can replicate existing observed volumes on the road network. This process is referred to as validation. Validation of the model is performed by comparing the observed volumes from the existing count data with the simulated volumes for the same links from the model. Validation is usually undertaken at screenline level of detail.

Screenlines are imaginary lines, in which the locations are chosen strategically to capture traffic that crosses major arterial roads, rivers, or other major physical boundaries in an area. **Figure 11-1** shows the screenline locations in Kingston.

**Figure 11-1. Screenline Locations**



Based on the validation results presented in **Figure 11-2**, the updated model is capable of forecasting flows within 10-15% of observed volumes across most major screenlines. Screenlines are used to compare model estimated volumes with traffic counts in key areas of the City and they are also used to determine corridors that have road network deficiencies.

**Figure 11-2. Model Calibration Result**

	Existing Volume - Counts		Simulation		Comparison	
	Afternoon Peak Hour		EB Flow	WB Flow	EB Sim/ Obs	WB Sim/ Obs
	EB	WB				
<b>E-W SCREENLINES</b>						
CORONATION BLVD. - NEIL ROAD	2704	3359	2837	3721	105%	111%
BAYRIDGE DRIVE	1772	3181	1767	2994	100%	94%
GARDINERS ROAD	3233	4533	3374	4724	104%	104%
LITTLE CATARAQUI CREEK	3254	5459	2978	5459	92%	100%
VICTORIA STREET - BEVERLY STREET	2682	4197	2088	4046	78%	96%
DIVISION STREET	3136	3593	2210	2671	70%	74%
BARRIE STREET	2387	2662	1209	2114	51%	79%
CATARAQUI RIVER	2398	2577	2526	2668	105%	104%
ABBAY DAWN ROAD	2178	1755	2024	1911	93%	109%
	23,744	31,316	21,012	30,310	88%	97%
	Existing Volume - Counts		Simulation		Comparison	
	Afternoon Peak Hour		NB Flow	SB Flow	NB Sim/ Obs	SB Sim/ Obs
	NB	SB				
<b>N-S SCREENLINES</b>						
FRONT ROAD WEST	1405	577	1105	651	79%	113%
JOHNSON STREET WEST (south side)	1661	1339	1376	1226	83%	92%
JOHNSON STREET EAST (south side)	1878	1322	1825	1307	97%	99%
BATH - CONCESSION (south side)	5228	4035	6137	3170	117%	79%
HWY. 33 (BATH ROAD) (north side)	2527	2159	2382	1442	94%	67%
WELLER AVENUE	2083	951	1873	899	90%	95%
PRINCESS STREET - JOHN COUNTER BLVD	4029	3671	4192	3181	104%	87%
HWY. 401 SOUTH - WEST	4581	3191	4753	2680	104%	84%
HWY. 401 NORTH - WEST	2015	933	1914	825	95%	88%
HWY. 401 SOUTH - EAST	1395	893	1481	1004	106%	112%
HWY. 401 NORTH - EAST	1080	693	1228	616	114%	89%
QUEEN STREET	2264	2039	1846	1633	82%	80%
RAGLAN ROAD (south side)	1261	770	1003	626	80%	81%
RUSSELL STREET	1276	835	1132	561	89%	67%
	31,022	22,069	30,871	18,596	100%	84%

## 12. Future Conditions

Forecasting future travel demands and road network capacity deficiencies was undertaken using the Kingston Transportation Model, which was designed to provide PM peak hour forecasts of future volumes on the City and surrounding County Road network under various land use, growth and transportation network improvement scenarios. An overview of the Model results are provided below.

### 12.1 Model Results – 2034 Do Nothing

Figure 12-1, below, highlights the network deficiencies forecasted using the City of Kingston transportation demand model for the 2034 horizon.

In the map, routes are colored by ranges representing the volume to capacity ratios (or the percentage of available capacity used) on each road link, as summarized in **Table 12-1** below.

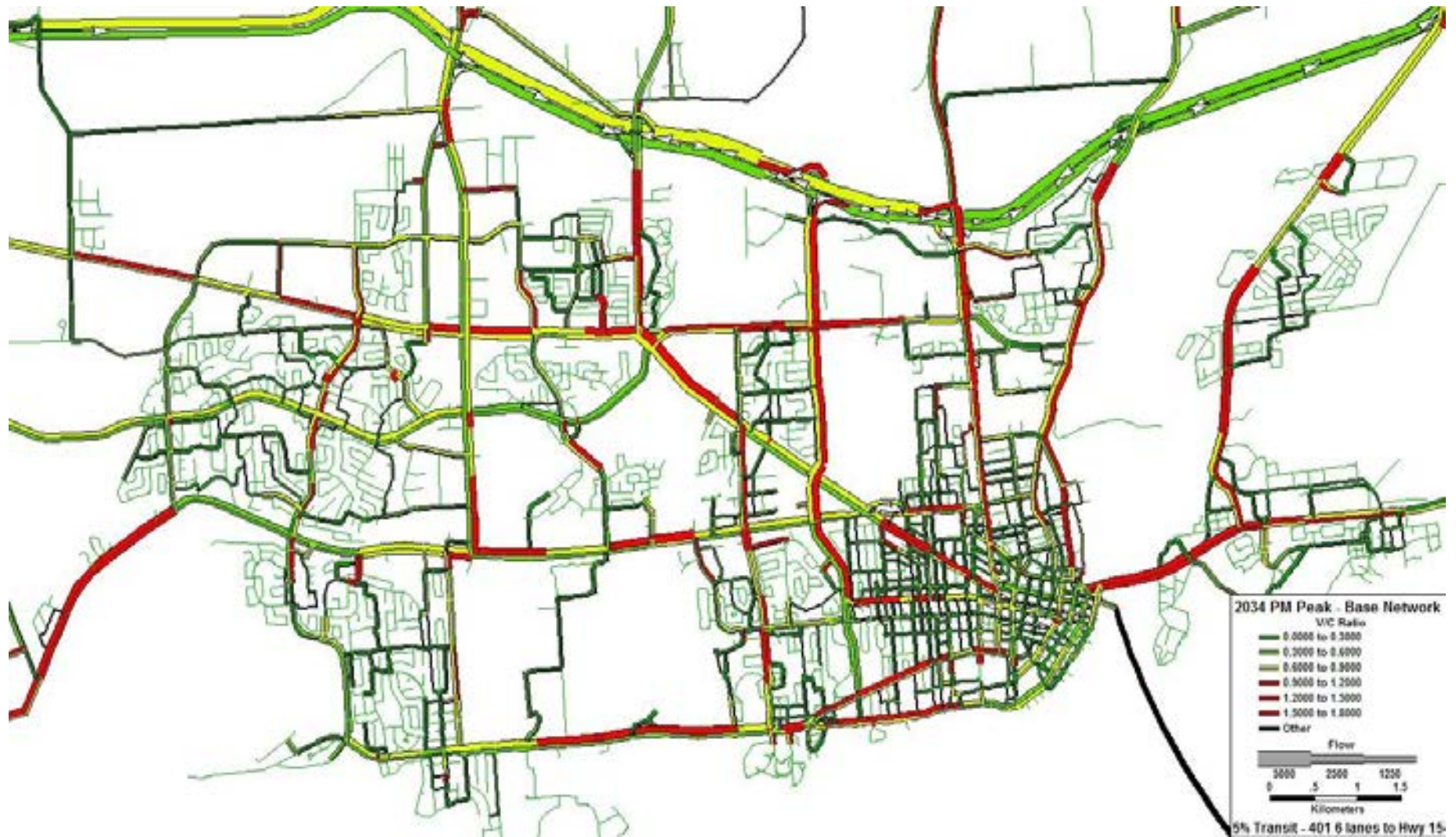
**Table 12-1. Volume to Capacity Descriptions**

<b>Colour</b>	<b>Description</b>	<b>Volume / Capacity ratio</b>
Red	At / Over Capacity	> 0.9 (90%)
Yellow	Approaching Capacity	0.6 – 0.9 (60-90%)
Green	Operating Well	< 0.6 (60%)

The Model’s 2034 “Do Nothing” network includes all projects completed up to 2013 plus planned improvements to roadways external to the City (i.e. completion of Highway 401 widening to 6 lanes between Montreal Street and Highway 15). The demand forecasts are based on the updated growth forecasts for the City. The City’s observed transit, auto, and non-auto mode shares from the updated travel survey were also used for the initial model run (assuming no changes from the patterns observed in 2009).

By 2034, with no improvements to the City road network, there is forecast to be significant levels of congestion on most of the major arterial roads in the City. Under 2034 base conditions it is estimated that approximately 81 km of the City road network is forecast to be operating at LOS D or a v/c ratio of 0.90 or worse. If all of these deficient road segments were to be widened, the estimated cost of this type of capital program would be in the order of magnitude of \$316 M over the next 20 years. Major arterial roads such as John Counter Boulevard, Princess Street, Division Street, LaSalle Causeway, Sir John A. MacDonald Boulevard, Montreal Street, Highway 15, Sydenham Road and sections of Bath Road are all expected to be operating at or over their capacity.

**Figure 12-1. 2034 Forecast Roadway Network Deficiencies**



As described in Section 2 above, the City uses a series of screenlines to examine the extent of capacity deficiencies and the need for improvements. Screenlines are imaginary lines and their locations are chosen strategically to capture traffic that crosses major arterial roads, rivers, or other major physical boundaries in an area. The screenlines for the City were established as part of the 2004 KTMP and have been maintained in subsequent model updates.

**Figure 12-2** shows the screenline locations in Kingston and the resulting new arterial lanes of capacity that would need to be provided to achieve the current Level of Service D (volume to capacity ratio 0.9) standard. The extent of deficiencies and road improvement needs using the updated growth forecasts are similar in nature to the previous road improvement needs identified in the 2009 Development Charge Update Study.



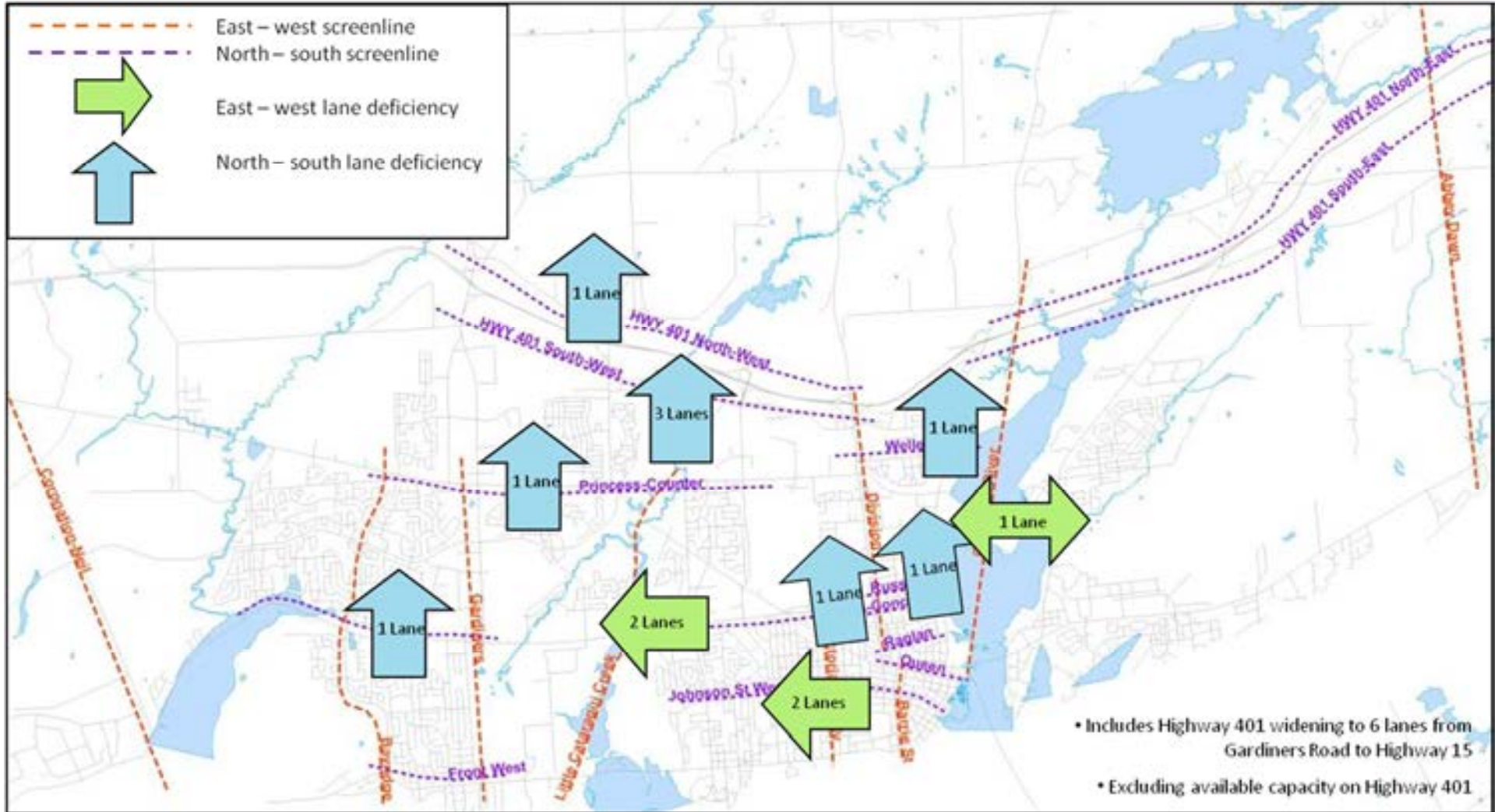


Figure 12-2. 2034 Screenline Deficiencies



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