



DEVELOPMENT OF A REGIONAL TRANSPORTATION PLAN FOR THE GREATER TORONTO AND HAMILTON AREA

WHITE PAPER 2: PRELIMINARY DIRECTIONS AND CONCEPTS

APRIL 25, 2008

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A MESSAGE FROM THE CHAIR

Rob MacIsaac
photo

April, 2008

It is time for solutions.

With the release of two White Papers, Metrolinx is taking the next major step towards a plan to dramatically change and improve transportation choices across the Greater Toronto and Hamilton Area.

The White Paper you are now reading sets out preliminary directions and concepts for a Regional Transportation Plan. These are potential initiatives to achieve the vision, goals and objectives set out in White Paper 1.

In the 16 months since Metrolinx was formed, we have undertaken a very broad, very detailed examination of transportation issues affecting this region. We released seven Green Papers to foster discussion around key topics. We studied other jurisdictions to help determine best practices and learn about innovative projects.

We conducted extensive consultations with a wide range of stakeholders. And we have encouraged broad-based input both through our interactive website and through meetings with stakeholders.

All of this has given us a strong sense of direction together with some very specific ideas about how we might proceed.

You will notice as you read through White Paper 2 that each section outlines the things that *could* be done to improve transportation across this region. Based on the feedback we receive, we will then make decisions about what we believe *should* be done. Again, we will consult extensively, ultimately determining our recommendations for what *will* be done.

I urge you to keep an open mind as you consider the various proposals. In some cases, your first reaction, particularly to some of the bolder ideas, may be scepticism. The reality is, to achieve our objectives we need to think creatively. Yes, some approaches will be more challenging and controversial than others, but our decisions must not be based solely on ease of implementation.

Metrolinx will not be shy about recommending initiatives that are difficult, as long as we believe they will improve the quality of life for the six million people who rely on the region's transportation system, while enhancing our economic competitiveness and protecting our environment.

A draft Regional Transportation Plan, will be released for public and stakeholder consultation in June. Our plan is to hold a series of Open Houses and Public Meetings across the region in June and July, giving everyone an opportunity to comment on every aspect of the Draft RTP.

Based on these consultations, followed by further discussions with the public on how the concepts could be paid for and implemented, we will make the appropriate revisions and release the final plan this Fall.

We will continue to welcome comments on our website and by other means throughout the process.

I am very excited about the progress we have made towards the specifics of the RTP. And I must say, this is long overdue.

Decades ago, prior generations built subways, rail lines, and a grid of 400-series highways which supported prosperity for those who followed. It is our turn to step up to the plate.

We need to build a new transportation system using the principles of sustainability and complete mobility for those who will follow us.

Thank you for taking the time to read the White Papers. We look forward to hearing your thoughts, concerns and suggestions.

And we look forward to moving boldly ahead, creating a transportation system befitting a first-class city-region.

[INSERT SIGNATURE]

Rob Maclsaac
Chair, Metrolinx

EXECUTIVE SUMMARY

White Paper 2 builds on the foundation of the seven Green Papers prepared earlier by Metrolinx and the responses received. This White Paper lists potential policy and program directions to address the issues identified in the Green Papers, and to fulfil the goals and objectives detailed in White Paper 1. It also includes a preliminary analysis of the costs and benefits of four infrastructure system concepts for 25 years from now. This paper is intended to generate further discussion and input to the process of creating a Regional Transportation Plan (RTP) for the *Greater Toronto and Hamilton Area (GTHA)*.

Preliminary Policy/Program Directions

White Paper 2 follows from the seven Green Papers. It recognizes that a successful plan for a future transportation system is a combination of two key elements: i) ambitious policies and programs, and ii) well-integrated and functional infrastructure. Together they can create a bold, transformational transportation system. These pieces must work together to provide an improved experience in the transportation system, encourage a significant change in travel behaviour, and deliver a robust and convenient transportation network.

The Preliminary Directions proposed create an environment that facilitates a major shift in attitudes and choices related to mobility in the *GTHA*:

- A system of complete mobility through improved road and transit connectivity, strong *transportation demand management*, heightened attention to *active transportation* and seamless inter-regional and local service connections.
- A system of *mobility hubs* that advance land use and transit service connectivity and create a strong sense of place.
- Excellent customer service.
- Sustainable funding.
- Innovation through ongoing research.

Test Concepts

The paper also describes and analyzes four preliminary transportation system test concepts:

- Business-As-Usual – The current transportation structure and committed transportation projects.
- Test Concept A: Linear – MoveOntario 2020 projects with some additions and enhancements to improve inter-regional connectivity.
- Test Concept B: Radial – Includes elements of the “Linear” concept, plus strengthens several major radial corridors from Union Station with lines providing very high levels of rail service.

- Test Concept C: Web – Includes “Linear” and “Radial” routes strengthened by additional east-west regional express connectivity.

Modelling Infrastructure Concepts

The four preliminary transportation system test concepts were modelled to determine their relative performance and evaluated in the context of the vision, goals and objectives set out for the Regional Transportation Plan in White Paper 1. Among the preliminary results of the modelling exercise:

- Projected average proportions of transit and *active transportation* trips across the *GTHA* increase from the current 26 per cent to 32 per cent for Test Concept A, 36 per cent for Test Concept B, and 39.5 per cent for Test Concept C.
- The per cent of people, on average in the region, who live within walking distance of a rapid transit line increases from 11 per cent in 2006 to 25 per cent under Concept A, 30 per cent under Concept B, and 32 per cent under Concept C.
- Energy consumption for transportation decreases as each test concept increases investment in transit infrastructure, maintaining high levels of mobility in an energy-efficient manner. Under the BAU scenario energy consumption increases 23 per cent. Test Concept A yields energy consumption increases of 22 per cent, Test Concept B gives 18 per cent, and Test Concept C results in energy consumption of 15 per cent over current levels.
- Congestion costs to passenger cars and commercial vehicles are estimated to increase in the future from the current estimate of \$2.2 billion per year. The BAU scenario results in costs of \$4.2 billion per year, whereas Test Concept A results in \$3.1 billion per year, Test Concept B results in \$2.7 billion per year, and Test Concept C results in \$2.5 billion per year.
- Annual capital investments over the next 25 years are projected to be between \$2.4 billion and \$3.6 billion amongst the three test concepts, well beyond the business-as-usual estimates of \$0.8 billion annually.

Limitations of Modelling

Two important caveats must be considered when interpreting the results of the modelling exercise. First, the model used in the preparation of this paper, like all models, has limitations. For example, it may underestimate the impacts of new modes and policies for which there is no observed behaviour from which to extrapolate. Also, it is not sensitive to changes in non-quantifiable measures, such as comfort, cleanliness and image. Second, the preliminary transportation system concepts are exactly that — concepts. They were developed and assessed merely to serve as a basis for discussion, review and comment by stakeholders and the public.

Preliminary Findings

Caveats notwithstanding, preliminary findings of the research-to-date include the following:

- Significant progress towards achieving the economic, social and environmental goals outlined in White Paper 1 can only be achieved through a combination of bold transit investment, coordinated transportation and land use planning, and supporting policies.
- Transit ridership increases are most significant when improved service is combined with aggressive land use intensification in transit corridors and at *mobility hubs*.
- The benefits in terms of transit use and efficiency are much greater when development is concentrated around a small number of *mobility hubs*, rather than when it is distributed over a more dispersed area.
- A *Regional Express* rail system would greatly enhance mobility for longer trips and is a viable new transportation option.
- *Metro* improvements (e.g. subway) should be considered in higher-density areas to maximize transit market share, as the transformative potential of Light Rail and Bus Rapid Transit are limited.
- Feeder bus and *paratransit* fleets will need to double or quadruple in suburban areas to support the rapid transit network under any future scenario.
- Implementation of the transportation system concepts outlined in this paper would not be sufficient in and of itself to meet provincial targets in reducing greenhouse gas (GHG) emissions. A whole suite of supporting programs and policies would be required. Further analysis will be performed to identify the steps and investments needed to meet these targets.

Implementing a Plan

This paper acknowledges the need for more reliable funding of transportation in the *GTHA*. It also outlines the need to better reflect the true costs of transportation choices and to send appropriate price signals to travellers in order to encourage efficient use of the transportation system. Also acknowledged is the need for ongoing dialogue and partnerships across municipal and other administrative boundaries that involves well-informed citizens as full and active participants. Finally, the need for an ongoing program of research is identified to improve our understanding of transportation issues and the factors that will affect our region's success.

Next Steps

Feedback from stakeholders and the public will be used to expand upon the ideas contained in White Papers 1 and 2. It will also inform the development of the Draft RTP, which will be released for further consultation in June 2008.

1. BACKGROUND

1.1 The Metrolinx Mandate

Metrolinx was created by the Government of Ontario to develop and implement an integrated multi-modal transportation plan for the *Greater Toronto and Hamilton Area (GTHA)* — the metropolitan region encompassing the City of Toronto, the four surrounding regional municipalities (Durham, Halton, Peel and York) and the City of Hamilton. Its mandate includes providing seamless coordinated transportation throughout this region, which is one of Canada's largest and among the most rapidly growing urban areas.

Metrolinx operates within the legislative framework of the *Greater Toronto Transportation Authority Act, 2006*.

Figure 1.1:
**The Greater
Toronto and
Hamilton
Area**



1.2 The Regional Transportation Plan

An immediate priority for Metrolinx is to create a Regional Transportation Plan (RTP), a long-term strategic plan for an integrated multi-modal regional transportation system. Triple bottom-line goals and objectives — people, environment, and economy — are guiding the RTP development, evaluation and recommendations.

The RTP's vision, goals and objectives for transportation over the next 25 years in this region will assist decision-making in the day-to-day planning, coordination and implementation of the transportation system. It will set out priorities, policies and programs for a future of complete mobility. The plan will also be a touchstone by which we can monitor and regularly check to ensure that we are moving closer to the vision for a region that is supported by a high quality of life, prosperity and a healthy environment.

This region is rapidly changing and the rest of the world to which we are connected continues to change around us as well. Having a clear vision with specific goals and objectives that influence decisions is critical to a steady path forward.

1.3 Developing The Regional Transportation Plan

During the period between December 2007 and March 2008, Metrolinx published seven RTP Green Papers, as the first step toward developing the Regional Transportation Plan. These Green Papers presented key trends, challenges and opportunities about the *GTHA* transportation system for public discussion and showcased best practices from around the world.

A wide range of public comments has been received on the Green Papers, and this feedback has informed the development of two companion White Papers.

White Paper 1: Visions, Goals and Objectives presents the vision for the *GTHA* transportation system, and a series of goals and objectives which, along with a range of possible indicators, form the basis for developing, evaluating and ultimately shaping the RTP.

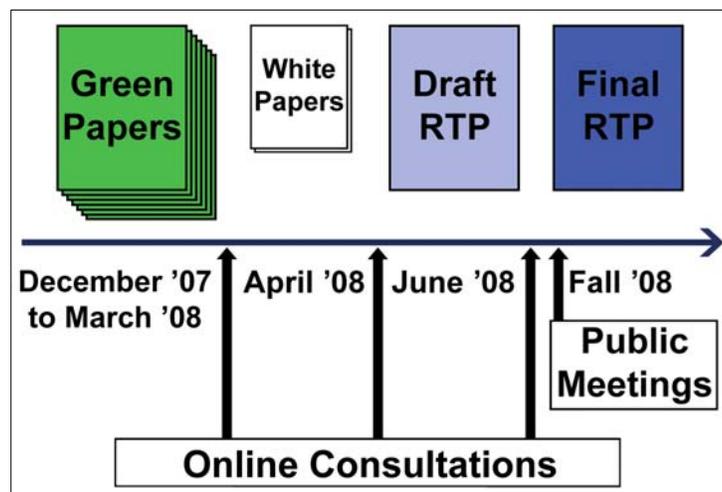
White Paper 2: Preliminary Directions and Concepts draws together the two key aspects of the plan: transformational policy programs and tools; and well-integrated and functional infrastructure. The paper sets out a preliminary analysis of three test concepts as well as a business-as-usual scenario for the transportation infrastructure system for a preliminary performance/cost comparison.

The White Papers have been published as interim reports in order to provide a basis for ongoing consultations with stakeholders and the public. Input on the White Papers will help to inform the development of the Draft RTP that will be released for public comment and broad consultation in June.

The final Regional Transportation Plan will be released in Fall 2008.

Metrolinx will also release a draft Investment Strategy for public consultation in the late spring 2008. The strategy will set out a suite of potential dedicated revenue sources and funding tools to expand, maintain and operate the regional

Figure 1.2: The RTP Process



transportation system in a financially sustainable way over the next twenty-five years and beyond.

1.4 Purpose and Structure of This Paper

The following Green Papers are available for review and comment at www.metrolinx.com or by calling 416-874-5900.

- **Green Paper 1: Towards Sustainable Transportation (December 2007)**
- **Green Paper 2: Mobility Hubs (February 2008)**
- **Green Paper 3: Active Transportation (February 2008)**
- **Green Paper 4: Transportation Demand Management (February 2008)**
- **Green Paper 5: Moving Goods and Delivering Services (February 2008)**
- **Green Paper 6: Roads and Highways (March 2008)**
- **Green Paper 7: Transit (March 2008)**

White Paper 2 follows the seven Green Papers. It presents programs and policies to address the issues identified in the Green Papers and fulfil the goals and objectives listed in White Paper 1. It also analyzes three infrastructure test concepts for the year 2031. Ultimately, the RTP will identify a complete package of programs, policies, potential legislative changes and infrastructure proposals, that when implemented together, would create a bold, transformational transportation system. These pieces must work together to provide an improved experience within the transportation system, encourage a significant change in travel behaviour, and deliver a robust and convenient transportation network.

The proposed directions create an environment that facilitates a major shift in attitudes and choices related to the transportation system. They include educational and promotional programs, a comprehensive regional parking strategy, convenient transit fare payment, and planning for improved integration between transportation and office and residential developments.

White Paper 2 also analyzes three test concepts of infrastructure improvements. These concepts support the objectives of the *Growth Plan for the Greater Golden Horseshoe, 2006* and are based on MoveOntario 2020, local official plans and transportation plans. The three test concepts, and the business-as-usual concept, are described in Section 3.

A preliminary analysis of the test concepts presents some initial findings and conclusions, based on estimated cost and network performance improvements under 2031 conditions. The findings are described against the key goals and objectives identified in White Paper 1.

This report also discusses implementation activities and issues, including necessary coordination activities and collaborations. A summary of next steps is presented, which focusses on ongoing work and input leading the development and continued evaluation of the pieces that will be presented in the Draft RTP.

A glossary of terms is provided in Appendix A.

1.5 Current and Future Challenges

As described in Green Paper 1, transportation supply, demand and performance trends over the past two decades have been deteriorating, and a projection of these trends to 2031 shows continuing decline unless significant improvements are made.

In the Green Papers, these trends and challenges were explored in detail and some key conclusions emerged.

- Our system for planning and financing transportation and our individual travel behaviours are unsustainable
- The transportation system must be improved to meet the needs of current residents, and also the millions more who will call this region their home in the future. Our population and employment forecasts show an increase of 2.5 million people and 1.3 million jobs across the *GTHA* by 2031, which will place increasing demands on our transportation system.
- Existing infrastructure is being used inefficiently, with far too many trips being taken in single-occupant motor vehicles and far too few trips being taken by transit, bicycles or foot. Average automobile occupancy rates are only 1.2 persons/vehicle.
- There is little choice for travellers. Most feel they need to depend on cars for getting around, or are limited by how far they are able to walk or how well their neighbourhood is served by transit. The average percentage of trips by car is currently 75 per cent across the *GTHA*.
- Transportation infrastructure and operations require predictable and reliable revenue sources. Funding for transportation infrastructure has not kept pace with the needs of a growing population, thereby reducing our productivity and increasing the cost of our goods and services.
- The true cost of travel is not reflected in the price that users pay for different options.
- The cost of operating an automobile in the region will continue to rise as a result of increasing fuel, insurance and other associated operating costs.
- There is a lack of awareness about the impacts of individual travel behaviour.
- The system is out of balance and in many instances seems designed for cars instead of people. Priority is generally given to car travel over other means, such as transit or *active transportation*.
- Land use planning and transportation planning are not being well integrated. Low-density land use patterns, particularly in the suburban areas of the region do not adequately support the provision of improved, competitive transit service.
- The transportation system is not adequately integrated and coordinated across boundaries, or across modes.

- *Transportation demand management (TDM) and Intelligent Transportation Systems (ITS) efforts are under-funded and therefore not used to their potential across the GTHA. Current efforts are not coordinated or integrated to maximize their effectiveness.*
- More emphasis and resources are required to improve overall transit customer service (e.g. vehicle cleanliness, personal safety, real-time travel updates, etc.).

In order to be transformational, the RTP must address these challenges using a broad range of tools — improvements to infrastructure alone will not be sufficient. Changes to legislation, educational and promotional programs, and supportive policies must also be designed and implemented. These pieces must work together to provide an improved experience within the transportation system, encourage a significant change in travel behaviour, and deliver a robust and convenient transportation network.

A Strong Foundation

Some important and foundational work is already in place, making the way forward promising. The province of Ontario and municipalities are implementing the *Growth Plan for the Greater Golden Horseshoe* that will direct growth in a way that makes transit and *active transportation* increasingly viable options. The Greenbelt Plan protects rural, natural and agricultural areas that are important to the ecological health of the region. In addition, all orders of government are recognizing the importance of programs, policies and legislation which create an environment that promotes more sustainable practices in travel behaviour.

The RTP will build on this work, marking the beginning of a journey towards a vastly improved, more sustainable transportation system. We have little choice but to change. Our current transportation system is quickly becoming dysfunctional. Space and cost considerations limit our ability to increase the capacity of major highways and *arterial roads*. We need to rely more on transit and *active transportation*. This means transforming land use, road use, goods movement and demand management policies. It means a bold plan and financial commitment to infrastructure over the long-term. It means a changed culture and behavioural shifts to address how we get around the region. This plan will be a guide to a future of complete mobility. It will set the foundation for a sustainable transportation system and more sustainable communities. This plan will be key for the GTHA to become one of the world's most attractive and successful regions.

Have a Say! Help Shape the GTHA's Transportation Future

Whether we walk to the corner store, take transit to work, drive to the hospital, cycle to school, or rely on the movement of goods for our business, we all have opinions on how the GTHA's transportation system is performing. Many of us have thoughts on how it could be improved. Whatever your transportation situation, Metrolinx wants to hear from you as we develop the Regional Transportation Plan for the GTHA. The more people we hear from, the more inclusive and effective the Plan will be.

Visit www.metrolinx.com to participate in our online public consultation or contact us at 416-874-5900 to find out how you can get involved.

2. PRELIMINARY DIRECTIONS

Meeting the ambitious goals and objectives set out in White Paper 1 for the RTP means not only building a new, bold transportation system, but also putting in place a comprehensive suite of smart, up-to-date and leading edge programs and policies. These will ensure complete mobility that is user-friendly and that gives people clear choices.

In this section, we present for discussion a series of preliminary directions that could be undertaken to achieve the proposed vision, goals and objectives. These will be necessary to realize the full potential of a new and expanded transportation system. These directions have been based on the content and feedback received on the Green Papers.

The preliminary directions presented here are wide-ranging.

Some are major, multi-million dollar efforts; others are little things that cumulatively could make a big difference.

Some would take many years to implement; others could be accomplished right away.

Some of these preliminary directions would be the responsibility of governments at the federal, provincial or municipal levels. Some could be led by Metrolinx. Others could be led by non-governmental organizations, private sector businesses, schools, individuals and others. Many will be the shared responsibility of more than one entity.

The preliminary directions include policies, programs, best practices, legislation, regulations and incentives.

All of these preliminary directions are presented here for feedback and discussion. We want to hear your ideas:

- Which directions should receive the highest priority?
- Do any directions not make sense?
- Are there any missing directions?
- Who should take the lead on each of the directions?

The preliminary directions are summarized into the following categories:

What we want to achieve:

- A System for Complete Mobility
- Placemaking and *Mobility Hubs*
- Excellent Customer Service

What needs to be done to get there:

- Sustainable Financing
- Innovation through Research
- Partnerships and Clear Decision-Making

(Note: technical terms that have been italicized are defined in the glossary in Appendix A).

2.1 A System for Complete Mobility

This set of preliminary directions is intended to expand the existing transportation network into a complete and integrated transportation system. A complete transportation system will offer users more choices, reduce impacts on the environment and help ensure the region's continued competitiveness and prosperity. This will require more transit-oriented development and strengthened connections both within the region and to points beyond. Many of the preliminary directions for complete mobility will be closely linked with the Metrolinx *Investment Strategy*, which will address reliable, long-term funding being made available from a variety of public and private sources for the expansion, renewal and operation of the region's transportation networks.

Direction 1: Improve travellers' options and encourage responsible choices by establishing a transportation hierarchy to be used as the basis for planning, designing, financing and operating the transportation network and for land use planning, based on the following:

- i. Transportation demand management (TDM)
- ii. *Active transportation*
- iii. Transit
- iv. Carpooling, car-sharing and taxis
- v. Single-occupant vehicles

Direction 2: Optimize the efficiency of the transportation system through an ambitious *transportation demand management* (TDM) program.

Possible Options:

- i. Following the lead of many of the region's municipalities and employers, encourage or require all governments, provincially-funded agencies, such as school boards and hospitals, *major trip generators*, and major new residential and commercial developments to implement TDM programs.
- ii. Support the Smart Commute Initiative and encourage the creation of Transportation Management Associations.

- iii. Develop guidelines to help municipalities develop and implement TDM policies in their Official Plans, as required by the *Growth Plan for the Greater Golden Horseshoe*.

<i>TDM programs could include ...</i>
<ul style="list-style-type: none"> • Identifying a staff person as a TDM coordinator to develop and help implement TDM programs, as many municipalities and institutions have already done. • Making an emergency ride home service available to employees. • Developing policies to promote telework opportunities and flexible work hours. • Supporting Active & Safe Routes to School programs to encourage students to walk or cycle to school. • Encouraging provincial and municipal governments and agencies to lead by example.

Direction 3: Promote *active transportation*.

Possible Options:

- i. Support and coordinate the work of municipalities across the region to plan and implement comprehensive walking and cycling networks . Undertake *active transportation* audits in municipalities to identify gaps and deficiencies and prioritize improvements.
- ii. Install bike racks on all buses and amend both the *Highway Traffic Act* (Section 109) and the *Public Vehicles Act* (Sections 23 and 24) so that buses with bike racks would not require special permits.
- iii. Create a pilot bike-sharing program in a major urban centre modelled after the Vélib’ program in Paris.
- iv. Establish *active transportation* modal split targets for all *urban growth centres, mobility hubs, and major trip generators*, including schools and universities.

<i>Other measures to support active transportation could include ...</i>
<ul style="list-style-type: none"> • Amenities for cyclists and pedestrians such as showers, change rooms and bike storage in large office and commercial buildings, and major <i>mobility hubs</i>. • Snow-clearing standards that focus on the needs of pedestrians and cyclists. • Designing and locating parking and drop-off areas around schools in a manner that ensures priority access and safety for students who arrive by

walking or cycling.

- A region-wide bicycle registry with the ability to report and look-up stolen bikes.
- Extension of the provincial sales tax exemption for bicycles and related safety equipment.
- Considering opportunities for promoting *active transportation* and connecting key destinations when designing greenways strategies and park systems.
- Pedestrian and cyclist bridges at key locations over 400 series highways.
- “Queue-jump” lanes for cyclists at key intersections.

Direction 4: Build a comprehensive regional transit network that provides new services and enhances existing services, including

Possible Options:

- i. Enhanced rapid transit service in east-west corridors across the region, including between suburban communities.
- ii. High-order connectivity to Pearson Airport from all directions, including a high-speed transit link to downtown Toronto.
- iii. Seamless connectivity across municipal boundaries, such as eliminating restrictions for transit operators to pick up passengers while passing through neighbouring jurisdictions.
- iv. On-demand transit to and from GO Transit stations.
- v. Connectivity between places and along corridors that support the urban structure and intensification objectives of the Growth Plan.
- vi. Better linkages between socially disadvantaged areas of the region and the transportation network.
- vii. Improved access by non-auto based transportation modes to major transit stations such as GO Transit stations.

Direction 5: Support the regional transit network with robust, comprehensive and coordinated local transit networks.

Over time, update local Transportation Master Plans to align with the Regional Transportation Plan.

Direction 6: Improve options for, and reliability of, goods movement.

Possible Options:

- i. Develop a strategy with incentives to steer a portion of inter-regional goods movement traffic away from congested times and areas on roads and highways.

- ii. Improve goods movement infrastructure through rail service rationalization and better road infrastructure to/from large inter-modal facilities.
- iii. Reserve lands near major transportation infrastructure, such as inter-modal facilities and highway interchanges, for goods-intensive land uses.
- iv. Develop separate land use categories in Official Plans and Zoning By-laws for goods-intensive land uses, and develop policies to ensure these areas are able to move goods quickly and efficiently, while minimizing the demands on the transportation system.
- v. Plan and design new *controlled access highways* to give priority to goods movement, through measures such as the location and spacing of interchanges, permitted land uses around interchanges, and prioritizing those highways that connect key goods movement hubs and major freight, logistics and inter-modal facilities.
- vi. Ensure coordination with other planning efforts to improve efficiency and reliability of goods movement to and from the U.S. borders.

Other measures to support goods movement could include ...

- Priority measures for truck-based goods movement for long-distance east-west through-trips.
- A new east-west dedicated rail freight corridor.
- Freight impact studies for new manufacturing, warehousing and industrial developments that examine ways to minimize impacts on the transportation system, particularly during peak hours.
- Common standards for municipalities to identify local truck routes.
- Encouraging local food production and processing to reduce the need for long-range transport.

Direction 7: Develop a long-range land protection and/or acquisition strategy to accommodate future needs for *active transportation*, transit, roads, highways and goods movement.

Possible Options:

- i. Determine future transportation network expansion needs, including likely long-range requirements beyond the planning horizon of the RTP, and acquire or otherwise act to protect land for future transportation corridors and *mobility hubs*.
- ii. Protect existing transportation corridors including existing or abandoned rail rights-of-way and hydro corridors for use as future network links.
- iii. Establish protocols with the Ontario Realty Corporation to simplify the use of provincially-owned lands for transit facilities.

Direction 8: Design and operate roads to better support all modes of transportation.

Possible Options:

- i. Design roads so that they do not compete with existing or planned transit, particularly when it operates within the same corridor.
- ii. Progressively retrofit existing and new arterials that have six or more lanes of traffic with *High Occupancy Vehicle (HOV)*/transit lanes through conversion of existing lanes.
- iii. Design HOV lanes to optimize transit use, through measures such as simplifying the process of entering and exiting lanes or providing separate HOV lane on- and off-ramps.
- iv. Improve connections to *mobility hubs*.

Many municipalities have employed one or more of the following measures to support walking and cycling...

- Traffic calming at key pedestrian and cyclist destinations such as schools, local retail stores, *mobility hubs* and community centres.
- Landscaping and other amenities, such as street furniture and lighting that enhance the experience of *active transportation* users.
- Narrowing of streets in high-pedestrian traffic areas.
- The phase-out or redesign of channelized right-turn-only lanes.
- Audio signals at major signalized pedestrian crossings.
- Resting points and island refuges on wide crossings.

Streets could give priority to transit with measures such as ...

- “Signal priority” devices that allow transit vehicles to change traffic signals at key intersections as they approach.
- “Queue-jump” lanes that allow transit vehicles to bypass other traffic at key intersections.
- Parking and turning restrictions for cars.

Direction 9: Reduce traffic congestion and delays by implementing improved incident clearing procedures.

Possible Options:

- i. Develop joint training and operational protocols and performance standards for transportation and emergency service agencies on highway clearing.
- ii. Continue to investigate ways to improve the ability of emergency service providers to clear vehicles and debris quickly from highways and roads, without fear of liability issues.

- iii. Expand and integrate incident detection systems.
- iv. In coordination with the insurance industry, implement measures and protocols to minimize disruption to rail transit due to incidents at grade crossings.

Direction 10: Create new markets for transit.

Possible Options:

- i. Alternative service models for suburban and rural communities, including outsourcing and smaller vehicles to provide more service in off-peak hours. Examples could include smaller off-peak trains, jitneys, shuttle bus services, and dial-a-bus to and from key destinations.
- ii. Augment public transit ridership in low ridership areas by initiating U-PASS programs with local school boards, shifting high school students from yellow buses to transit buses, and encouraging the development of a flexible, multi-purpose public transportation system with a variety of vehicles.
- iii. Amend the *Ontario Public Vehicles Act* to allow employers, *major trip generators*, tourism destinations and other third-party operators to implement vanpooling.

Other measures to attract new users to transit could include ...

- GO Transit train excursion packages to key regional tourism destinations.
- Free or reduced transit fares on smog days.
- Discounted weekend fares with free access for children.
- Free or discounted transit day-passes provided by event organizers and tourism partners, such as hotels.

Direction 11: Promote ride-sharing and car-sharing.

Possible Options:

- i. Parking for car-sharing vehicles reserved in all large parking lots.
- ii. The existing provincial carpool lot network expanded to include additional lots at strategic locations, aligned with the HOV and *Bus Rapid Transit* (BRT) networks, particularly at the periphery of the region.
- iii. Taxi stands included at all *mobility hubs*.
- iv. Post information about carpooling at all parking lots beyond a certain size.

2.2 Placemaking and *Mobility Hubs*

For any transportation system to be successful, it needs to be supported by an appropriate and attractive urban form and structure. Whether you are commuting

to work, taking your child to school, or running an errand, how your neighbourhood has been planned will influence how you travel.

The *Growth Plan for the Greater Golden Horseshoe, 2006* establishes a regional land-use structure for the *GTHA* that focuses growth in existing urban areas, around key nodes such as downtowns and *major transit station areas*, and along corridors such as *arterial roads*. It calls for the creation of more complete and compact communities, that are pedestrian- and transit-friendly.

In this section, we present a range of directions that would comply with the Growth Plan, and ensure that the transportation system is supported by appropriate land uses.

Direction 1: Build complete communities that are pedestrian, cycling and transit-supportive.

Possible Options:

- i. Adopt planning policies and targets in Official Plans that support and reinforce the directions in the Growth Plan to create pedestrian, cycling, and transit-friendly communities.
- ii. Focus growth in nodes and along key corridors such as *arterial roads* that would support the efficient delivery of transit service.
- iii. School catchment areas defined on the basis of maximizing walking and cycling as the primary means of school travel.
- iv. New institutions such as elementary, secondary and post-secondary schools, regional hospitals, large sporting venues and cultural centres leading by example in demonstrating excellence in transit-oriented and pedestrian-friendly design.

Transit, cycling and pedestrian-supportive measures could include ...

- Designing new subdivisions such that all homes are within walking distance of a transit stop with frequent service.
- Identifying the location of transit stops in new developments as part of the planning approval process.
- Erecting transit stop signage as soon as roads are constructed in new developments so that prospective homebuyers are aware of the planned location of all stops.
- Establishing sidewalks on both sides of all streets.
- Creating an attractive and pleasant walking and cycling environment, with attractive landscaping, shade trees and public art.

Direction 2: Identify a system of *mobility hubs* for the *GTHA*.

A system of existing and planned *mobility hubs* could be identified for the region based on strategic location, planned transit service level, transit-oriented development potential and that complement the *urban growth centre* structure of the Growth Plan.

A suite of programs and policies could be developed that are appropriate to each hub type. Four hub types have been identified for consideration:

- i. Anchor hubs would be strategically located hubs with the highest level of planned transit service, combined with significant transit-oriented development potential within their *transit catchment areas*. These hubs would encompass current or planned major regional destinations such as major institutions, employment centres, town centres, regional shopping centres, etc.
- ii. Gateway hubs would be hubs located at major regional transit interchange stations, with high levels of planned transit service, but lacking the significant transit-oriented development potential of anchor hubs. These hubs would be current or planned gateways between regional higher-order transit lines and destinations.
- iii. Destination hubs would be hubs located at unique destinations that have significant drawing power (e.g. universities, regional shopping centres, hospitals, etc.). These hubs may or may not have existing higher-order transit or transit-oriented development potential, but are important regional activity centres and trip generators.
- iv. Higher-order station hubs would include all other stations on higher-order transit lines not included in the previous definitions, that are locally significant gateways to the transportation system.

Direction 3: Identify and incorporate *mobility hubs* into planning policy documents including Official Plans and Transportation Master Plans.

The location, type and function of *mobility hubs* could be identified in all Official Plans and Transportation Master Plans. This planning framework could:

- i. Identify *mobility hubs* as priorities for higher-density development and a mix of uses, with a strong emphasis on *major trip generators*.
- ii. Set minimum densities for population and employment for *mobility hubs*, consistent with the type and function of the hub, and in compliance with the *Growth Plan*.
- iii. Set target modal splits for *mobility hubs*.
- iv. Identify *mobility hubs* as *major transit station areas* as defined in the *Growth Plan*.
- v. Encourage cultural facilities, public institutions, public service buildings and civic buildings to locate in *mobility hubs*, wherever feasible.

- vi. Establish a range of appropriate uses that complements the purpose and function of the *mobility hub*.
- vii. Establish a parking reduction strategy for *mobility hubs*.
- viii. Identify *mobility hubs* as potential tax increment financing districts or community improvement plan areas in order to allow for fiscal and other incentives for development including value capture strategies, area development charges/assistance, public-private partnerships, and expropriation powers.

Direction 4: Prepare *mobility hub* master plans.

Municipalities could work with transit operators and landowners to prepare master plans for *mobility hubs*. These master plans could:

- i. Set clear policies for enhancing transit, pedestrian and bicycle access.
- ii. Identify optimal zoning standards that ensure appropriate development that maximizes the return on the transit investment.
- iii. Provide for customer service amenities such as clean, comfortable, weather-protected waiting areas, and a plentiful supply of areas for waiting.
- iv. Establish a pedestrian-focussed internal movement plan that stresses efficient, comfortable movement through a well-designed human-scaled place.
- v. Identify how transit can be introduced and integrated into the site.
- vi. Provide for access for users with special needs.
- vii. Accommodate direct connections to the *transit catchment area*, and provide shortcuts and minimize barriers and detours.
- viii. Establish policies to phase-out free parking and replace it with enhanced access for transit, cycling and walking.
- ix. Set aside reserved parking spaces for carpool and car-sharing vehicles.
- x. Provide secure, weather-protected bicycle storage facilities.
- xi. Achieve at minimum *LEED Gold* or equivalent standards.
- xii. Improve the travelling experience through the use of public art, landscaping and architectural excellence.
- xiii. Set high standards for safety and cleanliness.
- xiv. Provide some degree of flexibility for technology shifts through more modular and scalable design elements.

Direction 5: Enhance the roles of Union Station and Pearson Airport precincts as the *GTHA's* largest and most unique *mobility hubs*, with convenient transfers between local/regional transit/transportation, intercity rail and bus services, and active modes of transportation.

Pearson Airport and Union Station are two places in the region where inter-modal activity can be expected to grow substantially over the next 25 years. Both areas

demonstrate core *Anchor Hub* qualities but with unique significance at a national and international scale. Attribute distinct policies, programs and tools for these two hubs, beyond described in this section of the White Paper.

Direction 6: Develop comprehensive parking strategies.

As alternatives to driving are introduced, planning and financial mechanisms could be used to redesign and reduce parking areas in order to support the creation of pedestrian, cycling, and transit-friendly communities and promote the use of alternatives to the automobile.

Possible Options:

- i. Update municipal parking by-laws regularly, with increasing emphasis on lowering parking standards.
- ii. Offer developers the option of providing other benefits in lieu of parking, such as transit passes, car-sharing memberships, carpooling services, rewards points toward services and products, or cash contributions towards transit or *active transportation* infrastructure.

Some of the best practices that have been used by GTHA municipalities to reduce and redesign parking areas include ...

- Allowing off-site, on-street and shared-parking capacity to be counted toward meeting minimum parking requirements.
- Requiring parking management plans for new developments.
- Establishing minimum bicycle parking requirements for new residential and commercial buildings over a certain minimum size.
- Establishing parking design guidelines that ensure parking facilities do not act as barriers to *active transportation*.

Direction 7: Plan, design and build the transportation system in a way that directs growth towards existing urban areas, and away from natural areas and agricultural lands.

2.3 Excellent Customer Service

In addition to increasing the range of transportation options that are available to people, a high-quality transportation system needs to provide a safe and enjoyable travelling experience. The transportation system must put the needs of users first, and travellers must be given the information they need to determine whether, when, where and how they travel. In this section, we present a series of directions designed to improve customer service.

Direction 1: Create an online regional transportation information system.

Possible Options:

- i. A regional transportation information portal that is accessible online and by telephone, e-mail or PDA that provides travellers with easily accessible, centralized information on the full-range of transportation alternatives that are available to them.
- ii. Display boards at all major transit stops and stations showing the arrival time of the next transit vehicle.
- iii. The expanded use of display boards on roads and highways showing the estimated time to key destinations and notifying travellers of delays.
- iv. Display boards at transit stations and around urban cores showing availability and location of parking spaces.
- v. Real-time information available to transit riders at key transit stops and by e-mail or web that tells them the arrival time of the next transit vehicle.

An online regional transportation information portal could provide information on ...

- Transit schedules
- Real-time location and arrival time of transit vehicles.
- Regional transportation maps and guides (including roads, transit, trails, lanes, paths, cycling routes).
- Road and transit closures, construction and detours.
- Planned infrastructure improvements.
- School bus cancellations.
- Parking lot location and availability.
- Fares.
- Carpooling.
- Car-sharing.
- Cycling facilities (e.g. storage facilities, maintenance facilities).
- Air quality conditions/smog alerts.
- A personal carbon footprint calculator that allows people to compare the environmental impacts of their transportation choices.
- Opportunities for contributing to local carbon offset programs.
- Air quality index values to inform people when air quality is low, and that transit use is encouraged.

Direction 2: Provide a seamless transit/transportation experience.

Regional travel could be made more convenient and barrier-free as travellers transfer between modes and services, and cross regional boundaries.

Possible Options:

- i. Coordinate schedules between transit service providers, including demand-responsive services for persons with disabilities.

- ii. Require GO Transit and local transit service operators to provide each other with a minimum 90-days' notice before implementing any changes in service, to allow time for operators to adjust and coordinate their schedules.
- iii. Adopt protocols to coordinate response, mutual assistance and information-sharing among transit operators, in the case of delays and other exceptions.
- iv. Integrated customer service that allows users to obtain travel information about the entire system from any service provider.

A common set of procedures, and visual and audio cues can help make the transit system easier to use and navigate ...

- Consistent numbering and naming of transit stations and stops.
- Common transit signage standards.
- Next stop announcements on transit vehicles.
- Convenient and user-friendly facilities, signs and services for travellers.
- Transferring between modes.
- Common region-wide branding of transit.

Direction 3: Foster a new “transit lifestyle” by simplifying the payment of transit fares and rewarding regular users in order to make transit more attractive for commuting and daily travel.

Possible Options:

- i. Implement, as soon as possible, the Presto fare smart card that allows users to pay a seamless, integrated fare for all transit systems in the region.
- ii. Expand the use of U-PASS programs currently offered by many transit providers to include all post-secondary and high school students, as well as major employers.

The Presto fare smart card could provide many additional benefits ...

- Provincial and municipal governments could use the card for multi-application service delivery (e.g. parking, library card).
- Partnerships could be established to turn Presto into an electronic wallet, debit and credit card.
- Frequent users could be offered loyalty reward benefits.
- Local retailers or event operators could offer discounts to card holders.
- Presto reward points could be offered for delays and cancellations.

Direction 4: Establish region-wide *transit service standards*.

Region-wide standards for customer service could be developed and adopted for all transit operators, and operators could be required to develop a strategy to meet these standards and to report publicly on their performance. Standards could address issues such as maximum service headways, loading and crowding, service reliability including delays and cancellations, cleanliness and comfort, and customer satisfaction.

Direction 5: Improve access for seniors, persons with disabilities and others with special needs.

Possible Options:

- i. Establish service guarantees for specialized transit.
- ii. Coordinate specialized transit services on a regional basis, with the possibility of merging services.
- iii. An adapted, diverse fleet of transit vehicles across the region that is in conformity with *Accessibility for Ontarians with Disabilities Act (AODA)* standards.
- iv. Accelerate the achievement of AODA conformity in transit facilities, such as stop announcements and station access.
- v. Free companion transit passes for people who accompany individuals who require assistance.
- vi. Ensure ongoing training for transit operators to ensure they have an understanding of, and are sensitive to the needs of seniors and persons with disabilities.

Direction 6: Provide marketing and promotional material on transportation alternatives directly to individual commuters, households and employers.

Possible Options:

- i. Individualized social marketing campaigns directed at the household level to reach every household at least once every three years with information about transportation alternatives, including local transit routes and schedules.
- ii. Build on the success that many *GTHA* municipalities have had with producing cycling and pedestrians route maps by creating maps for all municipalities in the region.
- iii. A comprehensive, *GTHA*-wide *active transportation* promotional campaign, in partnership with public health groups.
- iv. Encourage developers to provide information on transportation alternatives, including local transit routes and schedules, to new home buyers.
- v. Transit routes, schedules and fare information available at all transit stations.

- vi. Require operators of non-residential parking lots to provide visible information on carpooling, such as links to online carpooling or ride-matching services.

Direction 7: Improve safety of all modes.

Possible Options:

- i. Training and educational programs to increase the safety awareness of drivers, cyclists and pedestrians.
- ii. Multi-user safety audits of *mobility hubs*, transit stations and roads/intersections to identify and modify “trouble spots.”

Additional safety enhancement measures could include ...

- Safety sideguards on trucks to protect cyclists.
- Automated enforcement technology for speeding and red lights.
- Reduced speed limits in high-pedestrian traffic areas and around schools.

2.4 Sustainable Financing

A lack of sufficient and dependable financing has been a major impediment to ongoing investments in transportation in the *GTHA* over the past few decades. New revenue sources are needed. At the same time, we need to better reflect the true costs of transportation choices and send appropriate price signals to travellers in order to encourage efficient use of the transportation system. Costs have to be distributed in such a way that one transportation mode is not unfairly subsidizing another. These issues will be explored more fully in Metrolinx’s Investment Strategy; but a preliminary set of potential directions is presented here.

In addition to developing the Regional Transportation Plan, Metrolinx will develop an Investment Strategy to identify potential financial tools and revenue sources for the initiatives and priorities set out in the Plan. All options will be considered, including government funding, private sector investment, user-fees such as parking fees, road pricing or tolling, and transit fares.

As a sustainable financing plan, the strategy will include a life-cycle approach to expansion, optimization, renewal and operations. Its aim will be to suggest sufficient, reliable and dedicated funding sources to turn the Regional Transportation Plan into a reality.

Direction 1: Better reflect the true cost of using the road system as a way of promoting more responsible transportation choices.

Possible Options:

- i. User fees for roads, such as road tolling.
- ii. Vehicle registration fees, charged based on time-of-day, distance travelled, and/or geography, which could be increased for fuel-inefficient vehicles and decreased for fuel-efficient, low emission vehicles.
- iii. Transit fares varied by time-of-day, distance travelled and/or geography

Direction 2: Re-invest revenues generated from transportation-related user-fees to fund transportation infrastructure and programs.

Revenues generated from transportation-related user-fees could be re-invested to fund transportation infrastructure and programs that align with the RTP. Metrolinx could, for example, coordinate and administer the collection and distribution of these revenues, and front-end transportation investment by floating bond issues based on the generated revenue streams.

Direction 3: Eliminate free and subsidized parking.

Possible Options:

- i. Recognize free or subsidized parking provided by employers as a taxable benefit, even for the provision of non-reserved spaces.
- ii. Charge for parking at transit stations separately from transit fares.
- iii. Recover 100 per cent of capital and operating costs from parking fees for parking facilities at public facilities, including transit stations.
- iv. Property taxation and other financial strategies to increase the cost of parking, particularly surface parking, and encourage more efficient parking provision.
- v. Encourage employers to offer their employees a choice between a free or subsidized parking space and a cash equivalent.
- vi. Encourage developers and building managers to sell or lease parking spaces separately from residential or commercial space.

Direction 4: Provide financial incentives to promote transit use.

Possible Options:

- i. Remove the taxable benefit status for employer-provided or employer-subsidized transit passes.
- ii. Expand the practice of many transit operators to offer bulk transit pass sales to employers and other *major trip generators*.
- iii. Reward car owners for taking older vehicles out of service with measures such as tax incentives and/or the provision of a transit pass for one year.

Direction 5: Ensure that new development pays its fair share of costs for all modes of transportation.

Possible Options:

- i. Amend the *Development Charges Act* to enable municipalities to levy charges for all transportation-related infrastructure, including pedestrian and cycling facilities.
- ii. Amend the *Development Charges Act* to allow municipalities to recover the full growth-related cost of transit infrastructure, and to base cost recovery on a level of transit service above existing levels.
- iii. Encourage or require developers to temporarily subsidize transit service to their developments wherever an appropriate cost recovery ratio would not otherwise be met, for example by providing free transit passes for a period of one or two years after project completion, or until a pre-determined ridership level is reached.

Direction 6: Leverage private sector resources to help deliver transportation improvements while ensuring ongoing public control.

As a prerequisite for funding, the evaluation of the feasibility and desirability of Alternative Financing and Procurement (AFP) strategies could be required as a means to expedite the delivery of transportation infrastructure, design, construction, maintenance and/or operations, and to ensure the most appropriate allocation of both private and public sector resources.

Direction 7: Develop mechanisms to capture increases in land values that result from new transportation infrastructure as a revenue source to finance the transportation investment.

2.5 Innovation through Research

The best transportation systems and transportation plans are informed by the best available data and research. In the *GTHA*, information gaps exist in several areas, particularly with regard to the movement of goods and delivery of services. As the Regional Transportation Plan is being implemented, it will be important to continue to improve our understanding of transportation issues, and the factors affecting our success. The RTP will also propose some innovative new programs which have proven to be successful around the world, but where our local knowledge and experience may be lacking. There will be a need to build on existing local expertise through demonstration projects and best practices. In this section, opportunities for ensuring ongoing innovation through research are identified.

Direction 1: Improve our understanding of goods movement.

Possible Options:

- i. Develop a data base for information-sharing among private and public sector goods movement entities.
- ii. Provide funding and develop regulations to further disseminate available technology, such as loading and route optimization, and Global Positioning Systems (GPS).
- iii. Pilot innovative approaches, such as the use of LRT systems for urban deliveries, centralized lockboxes for end-consumer deliveries, shared urban freight and delivery centres (e.g. for construction sites) and logistics villages (e.g. next to inter-modal hubs).

Better information sharing on goods movement could lead to ...

- A regional strategy for the planning of large-scale logistics, inter-modal and other goods movement facilities.
- Identification of load consolidation opportunities.
- Strategies to reduce GHG emissions from goods movement.
- Systems and standards to easily understand, calculate and communicate the cost and emissions impacts of shipping choices to shippers and to end-consumers.

Direction 2: Identify and eliminate barriers to *short sea shipping*.

Identify barriers to *short sea shipping* on the Great Lakes in partnership with other jurisdictions, and investigate new opportunities, such as transferring containers from larger ships downstream to smaller ships for direct deliveries to Great Lakes ports on either side of the border.

Direction 3: Develop Centres of Expertise on the relationship between land use and transportation.

Possible Options:

- i. Centres of Expertise to undertake research, promote best practices, and provide advice and technical assistance with respect to *mobility hub* design, street design and parking management.
- ii. An urban development agency to lead development around those *mobility hubs* where jurisdictional issues, land ownership patterns, or other issues present particular challenges.

Direction 4: Build a better understanding of trends and opportunities in *active transportation*.

The Transportation Tomorrow Survey could be expanded, or a parallel research project created, to gather detailed information on *active transportation*, including all walking and cycling trips.

Direction 5: Improve the understanding of the inter-dependence between transportation and human health in the *GTHA*

Create partnerships with health professionals, researchers and related organizations to develop baseline *GTHA* data on current health and transportation-related indicators.

Direction 6: Support research on clean fuel technologies and green vehicles, and develop programs to provide incentives for their use.

Direction 7: Implement pilot and demonstration projects.

Pilot and demonstration projects that help build local knowledge and expertise, demonstrate best practices and serve as demonstration sites could be implemented.

Possible Options:

- i. Integrated land use and transportation initiatives at *mobility hubs*.
- ii. Lane conversions on busy *arterial roads* or highways to High Occupancy Vehicle (HOV) or reserved-transit lanes.
- iii. Road capacity enhancement projects, such as tidal flow operations, contraflow lanes, dynamic lanes, continuous flow intersections, diverging diamond interchanges, shoulder bus lanes, roundabouts, reversible lanes, and moveable barriers.
- iv. “*Naked streets*”, where normal cues such as signage and sidewalks are eliminated, resulting in an environment in which pedestrians have the right-of-way and vehicles proceed more cautiously.

Direction 8: Improve transportation modelling interface.

Building on this region’s reputation as a leader in transportation modelling, municipalities, provincial ministries, and educational and research organizations could partner to improve the coordination and standardization of transportation data collection/analysis and demand forecasting and backcasting models, particularly related to emerging issues such as the impacts of climate change, resource depletion, travel behaviour changes, demographic changes, and the integration with land use.

Direction 9: Re-examine the specialized transit delivery model.

The existing specialized transit delivery model could be re-examined, in consultation with user groups and other stakeholders, such as municipalities and

the Ministries of Health and Long-term Care and Education. This could include consideration of pooling and coordinating all vehicles and operators involved in non-conventional transit service, including school transportation, to achieve the most efficient use of resources. It could also include examining ways to improve customer service, to coordinate across jurisdictional boundaries, and to explore the evolving relationship between specialized and conventional transit.

2.6 Partnerships and Decision-Making

Ongoing dialogue and partnerships are critical to building a transformational regional transportation system for complete mobility that transcends traditional municipal and other administrative boundaries. This includes establishing decision-making processes in which well-informed citizens are full and active participants.

Direction 1: Coordinate transportation planning and delivery across governments, sectors and stakeholders.

Metrolinx was created to coordinate transportation planning and delivery across governments, sectors and stakeholders. Possible options for fulfilling this mandate include:

- i. Creating mechanisms to resolve system gaps and bottlenecks between municipalities.
- ii. Pursuing partnerships with the federal government for the implementation of the RTP.
- iii. Establishing a process to ensure the decision-making of provincial ministries and agencies support the RTP.
- iv. Establishing a formal mechanism for interaction between stakeholders to advance policies, standards and the alignment of priorities.
- v. Systematically evaluating the feasibility and desirability of using public-private partnerships to accelerate investment in additional rail, transit and road capacity, while retaining effective public control.
- vi. Facilitating or managing *mobility hub* development projects.

Direction 2: Expand the role of municipal transportation advisory committees.

All municipalities could follow the lead of several municipal governments in the *GTHA* by establishing dedicated citizen advisory committees to advise councils and develop programs on matters related to *active transportation*, transit, and *transportation demand management*.

Direction 3: Ensure that decision-making is informed by a full and complete understanding of the impacts on all aspects of the transportation system.

Possible Options:

- i. An evaluation of opportunities to incorporate all transportation modes be required as part of the Environmental Assessment process for road construction, reconstruction or widening.
- ii. All municipalities follow the lead of several municipal governments in the *GTHA* by obtaining the input of local transit operators and public health departments on all major planning and transportation matters.
- iii. Metrolinx as a commenting agency for major planning matters that could impact the transportation system or for local Transportation Master Plans.
- iv. Broaden the scope of traffic impact studies to transportation impact studies that consider the impacts of new development on all forms of transportation, including transit, walking and cycling, as well as the impact of induced traffic.

Direction 4: Gather and disseminate knowledge about best practices in transportation planning.

A mechanism could be established for gathering and disseminating information on best practices in transportation planning, drawing on examples from similar organizations in comparable regions such as Agence métropolitaine de transport in the Montréal area and TransLink in the Vancouver region. Metrolinx could engage in concrete collaboration with regional transportation agencies in other jurisdictions on specific initiatives.

3. TEST CONCEPTS

3.1 Introduction

This section describes four different transportation system infrastructure concepts. These concepts, as well as a business-as-usual concept, have been developed as test concepts for the purpose of modelling how different systems would perform with regard to the vision, goals and objectives set forth in White Paper 1.

Each concept takes an alternative approach to addressing the present and future transportation needs of the *GTHA* (looking forward 25 years). The alternatives are not intended to be mutually exclusive and it is anticipated that elements from each could form part of the recommended Draft RTP.

The test concepts will also inform the potential range and scale of transportation financing and pricing options to be detailed in the Metrolinx Investment Strategy.

The three system test concepts were developed based on several inputs:

- the vision, goals and objectives presented in White Paper 1;
- the ideas and concepts presented in the Green Papers;
- the gaps and deficiencies in the transportation system that were identified during the consultation process on the Green Papers, and through discussion with municipalities and stakeholders;
- municipal Transportation Master Plans (TMPs) and Official Plans; and
- provincial policies and plans.

What We Have Learned

The following observations were gathered from the research conducted in the Green Papers and through stakeholder consultations.

- i. There is a lack of convenient, auto-competitive transit service and poor internal connections in the ex-urban areas of the region.
- ii. The mid-portion of the region lacks sufficient *higher-order transit* service in an east-west direction.
- iii. The transportation system does not adequately support the directions in the Growth Plan on intensification, creating compact, walkable, transit-supportive communities, and supporting and linking *urban growth centres*.
- iv. The region lacks higher-order inter-connected transit service between Pearson Airport and Union Station.
- v. The current inter-regional services focussed on Union Station, as well as significant portions of the urban transit network, are well-used with latent demand that could be accommodated by additional service.
- vi. There are a number of socially and economically disadvantaged areas that are under-served by transit. Connections between these areas and employment areas are inadequately developed.

- vii. A substantial proportion of the *GTHA* population, approximately 35 per cent, does not have a driver's licence. This group's reliance on transit is high and their mobility is potentially limited, depending upon where they live.
- viii. Local transit service is not adequately integrated with the GO Transit rail network.
- ix. The system is overly focused on access to transit by car, and lacks non-auto-based connections between major transit hubs and destinations.
- x. Travel patterns indicate there is a high percentage of cross-regional trips, therefore convenient connections/transfers between transit services is critical to maintain the competitiveness of transit (e.g. route, scheduling, fare integration and high-quality traveller information is required).
- xi. Municipal/regional boundaries and operating jurisdictions have presented barriers to better, more efficient transportation service.

The MoveOntario 2020 Transit Plan (see Appendix B), which includes Toronto's Transit City Plan, was a key input to the development of the transportation system test concepts. The projects included in the MoveOntario 2020 Plan were used as the base for all of the test concepts, with additional elements being added to serve growth beyond 2020 and to integrate them with an overall regional transportation system.

In addition to physical improvements to the infrastructure, some of the policy and program directions, described in Section 2, are assumed to be in place to support each test concept.

Each of the test concepts also assume an urban structure appropriate to the particular needs and requirements of the concept. All of the concepts are based on the land use patterns and requirements of the Growth Plan. At minimum, they each achieve the requirements of the Growth Plan for densities and intensification rates, and all of the concepts are based on the growth forecasts of the Growth Plan as allocated to each regional municipality and the cities of Hamilton and Toronto, respectively.

Recognizing that higher-orders of transit service will require greater concentrations of both people and jobs to support them, the concentrations of growth in and around *mobility hubs* varies between the different concepts. To reflect this variation, different *Anchor Hubs* with different population plus employment targets have been identified for each of the concepts. Table 3.1 describes the assumed population and employment levels in all *Anchor Hubs*, and select *Gateway Hubs*, for the three test concepts.

The designation of anchor hubs in each of the three concepts was determined by:

- i. their strategic location (the presence of regionally significant facilities);

- ii. the level of contemplated transit service; and
- iii. their transit-oriented development potential.

The resulting distribution of anchor hubs for each concept is illustrated in the test concept maps.

3.2 The Test Concepts Defined

3.2.1 Business-as-Usual (BAU) Test Concept

The Business-As-Usual (BAU) test concept includes all committed transportation projects, not including the full suite of MoveOntario 2020 projects announced in 2007.

Metro

- Extension of the Spadina subway to Vaughan Corporate Centre.

Other Rapid Transit

- Lines on Main Street and Queen Street in Brampton.
- A line from Steeles Avenue to Richmond Hill Centre on Yonge Street.
- The Mississauga Transitway.

The BAU test concept includes all currently programmed improvements to the Ontario Ministry of Transportation (MTO) highway network, including the High Occupancy Vehicle (HOV) network, and the Highway 407 East extension to Highway 35/115. Because most major municipal roads are financed through development charges, which provide a relatively stable and predictable source of funding, the planned regional major arterial improvements in suburban areas were included. The BAU reference concept therefore includes all major roads in the 10-year municipal road programs and longer-range road network expansion plans in the Transportation Master Plans (TMPs) of the cities of Toronto and Hamilton and the regional municipalities of Halton, Peel, York and Durham.

Under the BAU test concept, implementation of municipal *active transportation* networks is anticipated to proceed at rates similar to those in recent years. A similar assumption applies regarding improvements to the movement of goods and delivery of services within the *GTHA*; these will continue to be made largely by trucks, and truck movements will be subject to the same congestion delays as automobile traffic.

The land uses proposed under the BAU test concept are based on the Growth Plan and is identical to the land use assumed for Test Concept A.

3.2.2 Test Concept A: LINEAR

The Linear Test Concept is based primarily on the MoveOntario 2020 projects and other proposed system improvements with the following additional services to complete connections, fill system gaps, and address growth beyond 2020.

Express Rail

- A Lakeshore *Regional Express* line between Hamilton and Oshawa (based on electrification of the Lakeshore GO Transit Rail line as included in MoveOntario 2020).

Commuter Rail

- *Commuter rail* service linkages outside the *GTHA*.

Metro

- Extension of the Scarborough *Rapid Transit* (SRT) to Malvern Town Centre.

Other Rapid Transit

- Extension of a line on Hurontario north to Mayfield Road.
- A line on Dundas Street in Halton and in Mississauga.
- A new east-west line in York north of Highway 7.
- A line in the Highway 407 East/401 East corridor from Halton to Durham.
- A north/south line in Pickering joining North Pickering with downtown Pickering.

The basic highway system in this test concept comprises programmed MTO municipal projects and projects in the municipal TMPs (as in the BAU reference concept). In addition, this concept includes Highway 407 East, the GTA-West proposed travel corridor that links Highway 400 to the Guelph area, and the Niagara-GTA project. A network of *High Occupancy Vehicle* (HOV) lanes is also included in the Linear Test Concept, based on the MTO and municipal-planned system. *Active transportation* networks planned by municipalities are assumed to be completed as a component of all test concepts.

The land uses proposed under the Linear Test Concept are consistent with the minimum requirements of the Growth Plan in terms of growth forecasts and density and intensification targets. Under Concept A, in order to qualify as an anchor hub for the purposes of the model, hubs need to be served by *high-order transit*, contain regionally significant facilities, and achieve a threshold level of population plus employment of at least 25,000 within its *transit catchment area* (see Table 3.1). This allocation results in approximately 5 to 10 per cent of the upper or single-tier's employment plus population growth locating within the *anchor hub*. These are

estimates only, and they relate to *transit catchment areas* that have not been precisely delineated.

A map of the Linear Test Concept is included in Appendix C.

3.2.3 Test Concept B: RADIAL

The Radial Test Concept builds on Test Concept A by strengthening several major transit corridors radiating from Union Station. *Regional Express* lines providing very high levels of rail service are a major part of the Radial Concept. *Regional Express* lines would provide a high frequency and high speed (average 80 km/h or more) service by electrified railways or other higher-order technologies.

The *higher-order transit* systems include all of the MoveOntario 2020 projects plus the following:

Express Rail

- *Regional Express* lines in the Lakeshore corridor from Oshawa to Hamilton, on the Milton line between downtown Toronto and Mississauga City Centre, to Pearson Airport from downtown Toronto, and a Don Valley express line using existing and abandoned rights-of-way from Union Station to Richmond Hill. This last project is intended to supplement the capacity of the Yonge Street subway by providing a parallel express line with limited stops.

Commuter rail

- *Commuter rail* service linkages outside the *GTHA*.

Metro

- New *metro* line on Eglinton Avenue between Kennedy station in Scarborough and the Pearson Airport/Renforth Gateway area, east and west extensions of the Sheppard subway line (to the Spadina subway and to Scarborough Town Centre) and extension of the SRT to Malvern.

Other Rapid Transit

- Two lines in Hamilton, north/south in the James Street corridor leading to Hamilton Airport and east-west in the King Street corridor connecting to McMaster University.
- Extension of the Hurontario line to Mayfield Road.
- A line in Hamilton in the Mohawk Road corridor.
- A line between Hamilton and Halton through the Waterdown area.

- North/south lines to Milton from Highway 5 and along Trafalgar Road from Midtown Oakville to Highway 407.
- A new east-west line in York north of Highway 7 between Vaughan Corporate Centre and Markham Centre in the Major MacKenzie Road corridor.
- A Highway 407 East line from Halton to Durham.
- A Steeles-Taunton line in Durham between the Don Mills line and Oshawa.
- A north/south line along Brock Road from north Pickering to downtown Pickering.
- A north/south line in Whitby in the Brock Street corridor.
- An east-west express bus corridor in the Highway 401 corridor across Toronto using *High Occupancy Vehicle* (HOV) lanes.

In the Radial Test Concept, only programmed road improvements have been included, as well as the Highway 407 East Extension which is now undergoing an Environmental Assessment. The HOV network as developed for the Linear Test Concept is also included. The Radial Test Concept does not include the GTA-West nor the Niagara-GTA travel corridors.

In this concept, there would be greater concentrations of growth around more *anchor hubs* that are more dense, to reflect the increased accessibility provided to these hubs by the radial routes and other high speed transit improvements (see Table 3.1). *Anchor hubs* in Test Concept B have strategic locations, the presence of high speed transit, and a threshold population and employment set at 50,000 people and jobs within the *transit catchment area* (see Table 3.1). Twelve such hubs are identified in test Concept B. These hubs would typically be expected to receive between 10 to 15 per cent of the upper or single-tier's population plus employment growth. These are estimates only, and they relate to *transit catchment areas* that have not been precisely delineated.

A map of the Radial Test Concept is included in Appendix C.

3.2.4 Test Concept C: WEB

The Web Test Concept provides enhanced radial service to/from Union Station, as in the Radial Test Concept, but also adds major new east-west *higher-order transit* lines. The network for this test concept is a fully integrated, hierarchical transit system that will connect most of the *urban growth centres* in the *GTHA*. In addition to the MoveOntario 2020 projects this option includes:

Express Rail

- *Regional Express* corridors on the Lakeshore line from Hamilton to Oshawa; to Mississauga City Centre, Pearson Airport, downtown Brampton and Richmond Hill Centre from downtown Toronto; from Pickering through Markham, Richmond Hill Centre, Vaughan Corporate Centre, Pearson Airport, and Mississauga City Centre to midtown Oakville; and an east/west line along Highway 401 from Scarborough Centre to Pearson Airport/Renforth Gateway.

Commuter Rail

- *Commuter rail* services linkages outside the *GTHA*.

Metro

- New *metro* line along Queen Street in Toronto linking with the Bloor Danforth subway both in the east and west areas of the city, and an Eglinton *metro* line from Kennedy station to Pearson Airport.
- Extension of the Sheppard subway to Downsview in the west and to Scarborough Town Centre in the east.
- An extension of the Scarborough *Rapid Transit* (SRT) to Malvern Town Centre.

Other Rapid Transit

- Two lines in Hamilton, along James Street and east/west on King Street to McMaster University
- An extension of the Finch line east to Seneca College.
- The Hamilton “T” line along Mohawk Road.
- Lines between Hamilton and Halton through the Waterdown area.
- A line along Dundas Street in Mississauga and Halton from Hurontario to Burlington.
- North/south lines from Milton to Lake Ontario and along Trafalgar Road to downtown Oakville.
- A link from Markham Centre to downtown Oshawa via Highway 407 East.
- A Steeles-Taunton link from York University to downtown Oshawa.
- A north/south line along Brock Road from north Pickering to downtown Pickering.
- A north/south line in Whitby in the Brock Street corridor.

The highway network is the same as in Radial Test Concept.

In this concept, the presence of both radial and circumferential high-speed lines creates a web that enables more *anchor hubs* to be served by at least two high-speed transit lines, particularly at the locations where the circumferential and radial lines cross. The concept, therefore, envisages a slightly greater number of larger anchor hubs (in excess of 50,000 population plus employment) than the Radial Test Concept (see Table 3.1), with a higher proportion of growth allocated to locations whose transit service has significantly increased over the Radial Test Concept. Fourteen such hubs are identified under test Concept C. *Anchor hubs* in this concept would typically be expected to attract 10 to 20 per cent of the upper or single-tier's employment plus population growth. These are estimates only, and they relate to *transit catchment areas* that have not been precisely delineated.

A map of the Web Test Concept is included in Appendix C.

3.3 Model Approach and Methodology

Following are the input assumptions to the Greater Golden Horseshoe Model (the MTO's transportation demand forecasting model covering the Greater Golden Horseshoe area), that were used for generating the test concept performance comparisons.

- Population, employment, land use and socio-economic characteristics:** 2031 projections at the traffic zone level (~3000 zones), consistent with the population and employment forecasts of the Growth Plan at the single and upper-tier level, consisting of population by age, occupation status, dwelling type, household structure and employment by type. All test concepts assume that the Growth Plan's minimum requirements for intensification and density have been met. For each test concept, a different system of *anchor hubs*, as well as select *gateway hubs*, has been identified. For the purpose of modelling the three tests concepts, population and employment levels have been assumed for each of the hubs as listed in Table 3.1. These are estimates only, and they relate to *transit catchment areas* that have not been precisely delineated.

Table 3.1: Population and Employment Assumptions for Anchor Hubs and Select Gateway Hubs for the Purposes of Modelling¹

Anchor and Select Gateway Hubs	Test Concept A: Linear	Test Concept B: Radial	Test Concept C: Web
Downtown Brampton	●●	●●●	●●●
Downtown Burlington	●●	●●●	●●●
Downtown Hamilton	●●	●●●	●●●
Downtown Milton	●●	●●	●●
Downtown Oshawa	●●	●●●	●●●
Downtown Pickering	●	●	●
Downtown Toronto	●●●●	●●●●	●●●●
Etobicoke Centre	●●	●●●	●●●
Markham Centre	●●●	●●●	●●●●
Midtown Oakville	●●	●●●	●●●
Mississauga City Centre	●●	●●●●	●●●●
Newmarket Centre	●	●	●
North York Centre	●●●	●●●●	●●●●
Pearson Airport	●●●	●●●	●●●
Richmond Hill/Langstaff	●●●	●●●	●●●
Scarborough Centre	●●●	●●●	●●●●
Vaughan Corp. Centre	●●	●●●	●●●
Yonge Eglinton	●●	●●	●●

Population and employment assumptions for the purpose of modelling (anchor hubs shown in red):

- 0 - 25,000 ●
- 25,000 - 50,000 ●●
- 50,000 - 100,000 ●●●
- 100,000 + ●●●●

- **Road network:** The highway network includes all elements in the province’s five-year capital program, and the *arterial road* network includes all road improvements as per the Transportation Master Plans of each upper- and single-tier municipality. The Linear Test Concept includes Highway 407 East, the GTA-West proposed travel corridor that links Highway 400 to the Guelph area, and the Niagara-GTA project, while the Radial and Web Test Concepts and the BAU Reference Concept include only the 407 East corridor.
- **Marginal auto operating cost** in Concepts A, B and C is assumed to increase 100 per cent in real terms from 2006 levels to capture potential increases related to increases in gas prices and/or implementation of road pricing. A 50 per cent increase is assumed for the BAU Concept, reflecting gas price increases.

¹ Note: These are estimates only, and they relate to *transit catchment areas* that have not been precisely delineated.

Possible road pricing schemes will be assessed more explicitly in preparing the Draft RTP report and the Investment Strategy.

- **Parking costs** in the Linear, Radial and Web Concepts are also assumed to increase by 50 per cent in real terms over the 2006 levels in mature urban areas with existing parking costs. In addition, areas subject to parking costs have been expanded to include *urban growth centres*, nodes/corridors and major employment areas in urbanized areas with high densities (ranging from \$6 to \$18 per day). In the BAU Concept, parking costs remain unchanged in real terms.
- **Bus and streetcar network** in all four concepts is assumed to be expanded into new urbanized areas (e.g. designated greenfield areas); improved service levels (frequencies) are assumed, consistent with population growth and projected transit mode share increases for each test concept based on typical bus loading standards.
- **Transit fares** in all four concepts are kept at the same level as in 2006, in real terms, with fare integration between the local transit operators to eliminate double fares for short cross-boundary trips.
- **Higher-order transit headways** and average operating speeds have been assumed as shown in Table 3.2:

Table 3.2: Headway and Operating Speeds of Various Modes

Mode	Peak Period Headway (min)	Nominal Operating Speed (km/h)
<i>Regional Express</i>	5	80
Commuter Rail (GO Rail)	10	50 – 60 *
Metro (Subway/SRT)	2	40
Other <i>Rapid Transit</i> (LRT, BRT)	2 - 3	30 – 80 **

* 50 km/h on all-stop services and 60 km/h on express services

** 30 km/h on surface LRT/BRT; 80 km/hr on grade separated *Transitway* (e.g. 407 *Transitway*)

3.4 Limitations of the Model

Like all state-of-practice models, the model used in the preparation of this paper has limitations that must be considered when interpreting its results. Among them are the following:

Observed behaviour: the model captures people's current perceptions of the modes available and observed travel behaviour. As such, it may underestimate the impacts of new modes and aggressive policies that do not exist today, as there is no observed behaviour from which to extrapolate.

Modal bias: the model is not sensitive to changes in non-quantifiable measures, such as comfort, cleanliness and image. Hence, attitudes toward buses, for example, are assumed to be constant and only the impacts of changes in cost, in-vehicle and out-of-vehicle travel time and transfers are modeled.

Regional scale: the model is based on a grid of 3,000 traffic zones for the Greater Golden Horseshoe, which is at a scale too large to provide sufficient detail at a local level and for short trips.

Modelling error: error is inevitable given the aggregations and simplifications necessary to model every trip for every person in the GGH.

4. TEST CONCEPT PERFORMANCE – PRELIMINARY FINDINGS

4.1 Introduction

To gain a better understanding of the long-range performance and costs of the test concepts described in Section 3, a transportation computer model was applied to estimate future travel patterns of *GTHA* residents. The computer model takes into account where people live, work, go to school or are travelling to for other purposes, and what travel options are available to make these trips. Through simulation, the model then determines what travel routes and modes might be used and estimates the trip volumes on roads, transit and walking/cycling facilities throughout the region.

The computer model simulates the behaviour of individual travellers taking into account the different costs (e.g. fares, tolls, parking charges, etc.) and travel times (e.g. walking, waiting, in-vehicle) via the available modes (e.g. auto, transit or walk/cycle) for that individual's trip. Different types of people behave differently and thus key socio-economic characteristics that affect travel and travel choices such as age, employment status, occupation type, household structure (e.g. single, married, married with children, etc.) are reflected when determining one's propensity to use a given mode. The computer model covers the entire *GTHA* and surrounding areas. Projections have been made for the year 2031 for the three-hour morning peak period of a typical weekday, when work and school trips are most concentrated and the network is experiencing maximum demand levels.

It is important to note that despite the model's sophistication, it is an inherently simplified view of the world and cannot fully simulate the complexity of our lives and future trends. It is also limited by the information that is traditionally collected by, and available to, transportation planners and engineers. For example, regional economic trends, social values and environmental concerns are reflected in the model as they manifested themselves in the travel behaviour of various socio-economic groups at the time(s) for which the model was calibrated. Model estimation of behavioural responses to major changes in those trends and attitudes (beyond the range of variation in the calibration data) would be subject to more uncertainty; simulated changes in behaviour may tend to be under-estimated in such cases.

In addition, while the model generally accounts for differences in land use patterns, demographics and the availability of transportation infrastructure and service levels (e.g. measures of travel times, costs and convenience), the full impacts of many of the programs and policies discussed in Section 2 are not directly incorporated into the model, nor are the impacts of those policies and programs reflected in the preliminary findings. For example, the model does not directly take into account how travel choices would be affected by major improvements in off-street walking and cycling networks, a bike-sharing program, regular marketing programs to inform households about transportation alternatives, or widespread use of an online regional transportation information portal. To the extent that the policies and

programs in Section 2 are designed to encourage use of the more sustainable transportation modes (e.g. transit, walking and cycling), the model likely underestimates the use of such modes.

Therefore, it should be acknowledged that the model is not a crystal ball, and the results presented in this section should not be taken as definitive statements about future conditions under the three test concepts; however the findings do provide a useful comparison of the relative demand levels/patterns and performance levels between the concepts.

The following sub-sections describe the estimated costs, performance levels and performance/cost implications of the three transportation system concepts described in Section 3, and the business-as-usual (BAU) reference concept. Preliminary findings are presented. Reflecting the uncertainties associated with any future forecast, the projections and performance measures are subject to standard forecasting error, but provide a sufficiently accurate basis upon which to show the relative differences between the concepts for planning purposes. They are also subject to further fine-tuning, based on further modelling that will take place for the Draft RTP. Readers are therefore advised that the value in these results is found in relating the results of different concepts to each other as opposed to predicting absolute outcomes.

4.2 Preliminary Cost Estimates

Capital Costs

Pre-engineering capital costs for system expansion were estimated for the three test concepts and the BAU concept based on industry-standard unit costs and costs for similar types of road and transit facilities. Broad assumptions were made with respect to the need for structures, tunnelling and other higher-cost construction activities, with contingency estimates added to reflect property acquisition and other cost uncertainties. For transit facilities, a cost component for transit vehicles was also included in the capital costs. These are costs for system expansion and do not include capital costs for ongoing rehabilitation of existing and new facilities. The estimates do not include the cost of operating additional programs as outlined in Section 2.

Capital cost estimates for the BAU concept and each of Test Concepts A, B and C are shown in Table 4.1 and assume a 25-year investment period.

Table 4.1: Order of Magnitude Capital Cost Estimates (billions of 2006 dollars)

	BAU	A - Linear	B - Radial	C - Web
Rapid and Local Transit	5	40	60	75
Regional Roads and Provincial Highways	15	20	15	15
Total *	20	60	75	90
Annual **	0.8	2.4	3.0	3.6
Per capita (in \$)	93	279	349	419

* Road and transit capital cost for expansion. ** Annual cost assumes a 25-year investment period.

These order-of-magnitude costs are intended to show the relative cost differences between the concepts and are intended for planning purposes only. They do not reflect the likely efficiency gains from increased capacity in the industry or from specialization. Nor do they reflect the efficiency gains experienced by other jurisdictions with ongoing infrastructure programs where public and private partners can efficiently and continually deploy human and technical resources and achieve economies of scale.

It is important to note that the costs will be borne by a significantly larger population than today's. As Table 4.1 above shows, when divided by the 2031 population of 8.6 million residents, annual capital costs per capita are between \$93 and \$419, and are much lower than the annual costs of owning and operating a car. Furthermore, funding could come from a variety of sources, including the private sector. Metrolinx's companion Investment Strategy will align the RTP twenty-five year capital cost estimates and annual transit operation cost estimates against a proposed suite of dedicated revenue and funding tools.

Finally, it is also important to note that each test concept is only a test, not a plan. A more complete analysis will further help identify which projects should be prioritized based on the goals and objectives outlined in White Paper 1.

It is clear that under all of these concepts, investments would allow millions more people to travel to work and elsewhere by transit than are currently able.

Operating Costs

Operating costs have not been fully calculated for all modes. Table 4.2 introduces transit operating costs, excluding the continued substantial operational spending on roads and highways.

The numbers below demonstrate that the operating requirements will grow significantly, with a 137.5 per cent increase between 2006 and Test Concept C.

Table 4.2: Transit Operating Cost Estimates (billions of 2006 dollars)

	2006	BAU	A - Linear	B - Radial	C - Web
Transit Operating costs (in billions of 2006 dollars per year)	1.6	2.1	2.6	3.3	3.8

4.3 Performance Comparisons

The three alternative long-range system test concepts have been assessed and compared in Appendix D using some of the quantitative indicators described in White Paper 1. They reflect the three major pillars of the transportation vision for the *GTHA*:

- A high quality of life for people;
- A thriving, healthy and protected environment;
- A strong, prosperous and competitive economy.

A High Quality of Life

A pivotal goal of the Plan is for the transportation system to provide more options for moving people and goods around the entire region conveniently, comfortably and safely, with minimum disruption to neighbourhoods and connecting *urban growth centres* and *mobility hubs*.

A Greater Role for Transit

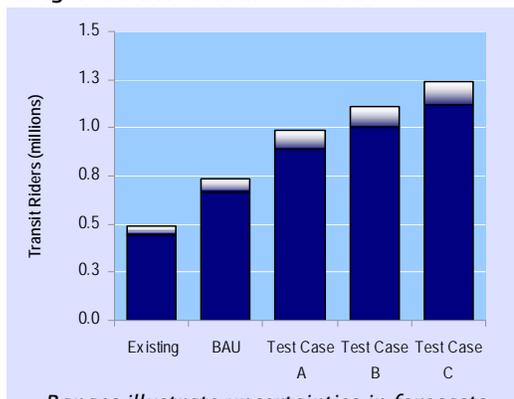
A key indicator of success to achieve this is the proportion of trips made by transit and *active transportation* modes. In the Web Test Concept, the combined modal-split for non-car modes almost doubles to reach close to 40 per cent of all morning peak trips, without taking into account the effects of a variety of policies discussed

in Section 2, except for a generalized increase in the cost of driving. This modal split would be an extraordinary achievement.

The Draft RTP will elaborate on trends to be expected for trips taken for reasons other than for work.

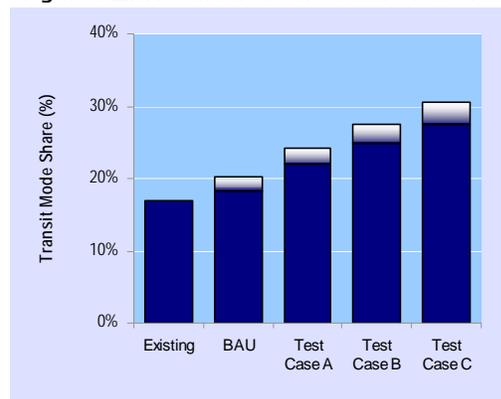
Increases between the 2006 situation and Test Concepts A to C, as shown in Table 4.3, can be explained by greater *rapid transit* infrastructure investment and the concentration of population and jobs within close proximity to them as described in Section 3.

Figure 4.1: Transit Riders – AM Peak



Ranges illustrate uncertainties in forecasts.

Figure 4.2: Transit Mode Share -- AM Peak



The relatively low increase in *active transportation* may be explained by the assumptions of the model, which mainly reflect the effects of land use changes in generating more short trips (thereby increasing the propensity to walk or cycle) and do not capture directly the other policies and programs for *active transportation* as proposed in Section 2. A greater increase in *active transportation* may result from the implementation of these policies and programs.

Table 4.3: Share of Morning Peak Period Trips by Transit and Active Transportation

Concept	Transit	Active Transportation	Transit + Active transportation
Current	16.5 %	9.0 %	25.5 %
Business-as-Usual	17.0 %	9.0 %	26.0 %
Concept A	23.0 %	9.5%	32.5 %
Concept B	26.0 %	10.0 %	36.0 %
Concept C	29.0 %	10.5 %	39.5 %

Significantly Greater Capacity

The increase in the share of transit shown above in table 4.3 — from 17 per cent in 2006 to 29 per cent under the Web Test Concept — does not tell the whole story. Because of the anticipated population growth and a projected increase in the average trip length from home to work, it would take significant transit investment merely to allow the same proportion of commuters to continue to be accommodated on transit.

The modal share shown above, multiplied by the much greater population and travel volumes projected for 2031, means that dramatic increases in transit ridership are projected, ranging from 2.0 to 2.3 and 2.5 times greater than 2006 levels for Test Concepts A, B and C, respectively.

The increase in the number of transit trips is shown in Table 4.4, with a much greater rate of growth than the share of transit.

Table 4.4: Increases in Transit Trips from Current (2006) Levels

Business-as-Usual	+ 50 %
Concept A	+ 101 %
Concept B	+ 127 %
Concept C	+ 153 %

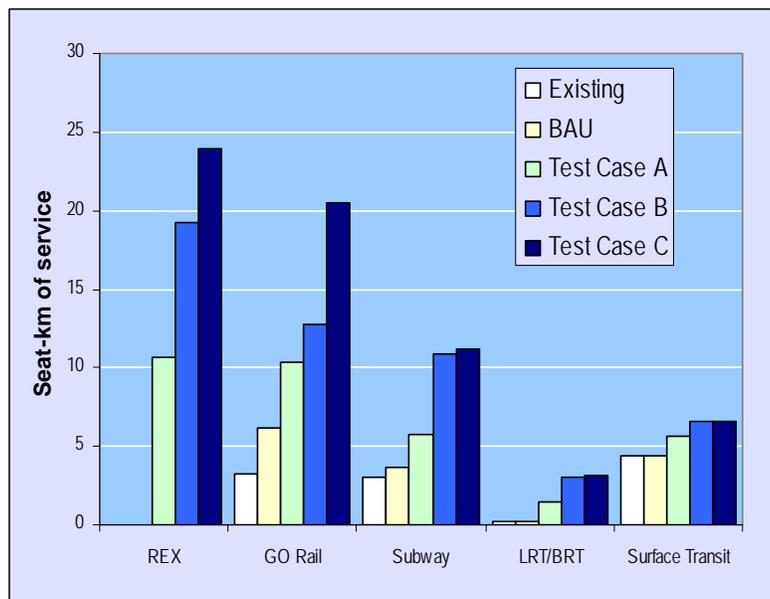
As illustrated in Table 4.5, there is tremendous growth in the length of *rapid transit* infrastructure under each concept.

Table 4.5: Rapid Transit Network Length (km)

Transit Mode	2006	BAU	A Linear	B Radial	C Web
Regional Express	0	0	120	200	440
Commuter Rail	420	420	500	440	560
Metro	70	80	100	150	160
Other Rapid Transit	50	100	600	660	650
Total Rapid Transit	540	600	1,320	1,450	1,810

The test concepts progressively show a significant increase in the number of seats available on transit vehicles, in all transit modes, as shown in Figure 4.3.

Figure 4.3: Increase in Transit Supply



Despite a relatively modest increase in the estimated future share of *active transportation*, the total number of walking and cycling trips is projected to increase significantly for every test concept. The full reflection of proposed programs and policies, including *active transportation* infrastructure, that is not reflected in the model, would boost these figures even higher.

Table 4.6: Increases in Active Transportation Trips

Current	+ 0 %
Business-as-Usual	35 - 45 %
Concept A	43 - 53 %
Concept B	51 - 61 %
Concept C	59 - 69 %

Linking People to Places

In addition to reflecting a fast-paced infrastructure program, an ambitious change is contemplated for how transit will be integrated with the way we design and build communities.

The proposed concepts show a significant difference in how close people live to transit. From the current situation in which only 11 per cent of the population lives within 500 metres — or walking distance — to *rapid transit*, Concept C would almost triple that percentage. With the significant population growth we are

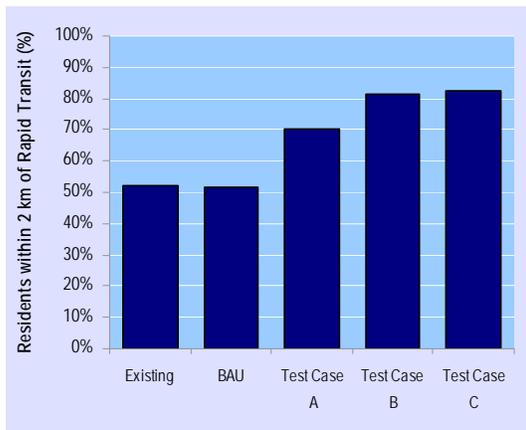
expecting, we would be bringing *rapid transit* to the doorstep of millions more people. The model also shows that from 52 per cent today, up to 82 per cent of residents would live within two kilometres of *rapid transit* — a short distance that lends itself well to cycling, local transit or being dropped off.

Table 4.7: Rapid Transit Coverage

Percentage of People Who Live Within Walking Distance (500 m) of a <i>Rapid Transit</i> Line	
Current	11 %
Business as Usual	13 %
Concept A	25 %
Concept B	30 %
Concept C	32 %

Along with the location of work places, proximity to transit is a fundamental element to help people choose transit. Infrastructure is an important prerequisite, but only the first step to transformational change. It is the successful implementation of programs and policies that will make the difference between residents walking to their nearest *mobility hub* to take transit, or driving by. Therefore, the greater availability of *rapid transit* to more people is a key finding of the model.

Figure 4.4: Residents Within Two km of Rapid Transit

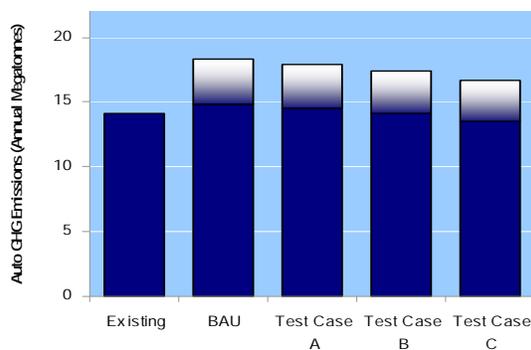


4.3.1 A Thriving, Healthy and Protected Environment

The Challenge of Climate Change

Climate change is the most daunting challenge facing the world today. Canadians are among the world's largest producers of greenhouse gases (GHGs) per capita and transportation is among the largest contributors at 31 per cent of Ontario's total emissions. The International Panel on Climate Change has recommended that emissions be reduced to stabilize the concentration of GHGs in the atmosphere. In its Go Green Climate Change Action Plan, the Government of Ontario has committed

to a decrease in GHG emissions of six percent below 1990 levels by 2014, and of 15 per cent below 1990 by 2020. As per the Go Green Action Plan, 13 per cent of the province-wide reduction by 2020 will have to come from passenger vehicles and transit, and six per cent from freight and diesel emissions.



The RTP can play an important role in meeting GHG reduction targets. However, the challenge of adding 2.6 million people to our region while trying to reduce or even hold-the-line on emissions cannot be overestimated. Based on the set of assumptions outlined above, none of

the modelled test concepts meets the Go Green target on its own, and it is clear that the added contribution of the policies and programs described in Section 2 will be critical. Although model estimates for the Web Test Concept show a possible decrease in emissions, this decrease takes place from 2006, not the 1990 base used for the provincial targets.

Table 4.8 below shows the performance of each scenario. Broad ranges are provided since there is substantial uncertainty over the future price and availability of gas, as well as the impact/use of more energy efficient vehicles. Due to these uncertainties, the range of reduction estimates could be significantly larger than shown.

A key finding is that the BAU reference concept and the three test concepts differ significantly in their emissions profiles.

Energy Use

The total modelled amount of energy used by personal vehicles and transit will increase from current levels (see Appendix D). This figure may be even higher once heavy trucks are taken into account, reflecting the rapid growth of truck traffic. It is interesting to note that for transporting people, the amount of energy used by personal vehicles represents about 96 to 97 per cent of the total, with about three to four per cent for transit, even as the role of transit is growing substantially.

Therefore, it is theoretically possible to maintain high levels of mobility with transit in an energy-efficient manner.

Again, as shown in Table 4.8, the reference scenario and the three test concepts differ in their energy use as well as GHG emissions, with the substantial energy use and emissions estimated for the BAU concept reduced progressively when moving from Concept A to Concepts B and C.

Table 4.8: Evolution in Greenhouse Gas Emissions and Energy Consumption

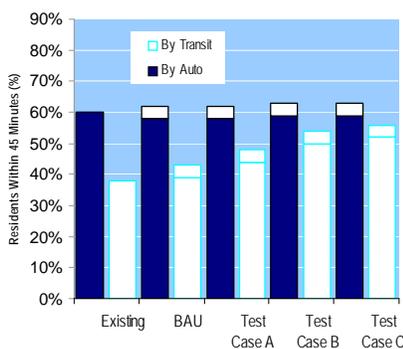
	GHG	Energy
Current (2006)	-	-
Business-as-Usual	+ 5 to 30 %	+ 11 - 34 %
Concept A	+3 to 28 %	+ 10 - 34 %
Concept B	+0 to + 23 %	+ 6 - 29 %
Concept C	-4 to + 18%	+ 2 - 25 %

Air Pollutants

A number of pollutants are responsible for poor air quality, smog and other adverse effects such as acid rain. The model results, without the full range of programs and policies, show that absolute emissions of common air pollutants, e.g. CO, NOx, SOx, VOCs, PM10 and PM2.5, which also contribute to smog, rise somewhat under each test concept from 2006 levels (see Appendix D). These represent emissions from cars only and exclude emissions from trucks, locomotives and ships as well as home heating, industrial processes and pollutants from other jurisdictions carried by the wind. However, higher emissions do not mean that smog days will increase in the future in all places since total emissions are not directly related to local air quality as weather conditions greatly influence air quality.

4.3.2 A Strong, Prosperous and Competitive Economy

Residents within 45 Minutes of Work by Auto and Transit Quality Jobs for Ontarians



The capital investment required for all test concepts will help boost the economy by adding thousands of design, planning and construction jobs. Additional indirect and induced employment increases would also result, as will be documented in the Draft RTP report.

The per cent of *GTHA* residents within 45 minutes of travel to their workplace — owing to combinations of greatly improved transit and closer live-work distances in *urban growth centres* and *mobility hubs* — remain relatively constant for travel by auto but increases significantly for travel by transit: from about 38 per cent in 2006 to about 54 per cent under Concept C in 2031.

Managed Congestion

No successful city-region anywhere in the world has completely eradicated congestion. The RTP will focus on moving people and goods, not just vehicles — and will provide improved choices to do so.

A comparison of today's situation, the BAU scenario, and test concepts A, B and C in terms of hours of delay and cost of congestion are shown in Table 4.9.

Table 4.9: Congestion Impacts

Hours of Delay and Cost of Congestion (\$ 2006)		
	Delay (hours in AM Peak hour)	Cost (B\$/yr)
Current	42,700	2.2
Business as Usual	84,500	4.2
Concept A	62,000	3.1
Concept B	54,000	2.7
Concept C	50,000	2.5

Results in Table 4.9 show that projects included in the test concepts, along with assumed service levels and related measures, would help to hold the cost and delays caused by congestion to present-day levels, even with the addition of 2.6 million more residents. For example, delays would increase by 14 per cent between 2006 and Concept C, but by 98 per cent — or close to double — between 2006 and the BAU scenario. Costs follow the same pattern.

Safer Transportation

Everyone in our region knows someone who has been involved in a traffic accident. While Ontario's transportation system is among the world's safest, too many of us continue to get hurt while moving through the system.

Even if driving habits do not change and vehicles do not become safer, a preliminary interpretation of the model shows that under each test concept, including BAU, vehicle-kilometres-travelled (VKT) increase at a much lower rate than our population. If we assume a constant rate of incidents per kilometre travelled — a conservative assumption, given our enviable track record over the last 30 years — the fact that each person may drive less may very well help save lives. The Draft RTP may enlarge on this working hypothesis.

4.4 Interim Findings

The following preliminary findings are based on the results of the model, with its assumptions and limitations acknowledged — for example, it does not include the full range of preliminary directions outlined in Section 2.

- Significant increases in transit use are achievable in the *GTHA* through bold transit investment, coordinated *rapid transit*/land use planning, and supporting policies and programs.
- Increasing population, jobs and economic output while reducing emissions and making up for a lost generation of transit investment, is a formidable challenge that will require the participation of all governments, public and private stakeholders, and each resident of the region.
- Significant progress towards achieving the economic, social and environmental goals outlined in White Paper 1 can be achieved in the *GTHA* only through bold transit investment, a new approach to joint planning and delivering of transportation and land use, and supporting policies.
- Greenhouse gas emissions are not estimated to drop enough to meet provincial targets solely as a result of network and service improvements, as simulated in the model. Common air pollutants, which contribute to smog, are not estimated to go down from 2006 levels, even in Test Concept C. Ambitious policy and program implementation will be needed to achieve desired GHG reductions.
- Transit benefits are most significant when combined with aggressive land use intensification in transit corridors and *mobility hubs*. Intensification and density above minimum Growth Plan targets allows for further leverage of the transit investment and greater shifts from driving to transit.
- Large *mobility hubs* (e.g. employment greater than 60,000 jobs) provide critical anchors to support any new *Regional Express/Metro* facility being considered. The extent to which the development potential at *mobility hubs* may be achieved will affect the timing and viability of major new cross-regional rail facilities. In terms of transit ridership and efficiency, concentrating development in a relatively small number of anchor hubs, particularly those with high employment targets, is more effective than distributing similar levels of development growth over a more dispersed urban area.
- Preliminary findings indicate that a *Regional Express* system is viable, at least in part. It could have a major transformative impact on the *GTHA* with greatly enhanced cross-regional mobility and associated transportation, quality-of-life, environmental, and economic benefits.
- *Metro* improvements should be considered in existing higher-density areas if the higher range of transit market shares is to be achieved, reflecting the capacity limitations of LRT/BRT and the higher transit penetration that may be achieved with *Metro*.
- Strong feeder bus and *paratransit* services are provided to support the *rapid transit* network under any future scenario with fleet sizes doubling to quadrupling in suburban areas and with major increases in the City of Toronto.

4.5 Further Testing and Analysis

The development and assessment of transportation system concepts is, at this stage of the study, a work in process. Additional model runs, analyses and comparative assessments will be carried out, leading to the preparation of the Draft RTP and draft Investment Strategy reports. More specifically, Metrolinx will continue our analysis to determine the optimal policies, programs and level of investment needed to achieve the goals and objectives outlined in White Paper 1.

In the meantime, the preliminary results presented in this White Paper are available for review and comment by stakeholders and the general public. Readers' opinions and comments are welcomed.

5. IMPLEMENTING THE PLAN

5.1 Introduction

The Regional Transportation Plan will set out a twenty-five year program to improve our quality of life, reduce our impact on the environment, and support a competitive, robust economy. As a result, implementing the RTP will involve much more than drawing lines on a map. While Metrolinx has, and will continue to have, the primary responsibility to coordinate transportation delivery in the *GTHA*, the two large cities, four regions and 24 local municipalities that comprise the *GTHA* each have responsibilities that are key to the success of the RTP. In addition, provincial ministries and transportation agencies retain their responsibilities to plan and provide elements of regional transportation infrastructure. There will also be an important role in plan implementation for individual citizens, non-governmental organizations, private businesses, health professionals, educators, and many other partners.

Metrolinx recognizes that the RTP's success will depend on a wide variety of initiatives including supportive land use, local transportation planning, capital investment, the implementation of *transportation demand management* initiatives, educational programs, and the delivery of infrastructure and service improvements.

Integration and coordination will be critical to ensure that all of these initiatives, undertaken by a multitude of partners, collectively support, and are consistent with, the implementation of the RTP.

5.2 Key Implementation Activities

As a new authority, Metrolinx will be working over the coming months to establish approaches to the coordination, integration, and in some cases leadership of the initiatives necessary to implement the RTP. There will be at least four main streams of activity in the implementation framework:

- land use coordination;
- operational and institutional collaboration;
- government involvement; and
- travel behaviour.

Land Use Coordination – The RTP includes an ambitious program for new transportation facilities which must be supported by a compatible pattern of development and land use. The Growth Plan provides the basic land use framework, and in implementing the Growth Plan, regional and municipal planning policies must ensure the most efficient distribution of people and jobs from a transportation perspective. Such municipal planning decisions must recognise the imperatives of the RTP — the mechanisms needed to ensure this will need to be detailed as the RTP moves forward. They may include a planning role for Metrolinx, status for the RTP in the planning process, an enhanced provincial interest in key

projects that could affect the viability of the transportation system, or leading by example through demonstration projects and best practice guidelines.

Operational and Institutional Collaboration – The RTP will provide important direction to the entities that deliver our daily transportation services. It will encourage the removal of operational and regulatory barriers to promote more efficient, cost-effective service, and allow operators and agencies to make more informed long-term investment decisions. Agencies will also be valuable partners in accelerating supportive land use projects such as transit station improvements or *mobility hub* development. Mechanisms will be needed to ensure that these decisions and undertakings are consistent with the directions in the RTP.

Government Involvement – Having set out a long-term plan for the future growth of the broader region under the Growth Plan, the province will play an important role in advancing many aspects of the RTP. Provincial ministries can provide access to legislative and fiscal tools that will assist in the implementation of the Plan. The RTP provides the Government of Ontario with a set of priorities to inform and guide its budgetary decisions. The federal government will also play a role in supporting the RTP through its regulatory authority related to airports, railways and marine systems, as well as ongoing investment in transportation infrastructure. Municipalities will play a significant role in land use planning, transportation planning, and financing. All governments will be called upon to show leadership in advancing best practices and delivering programs such as *transportation demand management* and *active transportation* measures. With over 30 governments and agencies having influence over transportation and land use in the region, decisions will need to be informed by, and be consistent with, the RTP.

Travel Behaviour – As the focus of the RTP, the travelling public will benefit the most from the Plan. All actions of the Plan will be geared towards improving the experience of the traveller through the delivery of more and better services, greater choices, as well as incentives, information and programs. The RTP will bring greater choice to all travellers. The success of the RTP will depend on how individual citizens respond to these new opportunities and change travel behaviours.

5.3 Investment Strategy

Metrolinx is developing, in tandem with the RTP, an Investment Strategy that is a sustainable financing plan for implementation, including a life-cycle approach to:

- expansion;
- optimization and renewal; and
- operations.

The Investment Strategy has as its principles:

- a shared responsibility by all three orders of government;
- access to a broad range of financing tools and revenue sources;
- dedicated funding pledged back to support life-cycle expansion, renewal, maintenance and operating needs;
- flexibility to fund integrated, multi-modal alternatives;
- the need to address the true costs of transportation, including external economic, environmental and social costs;
- private-sector participation, conditional on public control, public interest and transparency;
- the need to support GHG emissions reduction, renewable energy, stronger communities and improved public health;
- broad engagement of citizens and transportation customers in strategy development; and
- commitment to performance measurement, public reporting and accountability.

The Investment Strategy will identify criteria to evaluate the effectiveness of the proposed financing tools, and revenue sources to meet Metrolinx's objectives for an integrated, sustainable transportation system for the *GTHA*.

6. NEXT STEPS

The directions listed in Section 2, the test concepts described in Section 3, the performance/cost comparison of those test concepts described in Section 4, and the brief discussion of plan implementation issues in Section 5 are presented in this White Paper as a basis for discussion, review and comment by stakeholders and the public. This feedback will inform the development of the Draft RTP which will be released for further consultation in June 2008.

A final RTP will be released in Fall 2008.

You can send your comments on this paper to:

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You can also participate in our online consultations at www.metrolinx.com.

For copies of this paper, please visit our website or call Metrolinx at 416-874-5900.

Appendix A

Glossary of Terms

The glossary is intended to clarify the meaning of terms used in White Papers 1 and 2.

- **Active Transportation** – non-motorized travel, including walking, cycling, rollerblading and wheelchair movements: see Green Paper 3. The **Active Transportation Network** includes sidewalks, crosswalks, designated road lanes and off-road trails to accommodate *active transportation*.
- **Arterial Road** – high-volume urban road with at least four lanes having a typical speed limit of 50 to 60 km/h and typical spacing between traffic signals of 200 to 400 metres. Its typical volume is less than 20,000 vehicles/day and it connects to *collector roads*, other *arterial roads* and *expressways*.
- **Bus Rapid Transit (BRT)** – similar to *light rail transit* (see entry below) operating on protected rights-of-way, but using advanced bus technology and station/vehicle features to improve passenger comfort and convenience. Capacity of up to 10,000 people per hour, peak direction. Average speed: 15 to 30 km/h in mixed traffic; 30 to 40 km/h in separate right-of-way depending on station spacing. Example: Vancouver 98B Line (Richmond section).
- **Collector Road** – lower-volume road with a significant property access role, and typically two lanes with daily traffic between 2,500 to 8,000 vehicles. The speed limit is typically 40 to 50 km/h and the road typically connects to local, other collector and *arterial roads*.
- **Commuter Rail/GO Rail** – diesel-electric trains operating on existing rail lines, as in the current GO Transit rail network; approximate realistic capacity at 10 minute *headways* of 9,000 to 10,000 persons per hour peak direction (pphpd); higher capacities (up to 15,000 pphpd) could be achieved by using higher frequencies; service could be enhanced by electrification, enabling better train performance (acceleration) and therefore higher average speeds even with relatively close station spacing. Average speed: 60 km/h with 2 km station spacing; 80 km/h with wider station spacing or electrified trains. Example: GO Transit rail system.
- **Controlled-Access Highway** – high-speed, high-capacity highway with at least four lanes and grade-separated with access to the facility limited to ramps and interchanges. May include signalized intersections. Typical speed limit of 60 to 90 km/h with daily traffic greater than 20,000 vehicles;
- **Density** – the ratio of residents or jobs per unit of land area.

- **Expressway** – similar to a *controlled access highway*, but typically serving commuter traffic within a single city or municipality; may allow access from adjacent properties; may also include signalized intersections. The speed limit is typically 60 to 90 km/h with daily traffic greater than 20,000 vehicles.
- **Greater Toronto and Hamilton Area (GTHA)** – the metropolitan region encompassing the City of Toronto, the four surrounding Regional Municipalities (Durham, Halton, Peel and York) and the City of Hamilton.
- **Headway** – scheduled time between successive transit vehicles on a given route.
- **High Occupancy Vehicle (HOV) Lane** – a roadway lane designated for use only by vehicles with a specified minimum number of occupants, usually two or three; see Green Paper 6.
- **Higher-Order Transit** – includes all forms of *rapid transit* (see definition below). The term **High-Order Transit** is often used interchangeably.
- **Intelligent Transportation System (ITS)** – use of real-time computer/communications/information technology for advanced, traffic-responsive, area-wide traffic control and to provide information which allows transportation providers to optimize transportation system operations and enables travellers to use the system more efficiently and effectively, while also increasing their convenience and ease of travelling.
- **LEED (Leadership in Energy and Environmental Design)** – a Green Building Rating System, since expanded to rate neighbourhood development. Buildings can qualify for four levels of certification related to environmentally sustainable construction. Certification is granted by the Green Building Council based on an application documenting compliance with the rating system requirements, as well as paying registration and certification fees.
- **Light Rail Transit (LRT)** – streetcar trains (up to three or four cars per train) operating on protected rights-of-way adjacent to or in the medians of roadways or rail rights-of-way with at-grade intersections, possibly with some sections operating in mixed-traffic and/or in tunnels. Electric power is normally via an overhead trolley or pantograph. Capacity of up to 15,000 passengers per hour per direction, with even higher capacities on completely segregated rights-of-way. Average speed: 15 to 30 km/h in mixed traffic; 30 to 40 km/h on separate right-of-way depending on station spacing. Example: Calgary LRT system.
- **Local Road** – a low volume road (less than 2,500 vehicles/day) with primary function to access property. The speed limit is typically 40 to 50 km/h and the road typically connects to other *local roads* and *collector roads*.

- **Major Transit Station Areas** – the area including and around any existing or planned *higher-order transit* station within a *settlement area*, or the area including and around a major bus depot in a urban core. Station areas generally are defined as the area within an approximate 500 m radius of a transit station, representing about a 10-minute walk. [Source: Ministry of Public Infrastructure Renewal, *Growth Plan for the Greater Golden Horseshoe*, 2006.]
- **Major Trip Generator** – a facility or area which generates significant volumes of passenger and/or goods/services trips to/from residential, commercial and/or industrial land uses.
- **Metro** – electrified trains operating below or at-grade with separated rights-of-way; capacity in the range of 35,000 to 40,000 passengers per hour per direction. Average speed: 25 km/h with 0.5 to 1 km station spacing; 40 km/h with 2 km station spacing. Example: Toronto subway system.
- **Mobility Hub** – a place of connectivity where different modes of transportation, from walking to high-speed rail, come together seamlessly and where there is an attractive, intensive concentration of employment, living, shopping and enjoyment around a major transit station: see Green Paper 2.
- **Modal-Split** – the proportion of total person trips using each of the various different modes of transportation. The proportion using any one mode is its **Modal Share**.
- **Naked Streets** – streets in which traffic direction signs/controls have been modified or eliminated to force vehicular traffic to move cautiously and more slowly on local streets.
- **Paratransit** – small vehicles including buses, jitneys, vans and taxis, operating on fixed routes with deviation or independent of routes (e.g. group taxi service), and typically without fixed schedules. Passengers are usually picked up and dropped off by request.
- **Queue-jump Lanes** – short roadway lanes provided on the approaches to signalized intersections which allow buses or cyclists to by-pass queued traffic and enter the intersection before other traffic when the light turns green.
- **Rapid Transit** – transit service separated partially or completely from general vehicular traffic and therefore able to maintain higher levels of speed, reliability and vehicle productivity than can be achieved by transit vehicles operating in mixed traffic.
- **Regional Express** – high-speed electric trains, similar to *Metro*, but with wider station spacing to effectively serve longer-distance regional trips. *Regional Express* could have a capacity of approximately 60,000 passengers per hour in

the peak direction (pphpd) with trains operating in completely separated rights-of-way. Average speed: 80 km/h with 4 to 6 km station spacing. Example: Paris Réseau Express Regional (RER).

- **Settlement Areas** – urban and rural settlement areas within municipalities (such as cities, towns, villages and hamlets) where: a) development is concentrated and which have a mix of land uses; and b) lands have been designated in an official plan for development over the long term planning horizon provided for in the Provincial Policy Statement, 2005. Where there are no lands that have been designated over the long-term, the settlement area may be no larger than the area where development is concentrated. [Source: Ministry of Public Infrastructure Renewal, *Growth Plan for the Greater Golden Horseshoe*, 2006.]
- **Short sea shipping** – port-to-port goods movement on the Great Lakes. In the RTP context, these would likely be mainly among ports serving the *GTHA* or between these ports and transfer points to/from ocean-going vessels downstream from the St. Lawrence Seaway: see Green Paper 5.
- **Streetcars** – urban rail vehicles circulating at low speeds (e.g. 10 to 25 km/h) in mixed traffic, with closely spaced stops (e.g. 200 metres). Examples exist in Toronto and Portland, Oregon.
- **Surface Transit** – buses, trolley buses or *streetcars* operating typically in mixed traffic using standard and articulated diesel buses or electric propulsion. Capacity of up to 2,000 passengers per hour per direction. Average speed of 10 to 25 km/h.
- **Tollway** – similar to a *controlled-access highway* or *expressway* but with a toll cost to use the facility.
- **Transit Catchment Area** - the area around each transit station that contains most origins (e.g. home) and destinations (e.g. work) for transit users. The catchment area varies by the type of transit being accessed, the means by which it is being accessed, and by the surrounding urban fabric. For example, a downtown subway station will have a different-sized catchment area for a pedestrian than would a suburban GO train station.
- **Transit Service Standards** – standards specifying performance levels such as scheduled travel speeds, *service headways*, route spacing/coverage, station spacing, and vehicle loading.
- **Transitway** – buses operating on exclusive two-lane busways. Capacity of 10,000 passengers per hour per direction. Average speed: 40-80 km/h depending on stop spacing. Example: Ottawa *Transitway* system, average speed of 40 to 60 km/h.

- **Transportation Demand Management (TDM)** – a program of incentives (carrots and sticks) which influence whether, when, where and how people travel, and encourage them to make more efficient use of the transportation system: see Green Paper 4.
- **Transportation Hierarchy** – the priority order in which transportation directions and modes will be considered and given precedence in planning, designing, funding and operating a transportation system.
- **Urban Growth Centres (UGCs)** – centres designated under the provincial *Growth Plan for the Greater Golden Horseshoe, 2006*. The Growth Plan designates 25 UGCs in the Greater Golden Horseshoe, of which 17 are in the *GTHA*.

Appendix B

MoveOntario 2020 Projects

The MoveOntario 2020 Transit Plan was a key input to the development of the transportation system concepts modeled for this report. The projects included in MoveOntario 2020 are listed below:

GO Transit Commuter Rail

1. GO Lakeshore West rail line capacity expansion by adding a third track from Port Credit to Oakville
2. GO Lakeshore West rail line capacity expansion by adding a third track from Burlington to Hamilton
3. GO Lakeshore East rail line capacity expansion by adding a third track from Union Station to Scarborough
4. GO Lakeshore East rail line extension from Oshawa to Bowmanville
5. GO Lakeshore rail line electrification (SuperGO)
6. GO Milton rail line capacity expansion from Union Station to Milton
7. GO Georgetown rail line capacity expansion from Union Station to Georgetown
8. GO Bradford rail line capacity expansion from Union Station to Bradford
9. GO Bradford rail line extension and capacity expansion from Bradford to Barrie
10. GO Richmond Hill rail line capacity expansion from Union Station to Richmond Hill
11. GO Richmond Hill rail line extension to Aurora Road
12. GO Stouffville rail line capacity expansion from Union Station to Stouffville and extension of the line to Uxbridge
13. New GO Crosstown rail line between Weston Road and the Don Valley Parkway
14. New GO Crosstown rail line between the Don Valley Parkway and Agincourt
15. New GO rail line from Union Station to Bolton
16. New GO rail line on the Havelock line from Agincourt to Pickering
17. New GO rail line on the Seaton line from Agincourt to Brock Road in Pickering

GO Bus Rapid Transit (BRT)

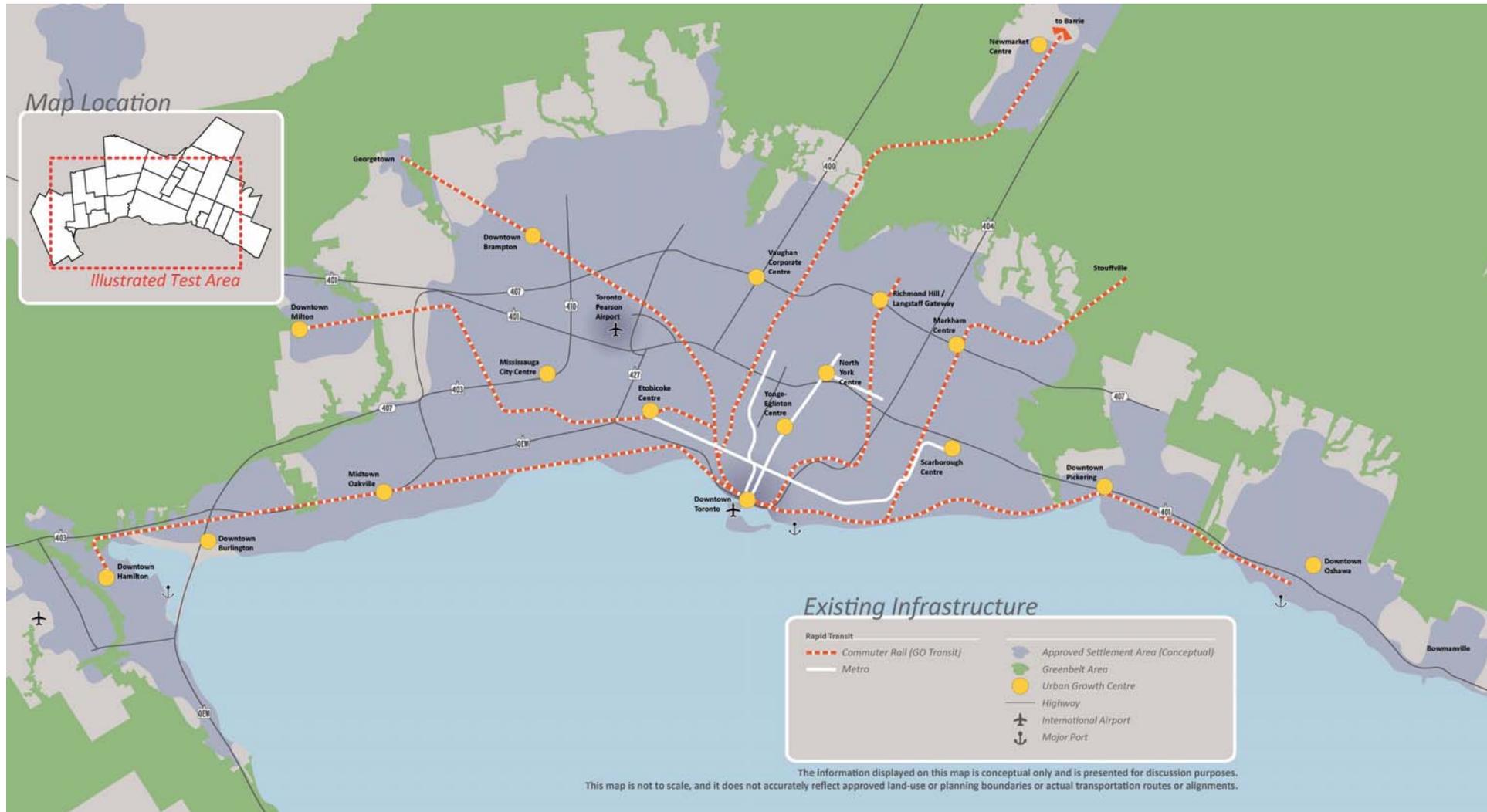
18. GO Bus Rapid Transit along Highway 403 from Oakville GO rail station to Mississauga
19. Mississauga Transitway west of Mississauga City Centre to Winston Churchill Boulevard
20. Mississauga Transitway east of Mississauga City Centre to Renforth Drive

21. GO Bus Rapid Transit northwest Toronto link from Renforth Drive to York University
22. GO Bus Rapid Transit on Markham Road from Highway 407 in Markham to Highway 401
23. GO Bus Rapid Transit on Highway 401 from Markham Road in Scarborough to Pickering GO rail station
24. GO Bus Rapid Transit connector on Highway 427 from Renforth Drive to Highway 407
25. GO Bus Rapid Transit along Highway 407 from York University to Langstaff (Yonge Street) and on to Markham Road
26. GO Bus Rapid Transit along Highway 407 from Burlington to Highway 401
27. GO Bus Rapid Transit along Highway 407 from Highway 401 to Highway 427
28. GO Bus Rapid Transit along Highway 407 from Highway 427 to York University

Subway and Other Rapid Transit

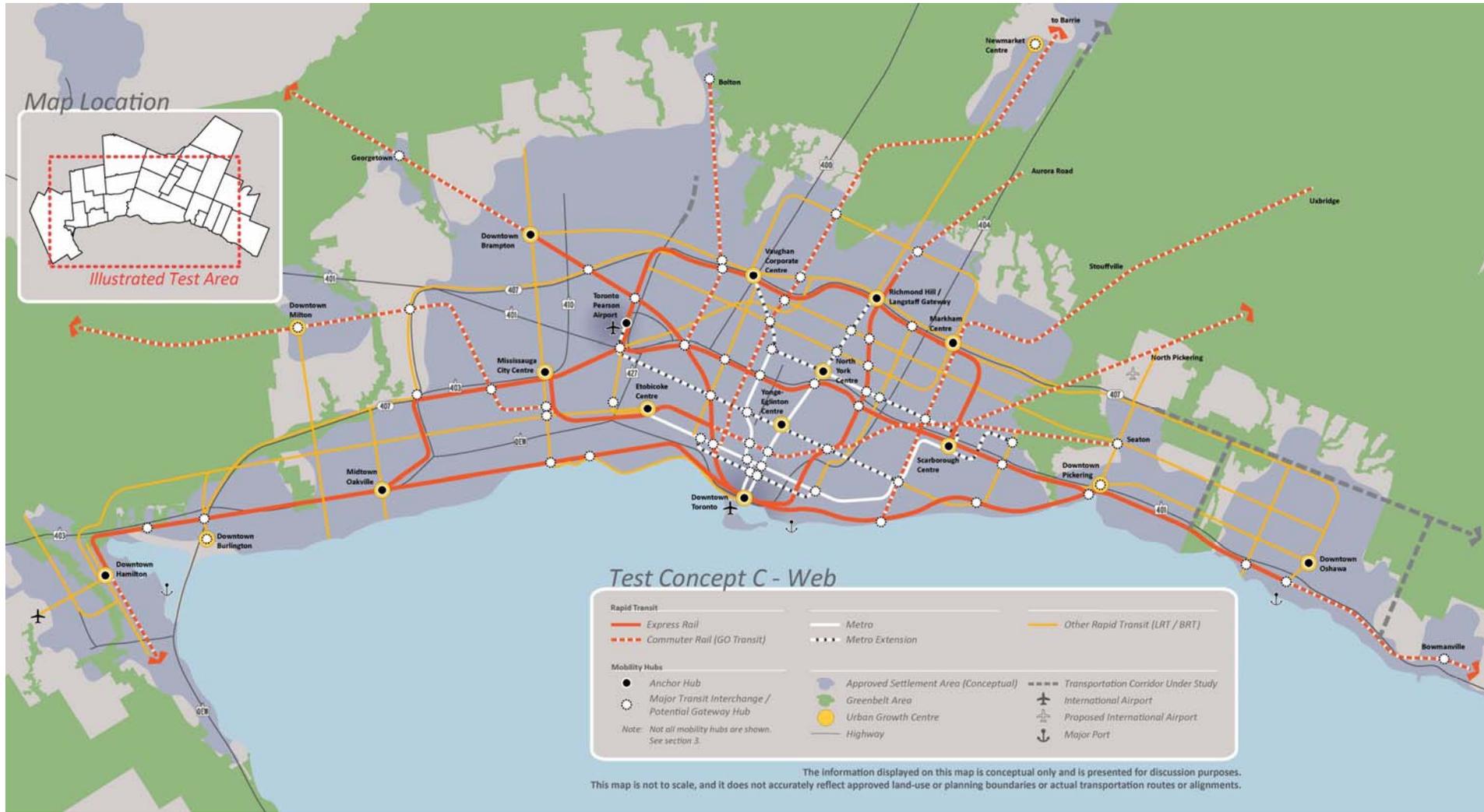
29. Yonge subway line extension north from Finch station to Highway 7 (Langstaff)
30. VIVA Markham North-South Link from Markham Centre to Don Mills station
31. Pearson Air-Rail link to Union Station
32. Hamilton east-west rapid transit on King/Main Streets from Eastgate Mall to McMaster University
33. Hamilton north-south rapid transit on James/Upper James Streets from Rymal Road to King Street
34. Brampton Acceleride on Queen Street from Main Street to Highway 50
35. Hurontario Light Rail Transit from Queen Street in Brampton to Lakeshore Road in Mississauga
36. Eglinton Avenue Light Rail Transit from Renforth Drive to Kennedy Road in Scarborough
37. Yonge Bus Rapid Transit busway from Finch station to Steeles Avenue
38. Dundas Street West Light Rail Transit from Kipling station to Hurontario Street
39. Scarborough RT extension from McCowan station to Sheppard Avenue
40. Sheppard Avenue Light Rail Transit from Don Mills Road to Morningside Avenue
41. Finch Avenue West Light Rail Transit from Highway 27 to Yonge Street
42. Don Mills Road Light Rail Transit from Steeles Avenue to the Bloor-Danforth subway
43. Jane Street Light Rail Transit from Steeles Avenue to Jane station on the Bloor-Danforth subway
44. Malvern Light Rail Transit from Kennedy station to Malvern
45. Waterfront West Light Rail Transit from Union Station to Long Branch
46. VIVA Yonge Street from Steeles Avenue to Highway 7 (Langstaff)
47. VIVA Yonge Street from Highway 7 (Langstaff) to 19th Avenue in Richmond Hill
48. VIVA Yonge Street from 19th Avenue to Newmarket
49. VIVA Highway 7 from Highway 50 to Yonge Street (Langstaff)
50. VIVA Highway 7 from Yonge Street (Langstaff) to Cornell
51. Durham rapid transit line on Highway 2 from Oshawa to Pickering
52. Spadina subway line extension north from Downsview station to Highway 7 (Vaughan Corporate Centre)

Appendix C: Maps of Existing Infrastructure and the Test Concepts









Appendix D: Concept Test Results

Performance estimates for the morning peak period (6a.m. to 9 a.m.) of a typical workday in 2031 are forecast in the following three tables, showing comparisons among the business-as-usual reference concept and each of Test Concepts A, B and C. The indicators used in the tables relate to the goals described in White Paper 1, as follows:

Table D-1: A Great Quality of Life for People

Table D-2: A Thriving, Healthy and Protected Environment

Table D-3: A Strong Prosperous and Competitive Economy

Representative objectives and indicators are shown in each table.

Table D-1: A Great Quality of Life for People

Objectives	Indicators	Test Concept Performance in 2031				
		2006	BAU	Test Concept A	Test Concept B	Test Concept C
Increased accessibility and transportation options to access a range of destinations including workplaces; improved capacity, coverage and competitiveness of transit						
Transit trips by destination region in the AM Peak Period						
	Toronto:	398,000	591,100	701,000	769,400	813,000
	Durham:	8,600	21,800	31,500	38,400	44,600
	York:	14,600	50,900	71,000	87,200	103,400
	Peel:	25,600	58,300	81,000	103,000	124,600
	Halton:	4,300	15,200	22,400	34,100	45,900
	Hamilton:	15,000	22,600	31,000	38,300	47,400
	Total:	466,700	699,900	937,900	1,057,900	1,178,900
Transit modal-split						
	Transit:	16.6%	17.2%	23.1%	26.1%	29.0%
Percent of commuters who can get to work within 45 minutes via transit, auto						
	Transit:	38%	39-43%	44-48%	50-54%	52-56%
	Auto:	60%	58-62%	58-62%	59-63%	59-63%
Percent of population within 500m, 1 km, 2 km and 5km of rapid transit and higher-order transit (RT, LRT/BRT/GO Rail)						
	0.5 km:	11%	13%	25%	30%	32%
	1 km:	25%	28%	47%	57%	59%
	2 km:	52%	51%	70%	81%	82%
	5 km:	89%	81%	89%	93%	94%
Increased transit service capacity (millions of seat-km)						
	<i>Regional express:</i>	n/a	n/a	10.7	19.2	23.9
	GO Rail:	3.2	6.2	10.4	12.8	20.5
	Subway:	3.0	3.7	5.7	10.9	11.2
	LRT/BRT:	0.22	0.25	1.5	3.0	3.1
	Surface Transit:	4.4	4.4	5.6	6.6	6.6
Decreased dependence on travel by auto						
Vehicle kilometres of travel (millions of VKT for a.m. peak hours)		14.7	18.1	17.9	17.3	16.6
Peak Hour Vehicle kilometres of travel per capita (km/person)		2.45	2.10	2.08	2.01	1.93
Am Peak period auto trips		2,068,000	2,912,000	2,736,000	2,594,000	2,456,000
Average home-based work trip length (km)		15.2	15.2	15.0	16.3	17.0
Improved walking and cycling amenities						
<i>Active transportation (AT) modal-split</i>		9%	9%	9.5%	10%	10.5%

Table D-2: A Thriving, Healthy and Protected Environment

Objectives	Indicators	Test Concept Performance in 2031				
		2006	BAU	Test Concept A	Test Concept B	Test Concept C
Decreased use of non-renewable resources and increased recycling rate of construction materials and vehicles						
Total annual fuel and electricity consumption						
	Auto (billion Litres):	4.54	5.60	5.54	5.35	5.14
	Auto (million Gigajoules):	158 M	195	193	186	179
	Transit (million Gigajoules):	5.25	5.45	6.25	6.41	8.26
Reduced and stabilized GHG emissions						
Auto GHG emission levels						
	Total (million tonnes/year):	14.1	14.8 – 18.3	14.5 – 18.0	14.1 – 17.4	13.5 – 16.7
	Tonnes Per Capita per Year:	2.35	1.72 – 2.12	1.69 – 2.09	1.64 – 2.03	1.57 – 1.94
	Auto GHG emissions levels (kg GHG per person-km)	0.23	0.19 – 0.24	0.19 – 0.23	0.18 – 0.22	0.17 – 0.22
Reduced emissions of other common air pollutants						
Total auto common air pollutant total emissions (million kg/year)						
	CO:	268	330	326	315	302
	NOx:	5.7	7.1	7.0	6.8	6.5
	SOx:	0.17	0.20	0.20	0.20	0.19
	VOCs:	9.0	11.0	10.9	10.5	10.1
	PM10:	0.74	0.91	0.90	0.87	0.84
	PM2.5:	0.33	0.40	0.40	0.39	0.37
Auto common air pollutant total emissions (grams / person-km)						
	CO:	4.41	4.31	4.21	4.06	3.91
	NOx:	0.09	0.09	0.09	0.09	0.08
	SOx:	0.003	0.003	0.003	0.003	0.002
	VOCs:	0.15	0.14	0.14	0.14	0.13
	PM10:	0.012	0.012	0.012	0.011	0.011
	PM2.5:	0.005	0.005	0.005	0.005	0.005

Table D-3: A Strong Prosperous and Competitive Economy

		Test Concept Performance in 2031				
Objectives	Indicators	2006	BAU	Test Concept A	Test Concept B	Test Concept C
Lower average trip time for people and goods						
Average vehicle speed, auto and Rapid Transit(km/h)						
	Auto:	48	38	43	45	48
	Rapid Transit:	29	28	29	30	31
Travel Times for Selected Major OD Pairs (min)						
	Richmond Hill-Downtown Toronto:	Auto: 49 Transit: 73	Auto: 53 Transit: 66	Auto: 50 Transit: 56	Auto: 48 Transit: 36	Auto: 44 Transit: 36
	Square One-Vaughn Corporate Centre:	Auto: 44 Transit: 82	Auto: 45 Transit: 81	Auto: 42 Transit: 74	Auto: 43 Transit: 68	Auto: 40 Transit: 44
	Pickering-Markham:	Auto: 37 Transit: 89	Auto: 48 Transit: 89	Auto: 44 Transit: 71	Auto: 43 Transit: 58	Auto: 42 Transit: 45
	Scarborough-Etobicoke:	Auto: 55 Transit: 75	Auto: 59 Transit: 75	Auto: 58 Transit: 69	Auto: 57 Transit: 64	Auto: 54 Transit: 64
	Airport-Downtown Toronto:	Auto: 43 Transit: 79	Auto: 47 Transit: 77	Auto: 45 Transit: 58	Auto: 45 Transit: 40	Auto: 44 Transit: 39
Reduced congestion growth						
Total hours of delay (autos)		42,700	84,500	62,000	54,000	50,000
Congestion costs (billions of dollars per year)		2.2	4.2	3.1	2.7	2.5
Transparent and fairly allocated passenger transportation costs, across modes						
Average user transportation costs per year (2006 dollars)						
	Transit Rider:	1,410	1,460	1,450	1,500	1,490
	Auto Driver:	9,300	10,800	18,200	18,700	18,800
	Average User	7,900	9,000	13,900	13,700	13,200
Total transportation capital costs for 2006 – 2031 expansion vs. Transit Riders roads, transit (billions of 2006 Dollars)						
	Transit Capital Costs:	-	5	40	60	75
	Road Capital Costs:	-	20	20	15	15
	Total:					
Total transportation operating costs (billions of 2006 dollars per year)		1.6	2.1	2.6	3.3	3.8

Appendix E

Table of Acronyms

AODA	Accessibility for Ontarians with Disabilities Act
BAU	Business-as-Usual
BRT	Bus Rapid Transit
CO	Carbon Monoxide
GDP	Gross Domestic Product
GGH	Greater Golden Horseshoe
GHG	Greenhouse Gases
GTA	Greater Toronto Area
<i>GTHA</i>	Greater Toronto and Hamilton Area
HOV	High- Occupancy Vehicle
LEED	Leadership in Energy and Environmental Design
LRT	Light Rail Transit
MTO	(Ontario) Ministry of Transportation
NOx	Nitrogen Oxide
PM10	Particulate Matter (Fine)
PM2.5	Particulate Matter (Ultra- fine)
RTP	Regional Transportation Plan
SOx	Sulphur Oxide
SRT	Scarborough Rapid Transit
TDM	Transportation Demand Management
TMP	Transportation Master Plan
UGC	Urban Growth Centre
VKT	Vehicle- kilometres Travelled
VOC	Volatile Organic Compounds