THE BIG MOVE

Modelling

December 2008

1. Introduction

This is one in a series of backgrounders that have been produced by Metrolinx to provide further explanation and clarification on the Regional Transportation Plan (RTP) for the Greater Toronto and Hamilton Area (GTHA). The RTP is available for downloading at www.metrolinx.com.

This backgrounder describes the modelling methodology that was used by Metrolinx as one of the inputs in developing the RTP regional rapid transit network. Section 2 of this backgrounder describes the regional transportation demand forecasting model that was used, including the way it simulates transportation behaviour, limitations of the model, and input assumptions used when the model was applied to compare alternative transit networks. Section 3 briefly describes the network test concepts that were developed for the Metrolinx RTP White Papers that were published and released for public comment in May 2008. Section 4 describes the process that was used to develop and assess the regional rapid transit network in the RTP, along with model results that forecast the expected performance of this network.

Metrolinx wishes to acknowledge the invaluable contribution of IBI Group to the preparation of this backgrounder.

2. How the Model Works

Modelling is a tool that helps planners estimate how travellers would likely use a potential future transportation network and how well the network would perform given the estimated demand levels. As applies to any forecasting method, the model used in developing the RTP is limited in terms of its accuracy and the aspects of travel behaviour which it can simulate. If used with judgment and recognizing its limitations, it complements other key inputs to the transportation planning process, including analysis of past trends and current conditions, demographic and land use projections, local and regional plans and visions, public and stakeholder feedback, and cost /benefit comparisons.

2.1 Simulating Transportation Demand and System Performance

The model used in developing the RTP was initially developed for the Ministry of Transportation for transportation planning in the Greater Golden Horseshoe (GGH) region and is referred to as the GGH Model. MTO provided the model as a prototype to Metrolinx to assist with the development of the RTP. Metrolinx has adapted some of the parameters of the model, as described in this paper, for the purpose of developing the RTP. MTO continues to refine the model and the inputs so that it can also be used for other planning studies in the Greater Golden Horseshoe.

The GGH Model is a computer simulation of transportation demand and supply interactions which represents the transportation network by links and nodes, all with specified capacities, speeds, costs and access times. Land use throughout the GTHA is represented by more than 3,000 traffic zones with current and projected population, jobs, population and employment densities, land use, socio-economic factors, and demographics specified for each. The model estimates users' travel decisions including trip purposes, start and end times, origins and destinations, travel routes and travel modes, which leads to estimated volumes of travellers and vehicles on each link by mode (e.g. walking, cycling, transit, automobile). For the RTP, the model was used to simulate the morning three hour peak period (6:00 a.m. – 9:00 am) of a typical workday in 2020 and 2031. These are the hours of maximum demand in the transportation system, when work and school trips are most concentrated. Some model results, such as transit ridership levels and greenhouse gas (GHG) emissions, were also extended to daily and/or annual levels based on observed and projected "peaking factors" relating peak period travel volumes to daily and annual volumes.

The model simulates the behaviour of travellers taking into account the different costs (e.g. transit fares, auto operating costs, road tolls, parking charges,) and travel times (e.g. walking, waiting, in-vehicle) via the available modes (e.g. auto, transit, walking, cycling) 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 propensities to make trips or use a given mode. The computer model covers the entire GTHA as well as surrounding areas that comprise the Greater Golden Horseshoe.

2.2 Limitations of the Model

As with any model that simulates reality, the GGH Model has limitations which should be borne in mind in interpreting its results. Specifically, the model has been calibrated based on a range of actual behavioural responses and current preferences as travellers choose among the travel modes and routes available to them in the existing system. It contains equations that represent observed behavioural responses to those choices as represented by alternative travel times, costs, and convenience ranges provided by the system and measured by travel surveys. In the GTHA, the Transportation Tomorrow Survey[1] (TTS) has been carried out at five-year intervals from 1986 through 2006, providing a rich source of travel behaviour data with which to calibrate and test the model.

[1] Carried out by the Data Management Group (DMG) at the University of Toronto with funding from the following GTHA agencies: Cities of Hamilton and Toronto, the Regional Municipalities of Durham, Halton, Peel and York, the Toronto Transit Commission, GO Transit and the Ontario Ministry of Transportation.

Model limitations include the following:

- **The model used for this study was calibrated based on 2001 TTS data** since the 2006 TTS and Census data were not yet fully available. If a future transportation network to be tested presents a significantly broader range of times, costs and/or convenience levels than those that existed at the time when the model was calibrated, as is the case with the RTP network, the reliability of model results becomes more uncertain. Experience over the past 40 years suggests that the model may tend to under-estimate demand levels on new or greatly improved transportation facilities under such circumstances.

- **The model is less sensitive to differences among alternatives that are not readily quantifiable** such as amenities for pedestrians, maintenance levels of transit stations and vehicles, on-time performance, and the possible diversity of fare products. As a result, the model will tend to have a built-in bias reflecting existing amenity and reliability levels in various parts of the region. In some cases, such qualitative variables can be reflected by categorizing traffic zones, for example, in terms of their level of amenity and convenience for pedestrian travel. This feature is included in the GGH Model in that a neighbourhood or area typology category is defined for each traffic zone and may be changed to represent future conditions; for example, as a zone's levels of population/job densities and mixed uses increase in future, its pedestrian amenity category will change for the better and model results will show higher walking percentages for relevant trips.

- **The model is 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. More detailed travel market information, such as the method of fare payment (e.g. pass, multi-ride, single) or parking costs, are not available from the TTS for each individuals' trip and thus averages by area or type of trip are made to depict these costs and other such factors. The TTS data is also subject to sampling bias and measurement errors as is true of any survey. For example, the TTS may under-report non home-based travel and trips by younger people. 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 and simulated changes in behaviour may tend to be under-estimated in such cases.

The model's usefulness as a planning tool would be enhanced if it were calibrated and applied for other time periods as well as the a.m. peak period, such as the p.m. peak period, the mid-day period and/or the evening/night period of a typical weekday, and similar periods for a typical weekend day. More detailed simulations such as these would pick up differences in the time-of-day variations of transportation service levels and resulting travel behaviour in various parts of the GTHA which would, in turn, provide more accurate estimates of off-peak, daily, and annual demand levels and emissions as well as peak period levels.

2.3 Model Input Assumptions

Population, Employment and Land Use

The 2031 projections are consistent with the population and employment forecasts of the *Growth Plan for the Greater Golden Horseshoe* for municipalities at the single- and upper-tier level. Demographic analysis was undertaken to derive population by age, occupation status, dwelling type, household structure (number of adults and children per household) and employment by type (i.e. professional/technical, general office, retail/services and manufacturing/construction). Allocation of the population and employment forecasts to the traffic zone level for the purpose of the model was based on an analysis of local planning documents as they existed at the time of the model's development, and the achievement of the *Growth Plan's* minimum requirements for intensification and density:

- Urban Growth Centres (UGCs) – the model assumes that the 17 urban growth centres in the GTHA will achieve, by 2031, the Growth Plan's minimum density requirement of 400 residents and jobs combined per (gross) hectare for the centres located in Toronto and 200 residents and jobs combined per (gross) hectare in other GTHA centres. Urban growth centre boundaries were based on the Spring 2008 Technical Paper produced by the Ontario Growth Secretariat, Ministry of Energy and Infrastructure entitled "Proposed Size and Location of Urban Growth Centres in the Greater Golden Horseshoe".
- Intensification Areas – the model assumes that at least 40% of the population growth for single- or upper-tier municipalities occurs in existing built-up areas, which is the minimum requirement of the *Growth Plan*. For the model, 40% of the municipality's growth was allocated to traffic zones within the built-up areas, with the exception of Toronto, where 100% intensification was assumed.
- Designated Greenfield Areas – for the purpose of the model, 60% of the growth projected for each municipality was allocated to traffic zones within designated greenfield areas.

For the purpose of modelling, an assumption was made about the population and employment within the transit catchment areas of Anchor Hubs identified in the RTP. These are shown in Table 1. These are estimates only, and they relate to transit catchment areas that have not been precisely delineated.

Table 1: Population and Employment Modelling Input Assumptions for Anchor Hub Transit Catchment Areas

Transit Catchment Area	Population and Employment Assumption*
Downtown Brampton	●●
Downtown Burlington	●●●
Downtown Hamilton	●●●
Downtown Milton	●●
Downtown Oshawa	●●
Downtown Pickering	●
Etobicoke Centre	●●
Markham Centre	●●●
Midtown Oakville	●●
Mississauga City Centre	●●●
Newmarket Centre	●
North York Centre	●●●●
Pearson Airport (LBPIA)	●●●
Richmond Hill-Langstaff Gateway	●●●
Scarborough Centre	●●●
Union Station	●●●●
Vaughan Corporate Centre	●●
Yonge-Eglinton Centre	●●●

> 25,000	●
25,000 – 50,000	●●
50,000 – 100,000	●●●
100,000 +	●●●●

** These are estimates only, and relate to transit catchment areas that are larger than the 800 metre radius analysed in the Mobility Hubs bckgrounder.*

Local bus, streetcar and paratransit networks

Local bus, streetcar and paratransit networks were broadly assumed to be expanded into new urbanized areas (e.g. designated greenfield areas) and improved service levels (frequencies) were assumed for existing urbanized areas and to/from higher order transit stations, consistent with population growth, projected transit mode share increases, and typical bus loading standards.

Transit Fares

Transit fares for the model were kept at the same current level, in real terms, with fare integration between local transit operators assumed, such that double fares for short cross-boundary trips would be eliminated. As discussed earlier in this backgrounder, model limitations preclude the ability to predict the beneficial impact on ridership of more widespread use of transit passes in the future. Discretionary use of transit would be expected to increase as the number of pass-holders increases, particularly in non-peak periods. As a result, the model may under-estimate future ridership.

Vehicle Fuel Efficiencies, Emission Rates and Fleet Replacement Rates

Vehicle fuel efficiencies, emission rates and fleet replacement rates were assumed to improve at rates projected by Transport Canada's Urban Transportation Emissions Calculator (UTEC). See Metrolinx's backgrounder "Climate Change and Energy Conservation, December 2008" for more detail.

Transit Headways and Speeds

Average operating speeds for the regional rapid transit network were assumed as shown in Appendix C. Transit headways were assumed as shown in Table 2 below.

Table 2: Assumed Headways of Various Modes

Mode	Peak Hour Headway (min)
Express Rail	5
Regional Rail	10 - 20
Subway	2
Other Rapid Transit (LRT, BRT, AGT)	2 – 3

2.4 Model Output Adjustments

As noted in the previous two sections, the model in its presently calibrated form is likely to underestimate transit ridership. This is because the future network envisioned in the RTP will include very substantial improvements well beyond the range of existing service levels, as well as supporting policies and programs and facility amenities, such that the calibrated range of equations in the model may not fully reflect how travellers will respond to these unprecedented improvements. To compensate for this, a number of post-run adjustments were made to the model results for the RTP, as shown in Table 3. Specifically, the following types of adjustments were made:

- Average auto occupancy was increased to reflect results of preferential treatment for high occupancy vehicles in carpool lots, parking lots and on HOV lanes, as well as employer education and incentive programs, as recommended in the RTP. The increased auto occupancy, in turn, reduces the volume of autos required to move a given number of people, with resulting reductions in rates of increase in congestion levels and in auto emissions.

- The percentage of people anticipated to work at home was increased, reflecting information programs and corporate policies to encourage home-based work. This, in turn, reduces the number of peak period work trips, with positive impacts on congestion, emissions, etc. as above.

- The transit mode split was increased to reflect the introduction of various measures in the RTP such as integrated fare systems, employer-provided transit passes and better integration with other modes, which cannot be captured explicitly by the model as currently calibrated. This, in turn, reduces auto volumes and increases the ridership and viability of transit services.

- The active transportation mode split was increased for trips of 10 kilometres or less in length, to reflect the enhanced pedestrian environment and more extensive networks of bicycle lanes and bicycle/pedestrian paths which are part of the RTP. This, in turn, reduces auto and other motorized trips, with positive impacts as noted above.

Table 3: Post-run Model Adjustments

RTP Action/Policy	Model Measure	Today	2031 (Pre-Adjustment)	Post-run Model Adjustment
Ridesharing (e.g. carpool lots, HOV lanes, etc.)	Auto occupancy	1.15	1.27	Add 0.05 to 2031 auto occupancy
Work at Home	Percent work at Home	5.3%	5.3%	Add 2.7% pts.
Mode Shift to Transit (e.g. fare integration, employer-provided transit passes, better integration with other modes)	Transit mode split	*18%*	24.2%	Add 2.0% pts to 2031 modelled mode split
Walk/cycle (e.g. bike paths, enhanced pedestrian environment)	Active transportation mode split for trips < 10 km	13% for trips < 10 km	13.5% for trips < 10 km	Add 5% pts to AT mode split for trips < 10 km

3. Modelling and Comparing Initial Network Test Concepts

Prior to developing the RTP, Metrolinx published two White Papers in May 2008. White Paper 2: Preliminary Directions and Concepts included a description of several network test concepts. Each concept took an alternative approach to addressing the present and future transportation needs of the GTHA (looking forward 25 years). Additional variations with respect to road capacity were further tested, and the results of this analysis are presented in Appendix E of White Paper 2. The various concepts were not intended to be mutually exclusive and it was anticipated that elements from each could form part of the recommended regional rapid transit network in the final RTP.

Primary characteristics of the White Paper test concepts were as follows (full descriptions and maps of these concepts are available in White Paper 2):

- **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 connectivity.

The test concepts were modelled to determine their relative performance. Appendix D of White Paper 2 provides detailed results, as well as comparisons with a business-as-usual scenario. Preliminary findings from the test concept model runs include the following:

- 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, making up for a lost generation of transit investment and dramatically improving the quality and quantity of the service 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 proposed for the RTP can be achieved in the GTHA only through bold transit investment, a new approach to jointly planning and delivering 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. Criteria air contaminant (CAC) emissions, which contribute to smog, are not estimated to go down from 2006 levels, even in the boldest test concept. Further directions are required to achieve these goals.

- Transit benefits are most significant when combined with aggressive land use intensification in transit corridors and mobility hubs. Intensification at hubs above and beyond minimum Growth Plan density targets allows for further leverage of the transit investment and greater shift from driving to transit.

- Large mobility hubs (e.g. employment > 60,000 jobs) provide critical anchors to support any new Express Rail or subway 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. The benefits in terms of transit use and efficiency of concentrating development in a relatively small number of anchor hubs, particularly those with high employment targets, greatly exceeds that which can be achieved by distributing similar levels of development growth over a more dispersed urban area with significantly greater transit ridership and resulting moderation of auto traffic growth pressures.

- A web Express Rail network is viable, at least in part, and strongly supports the vision for transportation in the GTHA. 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.

- Subway or grade-separated LRT improvements should be considered in existing higher-density areas if the higher range of transit market shares are to be achieved.

- Strong feeder bus and paratransit services are critical to support the regional rapid transit network under any future scenario, with fleet sizes doubling to quadrupling in suburban areas.

The above interim findings are drawn from Section 4.5 of White Paper 2. That paper describes the modelling and comparison of the initial test concepts in more detail.

4. Developing and Assessing the RTP Regional Rapid Transit Network

This section of the backgrounder describes the process that Metrolinx undertook to move from the test concepts in White Paper 2 to the regional rapid transit network of the Draft RTP and, ultimately, the final RTP. The final RTP's 25-year plan for the regional rapid transit and highway network can be found in Appendix A. More information on the network can be found in the RTP.

4.1 The Process for Developing The RTP Regional Rapid Transit Network

The process of developing the RTP regional rapid transit network did not rely on any one input or information source, and it was not distilled down to a simple mathematical scoring exercise. It involved a consideration and balancing of many different factors that are described below.

The underlying basis for developing and assessing the RTP transit network is found in the vision, goals and objectives of the RTP. These are based on the three pillars of a high quality of life; a thriving, sustainable and protected environment; and a strong, prosperous and competitive economy. As such, the process considered more than just traditional transportation indicators such as transit ridership, but also social, environmental and economic factors.

Regional Significance

The RTP is fundamentally about building an integrated, regional transportation network. As such, an important part of the process was identifying projects that made a significant contribution to a regional network. The regional significance of individual projects was assessed by rating each based on seven general criteria.

- Does the facility operate predominantly within its own right of way, separate from other traffic?
- Does the project connect key places (e.g. urban growth centres, areas of high density and/or social need)?
- Does the project provide significant carrying capacity?
- Is the project likely to have a minimum average distance between stops of 500 m or more?
- Does the project propose service that operates at an average speed of 25 km/h or greater?
- Does the project cross municipal boundaries or represent a significant transportation corridor of 15 km or more?

- Is the project cost/effective in terms of riders and/or passenger/kms per million dollars capital investment?

Projects meeting four or more of the above criteria were considered regionally significant and were carried forward for further analysis.

Modelling and Comparing Network Test Concepts

The White Paper network test concepts provided the starting point for developing the RTP network. The modelling results for those concepts, and subsequent analysis, provided a general indication of the performance of individual projects and their contribution to the performance of the overall system.

Draft Regional Transportation Plan

In the Draft RTP, Metrolinx presented a recommended regional rapid transit network for broad consultation, and undertook further modelling of both system, and individual project performance.

Municipal and Stakeholder Feedback

Publication of the White Papers and Draft RTP was followed by extensive consultation with municipalities and stakeholders that contributed significant input and insight into the development of the RTP network. During the consultation workshops, stakeholders were asked what were the most important places that needed to be linked by the transportation system in their local area and throughout the GTHA, and what were the most critical linkages. Through this consultation process, Metrolinx was able to compare options with municipally-developed transit plans and priorities, explore linkages, and identify key origins, destinations and areas of high current and future demand. It also helped Metrolinx to base the regional rapid transit network on local visions and aspirations.

Modelling

The GGH Model described earlier in this backgrounder was also an important input to the development of the recommended RTP network. This involved a combination of “top down” and “bottom up” modelling approaches. The “top down” modelling approach helped Metrolinx understand how all components would work together as a system and provided a context of estimated transportation demand/performance levels as background for a project-specific assessment. The “bottom up” modelling approach was used to refine the network and set project priorities as a basis for phased implementation of the network over time. Individual projects were considered within the context of the overall system, to screen the projects for their relative priority based on the performance benefits contributed by each. The detailed results of this stage of the process are described in the next section.

4.2 System Performance

The performance of the overall transportation system, or “top down” modelling approach, helped Metrolinx understand how all components of the system would work together. The system performance of the RTP regional rapid transit network is detailed in Appendix B and described below.

To provide a basis for comparison of the system performance, Metrolinx also developed a current trends scenario. The current trends scenario assumes that future travel will increase proportionately with population and employment growth and will exhibit travel patterns similar to those observed today. This stability in travel behaviour also assumes that the current policy context and the transportation improvement trends of the past two decades are continued.

Transit trips by destination region in the a.m. peak period: These estimates were produced directly by the GGH Model which accumulated the estimated number of transit trips arriving in each of the GTHA’s six single-tier or upper-tier municipalities during the a.m. peak period (6:00 a.m. – 9:00 a.m.). Total transit trips are estimated to more than double between 2006 and 2031 as a result of the RTP, with higher rates of growth in the four regional municipalities than in the Cities of Toronto and Hamilton, but the greatest absolute growth in the City of Toronto reflecting its substantial share of the total. In contrast, total transit trips in 2031 under current trends would be only about 50 per cent greater than 2006 levels.

Annual total transit trips: These estimates were derived by expanding the a.m. peak period totals to annual levels based on expansion factors derived from the TTS and from typical transit peak period, daily and annual ridership levels compiled by the Canadian Urban Transit Association (CUTA) for transit systems operating in the GTHA. As shown, these are estimated to increase from about 546 million trips in 2006 to 1.27 billion trips in 2031, compared to a considerably smaller increase to under 800 million trips in 2031 under current trends.

Transit modal split by destination region: This is the market share of transit trips relative to total trips, for trips arriving in each of the six single-tier and upper-tier municipalities and the total GTHA. These estimates were produced by the GGH Model, with post-processing adjustments described earlier in this backgrounder. As shown, the GTHA modal split is estimated to increase from 16.5 per cent in 2006 to 26.3 per cent in 2031 as a result of the RTP. Increase in modal split is negligible under current trends for the same period. While the transit modal split for Toronto is estimated to grow substantially (from 30 per cent to 45 per cent), considerably higher rates of growth (by factors of 2, 4 or more) are estimated for the other municipalities, which are starting from much lower modal splits in 2006.

New kilometres of rapid transit by region: The number of kilometres of new rapid transit (express rail, regional rail, subway and other rapid transit) were calculated based on the new transit projects proposed in the RTP network. Since these projects were coded into the model’s transit network, the model was used to calculate these measures of transit supply for each system. As shown, for the total GTHA, the RTP will provide 1,226 km of new rapid transit. Major increases are provided in each of the six municipalities.

Per cent of population within 2 kilometres of rapid transit: These estimates of transit supply/coverage were produced by the model by calculating the number of people within 2 km of the nearest rapid transit station using the transit network and zonal population numbers coded into the model. They express the GTHA population within 2 km of rapid transit as a per cent of the total GTHA population. As shown, this is estimated to grow from 42 per cent in 2006 to 81 per cent as a result of the RTP, with a significantly lower growth to 47 per cent under current trends.

Per cent of commuters who can get to work within 45 minutes via transit and auto: These estimates are provided directly by the model. As shown, as population increases, this measure of accessibility remains relatively static for the auto mode, but is estimated to grow for transit accessibility from about 38 per cent in 2006 to 52 – 56 per cent as a result of the RTP. In contrast, under current trends, the per cent of commuters who can get to work by transit or by car would both fall below current levels.

Average home-based work trip length (km): These estimates are provided directly by the model. As shown, trip lengths are estimated to remain relatively constant, with slight increases over the 25-year time horizon of the RTP, reflecting the greater transit mobility provided by the RTP relative to existing conditions.

Vehicle kilometres of travel (VKT) in the a.m. peak hour: This is the number of kilometres travelled by all autos in the GTHA during the morning peak hour. It is calculated directly by the model. As shown, as population increases, VKT is estimated to grow from 12.5 million in 2006 to 14.4 million over the 25-year time horizon of the RTP. In contrast, current trends would result in a significantly higher increase to 19.5 million vehicle kilometres of travel. Expressed on a per capita basis, VKT per person would decline from 2.1 in 2006 to 1.7 over 25 years under the RTP, and rise to 2.3 under current trends.

AM peak period auto trips: These estimates are produced directly by the model. It shows an increase from about 2.1 million a.m. peak period auto trips in 2006 to about 2.6 million in 25 years, with a much larger increase to about 3.2 million under current trends.

Active transportation (AT) modal split: This is the market share of walking and cycling trips relative to total trips in the a.m. peak period. It is produced directly by the model. As shown, the AT modal split is estimated to increase from 9 per cent in 2006 to 12.5 per cent as a result of the RTP, while it would remain at 9 per cent under current trends.

Total annual fuel and electricity consumption: These estimates are calculated based on the model output of auto and transit vehicle-kilometres in the a.m. peak period, factored to annual levels as described above for annual total transit trips. For auto trips, VKT estimates from the model for the a.m. peak period were expanded to annual levels using the same types of expansion factors as described earlier, but in this case applied to auto travel based on typical peak period, daily and annual auto VKT levels recorded by the MTO and municipalities in the GTHA. Auto fuel consumption is calculated based on auto VKT numbers from the model multiplied by existing or projected fuel efficiency measures (litres per 100 km) derived from the Transport Canada UTEC model. The differences between 2006 levels and future levels of auto fuel consumption for the RTP and current trends systems are similar to those noted above for VKT. These energy consumption figures are converted from litres of fuel to gigajoules, and estimates of transit energy consumption are presented as well, also in gigajoules, in order to include the electrical energy consumption for transit. As shown, the transit energy consumption is estimated to increase from about 5.6 million gigajoules in 2006 to 8.5 million in 25 years as a result of the RTP's much higher levels of transit service in the region, with a slight decrease to 5.1 million under the much lower transit levels of the current trends scenario. Reflecting the dominant energy consumption by the auto mode, and a 50% increase in population, total GTHA annual energy consumption, as shown, increases slightly from 158.6 million gigajoules in 2006 to 163.5 million in 25 years, with a much larger increase to 215 million gigajoules under current trends.

Greenhouse gas (GHG) emission levels: These emission levels were calculated from the model estimates of VKT in the a.m. peak period, expanded to annual levels as described above, and multiplied by GHG emissions per vehicle kilometre derived from the Transport Canada UTEC model. As shown, the tonnes of GHG emitted per capita per year from auto travel are estimated to decrease significantly from 2.3 in 2006 to 1.45-1.7 as a result of the RTP. Under current trends, GHG emissions per capita would remain constant, or decrease slightly to approximately 1.95 - 2.28 tonnes per capita per year, largely reflecting technology improvements that are projected over this timeframe. However, owing to the substantial increase in population, the total GHG emission level from both auto and transit is estimated to remain relatively constant. Current levels are about 14.3 million tonnes per year, compared to approximately 13.1 - 15.2 million tonnes per year in 25 years. Emission levels would rise significantly to 17.2 - 20.1 million tonnes per year under current trends. While it is estimated that the RTP would result in little or no increase in total GHG emission levels from 2006 levels (or possibly a small reduction) this would not be sufficient to meet the Province of Ontario's GHG reduction targets by 2020. The companion Metrolinx backgrounder "Climate Change and Energy Conservation, December 2008" describes additional measures which will be required to meet those targets, building on the significant per capita reductions which would result from the RTP.

Auto and transit criteria air contaminant total emissions (million kg/year): As shown, the criteria air contaminant (CAC) emissions that were estimated are carbon monoxide (CO), nitrogen oxides (NOx), sulphur oxides (SOx), volatile organic compounds (VOCs), particulate matter less than 10 microns in diameter (PM10) and particulate matter less than 2.5 microns in diameter (PM2.5). These estimates were derived from the VKT estimates for autos and transit respectively produced by the model, multiplied by the emissions levels of each CAC pollutant per vehicle kilometre provided by the Transport Canada UTEC model. As shown, these levels are estimated to decrease from current levels into the future for CO, NOx, and VOCs, based on significant decreases in vehicular emissions projected by the Transport Canada model reflecting continuing technological improvements. These improvements are not anticipated to be as significant for SOx and particulate matter emissions.

Auto and transit criteria air contaminant total emissions (grams/person-km): These are calculated in the same manner as described above, but expressed on a grams per person km basis (again drawing on the person-km model results). As shown, significant reductions in future from 2006 levels are estimated for all CAC emissions except SOx, reflecting the technological improvements projected by the Transport Canada UTEC model.

4.3 Individual Project Performance

For the "bottom up" component of the analysis, potential transit projects were subjected to a project assessment based on the indicators described below. These indicators were developed to reflect the broad vision, goals and objectives of the RTP. They include both quantitative and qualitative indicators. It is important to note that the indicators were not weighted, and as a result this analysis was not used to produce a numerical "score" for individual projects. Rather, the individual project performance was considered in balance with the other factors and inputs described in section 4.1 to develop the recommended RTP regional rapid transit network. Detailed project performance results are provided in Appendix C.

AM Peak Hour Boardings: This reflects the number of boarding passengers who use the rapid transit facility for all or part of their transit trip, as estimated by the model.

AM Peak Hour Peak Point Riders: The number of passengers on transit vehicles passing the peak load point of the transit line in the peak hour in the peak direction, as estimated by the model.

Total AM Peak Hour Pass-km: The sum of the distance travelled by all passengers on the rapid transit facility during the a.m. peak hour, as estimated by the model.

Annual Riders: These estimates were derived by expanding the a.m. peak period totals to annual levels based on expansion factors derived from the TTS and from typical transit peak period, daily and annual ridership levels compiled by CUTA, for transit systems operating in the GTHA.

Average employment and residential density within 500m of the project: Current densities were derived from Census data. Projected densities were derived from population and employment projections consistent with the Growth Plan, as described in Section 2.3. Densities described are averaged across the entire length of the line.

Number of mobility hubs connected (anchor hubs and gateway hubs): This indicator identifies the number of anchor hubs and gateway hubs that each project connects. For more information, please refer to the backgrounder "Mobility Hubs, December 2008" available on the Metrolinx website.

Diversion of person trips from 400 series highways onto transit: This indicator was assessed qualitatively based on the project's likelihood of drawing travellers away from 400 series highways due to the project's location, end points and average speed.

Number of seniors and number of low-income persons (15+) within 500 metres of a rapid transit station: These indicators were estimated based on demographic profiling conducted as part of the GGH Model development and are provided as a proxy for identifying areas of social need.

Annual Reduction in GHG Emissions (tonne CO2 equivalent): This was calculated from the model estimates of VKT, expanded to annual, and multiplied by GHG emissions per vehicle-kilometre derived from the Transport Canada UTEC model.

Estimated percentage of the route within the existing built-up area: This indicator was based on an approximate comparison of the project against the existing built-up area as depicted in the Ministry of Energy and Infrastructure's paper entitled "Built Boundary for the Growth Plan for the Greater Golden Horseshoe, 2006 (2008)".

Approximate length of line crossing the Greenbelt: This indicator was based on an approximate comparison of the project against the boundaries of the Greenbelt.

Approximate number of rapid transit network cross-connections provided: This criterion indicates the number of direct connections the project has with other rapid transit lines in the RTP regional rapid transit network.

5. Sensitivity Studies

In order to provide further insights regarding the transit network, a series of sensitivity studies were carried out at the time of the Draft RTP using the GGH Model to estimate how demand and performance levels 25 years from now would be affected by differing trends and/or policy interventions. The base network used was the recommended regional rapid transit network of the Draft RTP. In each sensitivity study, the base network and all model input assumptions were held constant, while one factor was adjusted in order to isolate the impact that the selected factor could be expected to have on the performance of the system. Because this sensitivity analysis is limited by the same modelling limitations described earlier in this backgrounder, its primary value lies in comparing relative differences; therefore, the results are presented as percent changes relative to the base case.

5.1 Auto Operating Costs

Two sensitivity model runs were carried out to assess the effects of changes in auto operating costs. The first estimated the impact of applying road pricing on all controlled access expressways in the GTHA. The second estimated the impact of a more significant increase in auto operating costs by 400 per cent over 2008 levels rather than 200 per cent as assumed for the base case, on the assumption that energy prices could increase more significantly by 2031 if petroleum production levels are unable to keep up with rising demand levels.

To provide a general sense of the expected impact of road pricing, a 20 cent/km fee was assumed to apply to the 400-series expressways in the GTHA plus the Don Valley Parkway, Gardner Expressway, Queen Elizabeth Way, Lincoln Alexander Parkway and Red Hill Creek Expressway. Under this sensitivity study the levels of annual transit ridership and the transit modal split were estimated to increase three per cent. Vehicle-km of travel would drop six per cent and energy consumption levels and emission levels would drop commensurately.

The impacts of a more general 400 per cent increase in auto operating costs, rather than the 200 per cent increase assumption of the base case, would be somewhat more significant than those for the road pricing study. Total annual transit ridership and the transit modal split would increase nine per cent. VKT of travel in the a.m. peak hour would decrease eight per cent, with commensurate decreases in a.m. peak period auto trips and auto energy consumption and emissions.

5.2 Land Use

Two sensitivity model runs were carried out to assess the effects of changes in land use on the performance of the system. The first estimated the impact of a more intensified land use concept. The second estimated the impact of allowing more development outside of existing settlement areas.

To provide a general sense of the expected impact of more intensified land use, the performance of the system was modelled assuming Land Use Concept C (as described in White Paper 2). This land use is based on the same overall population and employment forecasts that were used for the base case, but the growth is concentrated more around urban growth centres and within existing built-up areas. Growth is particularly concentrated in Mississauga City Centre, North York Centre, Scarborough Centre and Markham. Transit ridership levels with a more intensified land use would increase five per cent, and the modal split would increase four per cent. Vehicle-km of travel would decrease two per cent, with commensurate decreases in a.m. peak period auto trips, auto energy use and emissions.

The second sensitivity study assumed that urban boundaries in the municipalities outside of Toronto would be permitted to expand into surrounding lands. After assuming that all upper- and single-tier municipalities met the Growth Plan’s minimum requirements for intensification, the existing Designated Greenfield Areas were assumed to build-out at an average of 50 people and jobs combined per hectare, in accordance with minimum Growth Plan requirements. The remaining growth for each upper- and single-tier municipality, other than Toronto, was assumed to occur outside of existing settlement areas. The result is a slight drop in transit ridership and transit modal split of one per cent. Vehicle-km of travel would increase one per cent, with commensurate slight increases in auto energy consumption and emission levels. The rather marginal changes under this sensitivity study reflect the fact that, while transit use by new residents in the expanded area would be lower than if these people were living in the existing urbanized area, only a relatively small proportion of the overall GTHA population (about 3 per cent) would be affected. The negative transportation and land use impacts (additional sprawl, higher cost of providing transit in low density areas, increased energy consumption and emissions) would be more significant if this urban growth pattern were to become more widespread and long-term.

5.3 Road Capacity

In developing the RTP White Papers, Metrolinx undertook an additional sensitivity analysis to estimate the effects of road capacity on the performance of the transportation system. These results were based on a significantly different base case, so they are not directly comparable to the sensitivity analysis described above. They do, however, provide useful insight into the impacts of increasing or decreasing road capacity.

As described in White Paper 2, Test Concept B2 examined the impact of expanded road capacity by including the following additional road and highway improvements: GTA-West proposed travel corridor linking Highway 400 to the Guelph area, Niagara-GTA corridor, Bradford Bypass from Highway 400 to Highway 404, Highway 410 extension north to the GTA-West transportation corridor, Highway 404 extension north to Highway 12, Highway 427 extension north to the GTA-West transportation corridor and a 10 per cent increase in the arterial road capacity in Durham, York, Halton and Peel Regions. It is also assumed that planned HOV lanes were constructed as general-purpose, or mixed-traffic lanes.

Test Concept C2 examined the impact of reduced road and highway capacity by excluding programmed improvements that are documented in MTO's capital program and in municipal Transportation Master Plans, the Highway 407 East extension, and the extensions to Highway 404 and Highway 427.

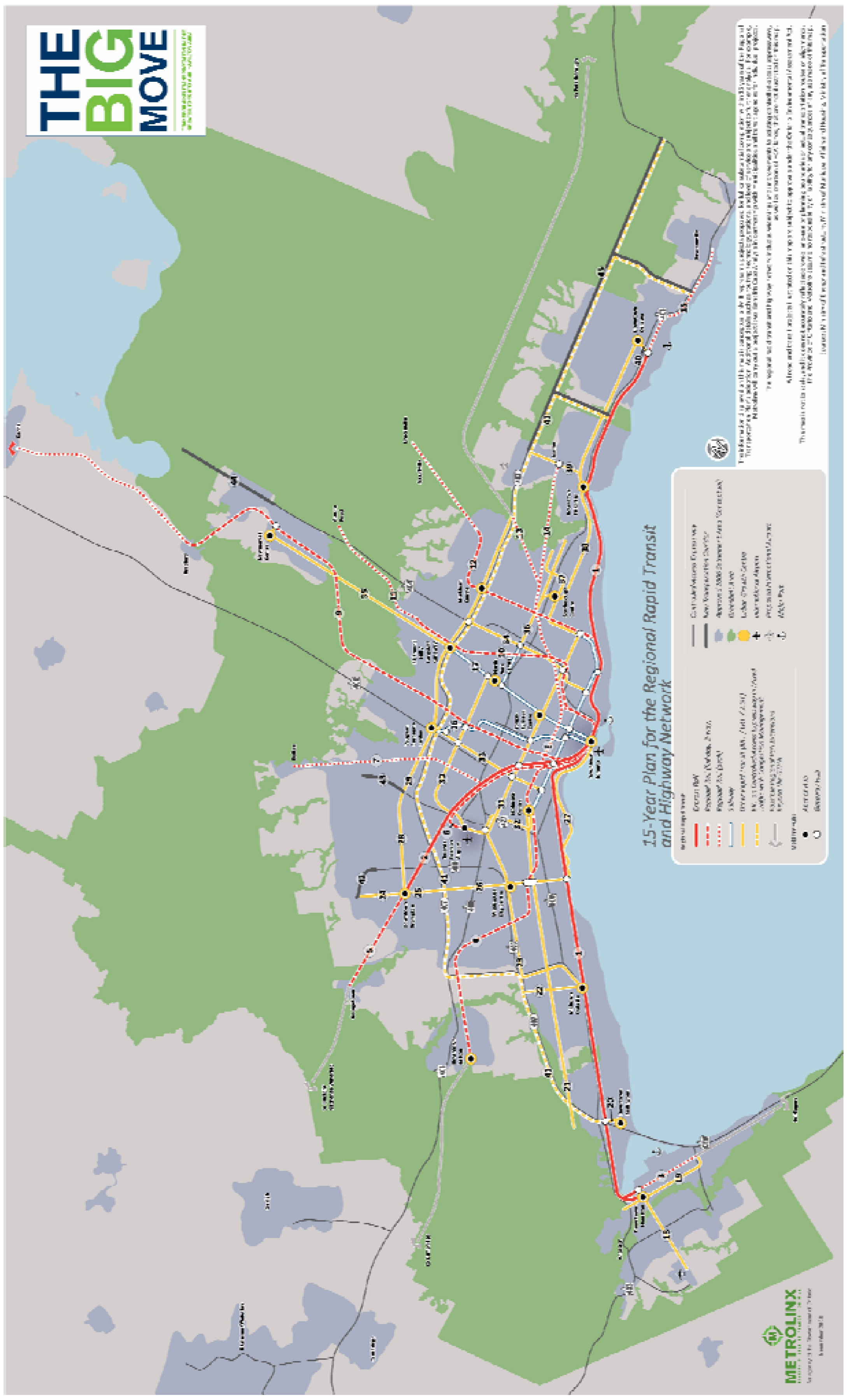
The results of this analysis are described in detail in Appendix E of White Paper 2 and are summarized here:

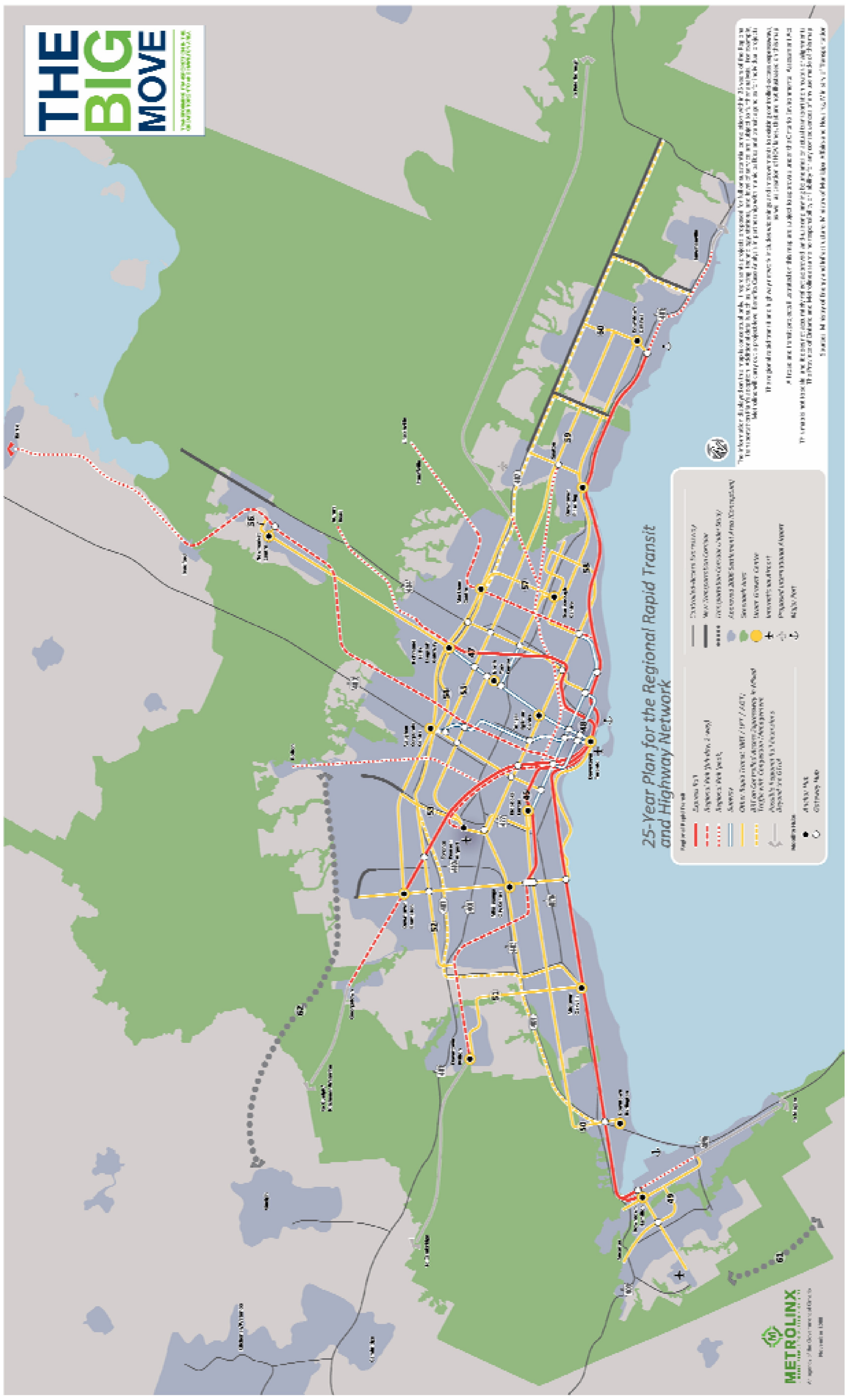
- Expanding the capacity of the road system carried a significant capital cost.
- Expanding the capacity of the road system provided economic benefits through reduced delays and congestion, particularly outside of Toronto (although this did not include the impact of any induced traffic demand that may result from the increased road capacity).
- Expanding road capacity resulted in more and longer trips, which translates into higher GHG and other emissions.
- Expanding road capacity resulted in increased fuel consumption.
- Expanding road capacity had a significant effect on transit ridership, causing many travellers to switch from transit to driving, particularly outside of Toronto. Reduced road capacity had limited effect on transit modal split.

APPENDICES

Appendix A:

RTP 15-Year and 25-Year Plans for the Regional Rapid Transit and Highway Network




THE
BIG
MOVE
25-Year Plan for the Regional Rapid Transit
and Highway Network
METROLINX

Regional Rapid Transit* and Highway Network

15-Year Plan

Express Rail

Lakeshore (1): *Hamilton - Oshawa GO*
Brampton (2): *Downtown Brampton - Union Station*

Regional Rail

Stoney Creek (3): *James Street North Station - Stoney Creek*
Milton (4): *Downtown Milton - Union Station/Summerhill*
Georgetown (5): *Georgetown - Downtown Brampton*
Airport (6): *Pearson Airport - Union Station*
Bolton (7): *Bolton - Union Station*
Crosstown (8): *Dundas West - Summerhill Station*
Barrie (9): *Bradford - Union Station*
Richmond Hill (10): *Richmond Hill GO - Union Station*
Richmond Hill (11): *Aurora Rd. - Richmond Hill GO*
Stouffville (12): *Mt Joy GO - Union Station*
Havelock (13): *Locust Hill (Markham) - Union Station/Summerhill*
Seaton (14): *Seaton - Union Station/Summerhill*
Lakeshore (15): *Oshawa GO - Bowmanville†*

Subway

Spadina (16): *Downsview Station - Vaughan Corporate Centre*
Yonge (17): *Finch - Richmond Hill/Langstaff Gateway*

New Transportation Corridors

Highway 410 Extension (42)
Highway 427 Extension (43)
Highway 404 Extension (44)
Highway 407 East (45)

Other Rapid Transit (BRT / LRT / AGT)

Hamilton James Street (18): *Downtown Hamilton - Hamilton Airport*
Hamilton King/Main (19): *McMaster University - Eastgate Mall*
Burlington Connector (20): *Fairview GO - Downtown Burlington*
Dundas Street (21): *Brant St - Kipling Station*
Trafalgar (22): *Hwy 407 - Midtown Oakville*
403 Transitway (23): *Midtown Oakville - Renforth / Airport*
Hwy 10 (24): *Mayfield West - Downtown Brampton*
Main Street AcceleRide (25): *Downtown Brampton - Hwy 407*
Hurontario (26): *Hwy 407 - Port Credit GO*
Waterfront West (27): *Port Credit GO - Union Station*
Queen Street AcceleRide (28): *Downtown Brampton - Peel-York Boundary*
VIVA Highway 7 (29): *Peel-York Boundary - Locust Hill (Markham)*
Finch West (30): *Pearson Airport - Finch Station*
Eglinton (31): *Pearson Airport - Kennedy Station*
Hwy 427 South (32): *Pearson Airport - Kipling Station*
Jane (33): *Vaughan Corporate Centre - Bloor Street*
Don Mills (34): *Hwy 7 - Bloor Street*
VIVA Yonge (35): *Richmond Hill/Langstaff Gateway - Newmarket Centre*
Sheppard East (36): *Don Mills Station - Meadowvale Road/ Scarborough Centre*
Scarborough RT (37): *Kennedy Station - Malvern*
Hwy 2 (38): *Scarborough Centre - Downtown Oshawa*
Brock Road (39): *Downtown Pickering - Hwy 407*
Oshawa Connector (40): *Oshawa GO - Downtown Oshawa*

BRT on Controlled-Access Expressway in Mixed Traffic with Congestion Management

Hwy 407 (41): *Halton - Durham*

25-Year Plan

Express Rail

Mississauga (46): *Cooksville - Union Station*
Richmond Hill (47): *Richmond Hill/Langstaff Gateway - Union Station*

Subway

Downtown Core (48): *Bloor West - Downtown - Danforth*

Transportation Corridors Under Study

Niagara-GTA (61)
GTA-West (62)

Other Rapid Transit (BRT / LRT / AGT)

Hamilton Mohawk (49): *Centre Mall - Ancaster*
Brant (50): *Fairview GO - Dundas Street*
Trafalgar/Main (51): *Downtown Milton - Hwy 407*
Steeles AcceleRide (52): *Lisgar GO - Hwy 427*
Hwy 427 North (53): *Pearson Airport - Queen Street*
407 Transitway (54): *Hwy 427 - Markham Centre*
Steeles (55): *York University - Milliken GO*
VIVA Yonge North (56): *Newmarket Centre - Green Lane*
McCowan (57): *Markham Centre - Scarborough Centre*
Scarborough - Malvern (58): *Kennedy Station - Malvern*
Steeles/Taunton (59): *Milliken GO - Downtown Oshawa*
Simcoe (60): *Downtown Oshawa - Hwy 407*

Notes

** Details such as routing, technology, stations, and level of service are subject to further analysis, such as the project-level Benefits Case Analysis that Metrolinx will carry out in partnership with municipalities and transit agencies.*

† Routing on either CNR or CPR corridor to be assessed through the environmental assessment process

Appendix B:

System Performance of the RTP 25-Year Plan for the Regional Rapid Transit and Highway Network

Indicators	2006	25 Years From Now	
		CURRENT TRENDS	RTP FORECAST
Transit trips by destination region in the AM Peak Period:			
Toronto:	398,000	520,520	731,232
Durham:	8,600	20,192	40,770
York:	14,600	48,954	98,852
Peel:	25,600	59,841	136,079
Halton:	4,300	13,734	42,884
Hamilton:	15,000	18,453	35,195
Total:	466,700	681,694	1,085,012
Total annual transit trips (millions):	546.0	797.6	1,269.5
Transit modal-split by destination region:			
Toronto:	30.4%	31.5%	44.5%
Durham:	4.1%	5.5%	11.3%
York:	3.7%	7.0%	14.0%
Peel:	4.7%	7.6%	17.0%
Halton:	2.2%	3.8%	12.3%
Hamilton:	7.9%	6.4%	13.6%
Total:	16.5%	16.4%	26.3%
New km of rapid transit by region:			
Toronto:	-	6.2	445.7
Durham:	-	-	139.5
York:	-	2.4	263.3
Peel:	-	17	172.8
Halton:	-	-	136.2
Hamilton:	-	-	68.7
Total:	-	25	1226.2
Average home based work trip length (km):	15.2	17.5	15.6

Indicators	2006	25 Years From Now	
		CURRENT TRENDS	RTP FORECAST
Percent of commuters who can get to work within 45 minutes via transit, auto:			
Transit:	38%	26-30%	52-56%
Auto:	60%	45-49%	59-63%
Percent of population by region within 2 km of rapid transit:			
Toronto:	60-65%	-	95-100%
Durham:	10-15%	-	65-70%
York:	25-30%	-	70-75%
Peel:	25-30%	-	70-75%
Halton:	25-30%	-	70-75%
Hamilton:	10-15%	-	65-70%
Total:	42%	-	81%
Vehicle kilometres of travel:			
Millions of VKT for a.m. peak hour	12.5	19.5	14.4
Vehicle kilometres of travel per capita	2.1	2.3	1.7
Am Peak period auto trips:	2,068,000	3,206,490	2,603,722
Active transportation (AT) modal-split:	9%	9.0%	12.5%
Total annual fuel and electricity consumption:			
Auto (million Gigajoules):	153	210	155
Transit (million Gigajoules):	5.59	5.1	8.5
Total (million Gigajoules)	158.6	215.1	163.5
GHG emissions:			
Per capita auto GHG emissions (tonnes/year)	2.3	1.95 - 2.28	1.45 - 1.69
Total auto GHG emissions (million tonnes/year)	13.8	16.9 - 19.7	12.5 - 14.5
Total transit GHG emission levels (million tonnes/year)	0.47	0.33 - 0.38	0.56 - 0.65
Total transportation GHG emissions (million tonnes/year)	14.3	17.2 - 20.1	13.1 - 15.2

Indicators	2006	25 Years From Now	
		CURRENT TRENDS	RTP FORECAST
Auto and transit criteria air pollutant total emissions (total million kg/year and grams/person-km):			
CO:	475 / 8.54	356 / 4	264 / 3
NOx:	37.51 / 0.67	14.61 / 0.16	14.9 / 0.18
SOx:	0.504 / 0.009	0.458 / 0.005	0.477 / 0.006
VOCs:	28.5 / 0.51	12.1 / 0.1	9.1 / 0.1
PM10:	0.700 / 0.0126	0.988 / 0.011	0.732 / 0.009
PM2.5:	0.343 / 0.0062	0.437 / 0.005	0.323 / 0.004

Appendix C:

Individual Project Performance for the RTP 25-Year Plan for the Regional Rapid Transit and Highway Network

RTP Project Map Number and Name	Length (km)	Modelled Speed	AM Peak Hour Boardings	AM Peak Hour Peak Point Riders	AM Peak Hour Pass.-km	Annual Riders (mil./yr)	Average Existing Density Within 500m of the entire line (people and jobs per hectare)	Average Projected Density Within 500m of the entire line (people and jobs per hectare)	Anchor Mobility Hubs Connected	Gateway Mobility Hubs Connected	Diversion of person trips from 400 series highways	Seniors within 500 metres of a rapid transit station (in 2031)	Low-income persons (age 15+) within 500m of rapid transit (in 2001)	Approximate Annual Reduction in GHG Emissions (t CO2e)	Estimated percentage of the route within the existing built-up area	Approx. km of line crossing Greenbelt	
Express Rail																	
1 - Lakeshore (West)	64.9	80 km/h	53,500	23,000	1,828,500	86.9	75	107	4	3	Best	18,200	12,100	968,000	90	4	
1 - Lakeshore (East)	50.8	80 km/h	34,100	26,300	1,022,900	55.5	118	138	4	4	Best	19,700	10,400	541,000	90	4	
2 - Brampton	32.3	80 km/h	38,100	19,800	806,100	61.9	137	160	2	2	Best	19,000	14,300	427,000	100	0	
46 - Mississauga	24.8	80 km/h	25,800	17,000	508,500	41.9	144	214	2	2	Best	16,900	11,000	269,000	100	0	
47 - Richmond Hill	26.0	80 km/h	19,600	18,100	544,300	31.9	122	178	2	1	Best	16,100	7,400	288,000	100	0	
Regional Rail																	
3 – Stoney Creek	9.2		1,100	2,200	20,300	1.4	51	72			Good	1,200	1,600	11,000	-	-	
4, 8 – Milton, Crosstown (2-way all day to Union Station/Summerhill)	50.1	50-60 km/h	6,100	7,500	163,100	8.3	45	67	2	1	Better	6,600	2,200	86,000	85	1	
5 - Georgetown (2-way all day)	47.2	50-60 km/h	4,700	3,700	76,800	6.4	131	180	1	0	Better	7,400	4,300	41,000	85	2	
7 - Bolton	35.9	50-60 km/h	6,000	5,600	167,300	8.2	114	156			Better	3,600	1,400	89,000	70	-	
9 - Barrie (2-way all day to Bradford)	98.6	50-60 km/h	9,600	8,700	721,500	13.2	76	102	1	1	Better	4,500	1,500	382,000	30	14	
10, 11 – Richmond Hill (2-way all day to Richmond Hill GO and Aurora Rd)	30.6	50-60 km/h	1,000	1,200	10,500	1.8	101	168			Better	25,700	7,900	6,000	100	-	
12 - Stouffville (2-way all day to Mt Joy)	50.9	50-60 km/h	3,600	3,100	118,000	4.9	96	144	1	1	Better	7,500	3,400	62,000	85	7	
13 - Havelock	33.4	50-60 km/h	3,600	2,000	60,700	5.0	30	33			Better	3,000	1,500	32,000	85	6	
14 - Seaton	39.8	50-60 km/h	10,800	6,600	240,800	14.9	26	32	2	2	Better	4,000	2,000	127,000	70	9	
15 - Lakeshore (extension to Bowmanville)	17.6	50-60 km/h	1,100	1,100	17,900	1.4	10	19			Good	400	200	9,000	-	-	

Subway																	
n/a - Bloor - Danforth	26.2	31 km/h	70,000	16,400	378,800	143.5	130	157	1	7	Neutral	46,000	35,600	n/a	100	-	
n/a - Yonge-University-Spadina	29.7	30 km/h	106,100	25,400	500,900	217.5	273	341	3	7	Neutral	43,200	28,200	n/a	100	-	
n/a - Sheppard	5.4	30 km/h	10,100	5,900	41,700	20.8	83	113	0	2	Neutral	5,000	3,700	n/a	100	-	
16 - Spadina	7.6	40 km/h	11,000	7,200	55,900	21.4	31	50	1	2	Neutral	18,000	16,600	67,000	100	-	
17 - Yonge	6.8	40 km/h	10,000	8,800	51,000	19.5	56	104	2	3	Neutral	13,600	12,100	71,000	100	-	
48 - Downtown Core	13.3	40 km/h	57,100	17,500	261,700	117.1	277	326	0	4	Neutral	29,900	27,300	-	100	-	
Other Rapid Transit																	
23 - 403 Transitway (East)	9.3	25-30 km/h	4,400	2,600	33,800	8.5	33	63	3	1	Good	4,300	1,400	18,000	100	-	
23 - 403Transitway (West)	20.3	25-30 km/h	1,200	900	10,600	2.3	33	65			Good	5,800	1,300	6,000	90	-	
53 - Hwy 427 North	25.4	25-30 km/h	7,200	2,800	54,500	13.8	19	34	1	0	Good	2,300	700	-	100	-	
20, 41, 54 – Burlington Connector, 407 Transitway (Central)	25.0	25-30 km/h	16,300	5,600	292,000	31.7	23	53	3	1	Good	3,300	700	155,000	100	-	
Toronto																	
27 - Waterfront West	21.2	25-30 km/h	14,200	5,200	34,500	29.2	110	146	1	1	Neutral	23,200	15,100	18,000	100	-	
30 - Finch West	22.8	25-30 km/h	11,300	4,500	88,300	23.2	59	71	1	3	Neutral	15,100	15,800	47,000	100	-	
31 - Eglinton	31.2	25-30 km/h	30,700	7,800	208,700	62.7	72	82	2	6	Neutral	31,000	19,600	111,000	100	-	
32 - Hwy 427 South	11.8	25-30 km/h	1,900	1,000	13,100	3.9	44	73	2	1	Neutral	6,500	3,100	7,000	100	-	
33 - Jane	17.3	25-30 km/h	7,700	3,000	53,700	15.7	63	73	1	3	Neutral	17,800	17,300	28,000	100	-	
34 - Don Mills	19.9	25-30 km/h	19,200	5,000	119,500	39.4	68	77	0	4	Neutral	21,900	16,900	63,000	100	-	
36 - Sheppard East	17.4	25-30 km/h	6,800	3,100	30,700	13.9	68	102	0	1	Good	15,300	10,400	16,000	100	-	
37 - Scarborough RT	11.3	36 km/h	15,300	6,400	81,900	31.2			1	1							
55 – Steeles	15.6	25-30 km/h	1,800	1,800	26,900	3.7	50	60	0	2	Neutral	8,200	4,900	14,000	100	-	
58 – Scarborough - Malvern	14.2	25-30 km/h	6,800	4,000	32,800	13.9	57	62	1	1	Neutral	13,500	12,300	17,000	100	-	
59 - Steeles/Taunton (West)	15.6	25-30 km/h	1,800	1,800	26,900	3.7	50	60	0	1	Neutral	8,200	4,900	14,000	100	-	

Durham																	
38 - Hwy 2	40.5	25-30 km/h	7,700	2,500	56,500	15.0	39	74	3	1	Good	12,000	5,600	16,000	100		
39 - Brock Road	10.9	25-30 km/h	6,500	3,700	31,200	12.6	22	51	0	1	Neutral	4,600	1,000	17,000	100	-	
40, 60 - Simcoe	10.4	25-30 km/h	7,100	5,200	30,100	13.8	37	53	1		Neutral	3,100	1,900	16,000	90	-	
59 - Steeles/Taunton (East)	41.0	25-30 km/h	2,100	900	16,700	4.1	21	30	0	3	Neutral	6,000	2,800	9,000	55	17	
York																	
29 - VIVA Highway 7	46.0	25-30 km/h	16,100	3,100	71,300	31.5	28	60	3	0	Good	19,500	6,700	-	100	-	
35, 56 - VIVA Yonge	32.4	25-30 km/h	10,700	5,800	115,900	20.6	30	47	2	0	Good	12,400	4,000	61,000	85	11	
57- McCowan	13.4	25-30 km/h	4,500	1,300	29,400	5.3	54	137	2	0	Good	12,600	5,900	14,000	100	-	
Peel																	
21- Dundas Street (Hurontario to Kipling)	9.2	25-30 km/h	3,500	1,500	13,300	6.8	49	75	1	1	Neutral	7,200	3,600	7,000	100	-	
21 - Dundas West (Central)	10.3	25-30 km/h	2,300	1,000	15,800	4.4	43	51		1	Neutral	6,300	3,000	8,000	100	-	
24, 25, 26 – Hwy 10, Main Street AcceleRide, Hurontario	28.6	25-30 km/h	27,400	5,500	176,000	56.0	46	75	2	3	Neutral	25,300	11,100	-	100	-	
28 – Queen Street AcceleRide	13.2	25-30 km/h	4,700	2,000	30,500	9.1	37	65	1	0	Neutral	8,800	3,700	16,000	75	-	
52- Steeles AcceleRide	30.2		11,400	2,600	63,200	22.1	17	34	0	2	Good	4,600	1,600	11,000	90	-	
Halton																	
21 - Dundas Street (West)	20.7	25-30 km/h	1,700	700	13,500	3.3	12	25	0	1	Neutral	2,600	300	7,000	40	9	
22, 51 – Trafalgar, Trafalgar/Main	23.7	25-30 km/h	7,000	2,300	72,100	13.6	9	39	2	1	Neutral	4,200	400	38,000	65	2	
50 - Brant	6.5	25-30 km/h	2,000	1,100	5,200	3.9	37	53	0	1	Neutral	3,100	1,900	1,000	100	-	
Hamilton																	
18 - Hamilton James Street	14.9	25-30 km/h	3,500	2,100	15,700	7.1	44	60	1	0	Neutral	6,400	6,400	8,000	80	1	
19 - Hamilton King/Main	14.3	25-30 km/h	9,000	2,800	40,300	18.5	78	93	1	0	Neutral	16,600	20,800	21,000	100	2	
49 - Hamilton Mohawk	16.5	25-30 km/h	4,500	1,100	21,100	8.7	41	46		1	Neutral	10,400	7,400	11,000	100	2	