Appendix M

Travel Demand Modelling Process

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

This technical appendix details the travel demand modeling methodology used to develop the 2031 recommended road and transit networks for the York Region Transportation Master Plan Update (TMPU).

The intent of this document is five fold. First, to document the structure and performance of York Region's Travel Demand Forecasting (EMME/2) model; second, to describe the transportation travel patterns prevalent in the Region; third, to document the process used to arrive at the 2031 recommended road and transit networks and the preferred land use scenario; fourth, to describe the recommended full transit and road network and its phasing plans; and finally, to present possible future directions for the York Region model that stem from experience gained through the course of this study.

2.0 MODEL DEVELOPMENT

A travel demand model is a collection of computer programs that implements transportation theories using advanced algorithms to reflect observed, as well as to estimate forecasted travel behavior. Like any other forecasting model, it is has certain limitations that arise due to the lack of data and, consequently, the assumptions needed to compensate for the paucity of this data. It is an invaluable tool in transportation planning, especially when its limitations are understood and considered in the decision-making process.

For the York Region TMP Update, the model was predominantly used to evaluate network improvements and travel-related behavioral changes, which could be initiated through infrastructure improvements and policy implementation.

The following four sections provide a brief overview of the Region's Travel Demand Forecasting (YRTDF) Model which is built using the EMME/2 software by Inro Inc., which will further on be referred to as the YRTDF model. This brief summary on the model is meant to complement the detailed YRTDF Model User's Manual February 2005.

2.1 MODEL STRUCTURE

The YRTDF model is a standard four stage travel demand model, consisting of trip generation, trip distribution, modal split and trip assignment. For details on each of the above stages in terms of the algorithms / equations used, please refer to the YRTDF Model Users Manual Version 1.1.

The model simulates travel for four purposes during the morning peak period, these being work, secondary school, post- secondary school, and other. The work trips are further categorized into three occupational categories of office, manufacturing and professional. The "other" trip category accounts for a number of discretionary trip purposes including, but not limited to, shopping and "facilitate" (passenger drop-off and pick-up) trips.

Figure 1 shows the model structure, sequential process and the inter-relationship among the various modeling components.

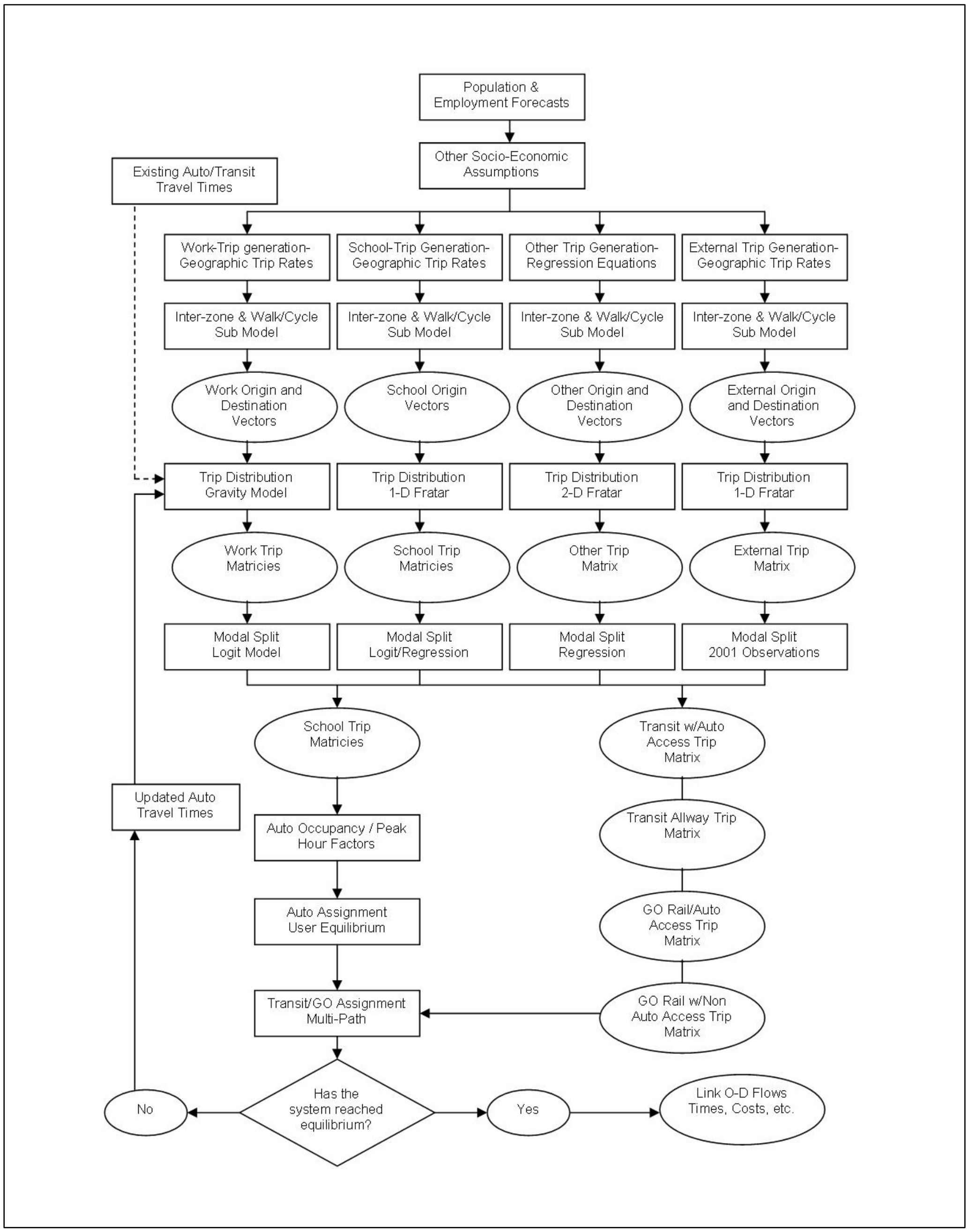


Figure 1. York Region Travel Demand Model Forecasting Process

The model explicitly analyzes five motorized and one non-motorized travel mode for work purpose and post-secondary school trips. More detail on each of the five modes is listed in Section 2.3. Of note is the separation of the “Public Transit / GO Rail with walk access” mode to that of “Public Transit / GO Rail with auto access” in the model. This is an important differentiation, which allows the user to model Park-n-Ride lots for transit services. The York Region model uses network coding standards developed by the Data Management Group (DMG) at the University of Toronto.

2.2 TRAFFIC ZONE SYSTEM

The model has been developed (calibrated and validated) using the 2001 GTA zone system maintained by the DMG. In addition, refinements have been carried out in York Region, mainly along the Yonge and Highway 7 corridors to better reflect walking access to transit stops in these areas. Additional details on the new zones with reference to their locations, numbering system and correspondence with the 2001 GTA zone system can be found in the YRTDF Model User's Manual, dated February 2005.

2.3 TRAVEL MODES

As noted earlier in Section 2.1, the YRTDF model includes one non-motorized and five motorized modes. These are defined as follows[i]:

Auto Driver / Auto Passenger – only auto driver mode trips are assigned to the auto network. Combined driver and passenger trips are converted to driver trips through the application of auto occupancy factors;

Public Transit with Walk Access – includes all modes of public transit (bus, streetcar/LRT, and subway), excluding commuter rail. No explicit differentiation is made between the various transit modes. The model relies on EMME/2's transit assignment procedures to assign the transit trips to the appropriate mode;

Public Transit with Auto Access – relates to Park/Kiss-'n-Ride at subway stations. Trips accessing subway stations using commuter parking lots are limited to locations with such facilities;

GO Rail with walk or public transit access – trips accessing GO Rail by foot or other transit service;

GO Rail with Auto Access – represents Park/Kiss-'n-Ride at GO Rail stations. Other than Union Station all the GO stations are assumed to have a Park-'n-Ride facility; and

Non-motorized – walk/cycle trips.

2.4 CALIBRATION AND VALIDATION OF THE MODEL

The YRTDF model was calibrated using the 2001 Transportation Tomorrow Survey (TTS) data. For the purpose of this study, re-calibrating the model using 2006 TTS data was deemed unsuitable for two reasons. First, the 2006 data would not be available in time to undertake re-calibration of the model; and second, the change in travel behavior between the two time periods was not expected to be significant enough to warrant such an extensive undertaking. However, to ensure that the model accurately reflects the base year travel patterns, it was validated against the 2006 TTS data. This was a preliminary version of the 2006 data that was not recommended for calibrating the model but could be used for model validation. The results of this validation are documented below in **Table 1**. The rows in the tables below represent origins and the columns represent destinations.

Table 1. Base Year Comparison of Total Trips – AM Peak Period All Modes Combined

AM Peak Period: Modeled 2006 Trips - All Modes Combined

	PD1	Toronto	Durham	York	Peel	Halton	Hamilton	GTA+H
PD1	32,875	35,764	318	3,627	5,159	401	46	**78,189**
Toronto	209,422	577,921	13,196	86,222	59,722	5,469	1,324	**953,275**
Durham	16,026	45,910	153,127	17,201	3,529	288	119	**236,201**
York	40,887	105,161	5,160	237,873	17,673	1,378	253	**408,387**
Peel	35,676	77,691	984	19,394	347,346	20,370	2,532	**503,992**
Halton	14,821	11,581	126	2,066	35,078	105,854	11,391	**180,916**
Hamilton	2,491	2,314	62	385	4,686	23,609	142,571	**176,117**
GTA+H	**352,198**	**856,343**	**172,973**	**366,767**	**473,193**	**157,369**	**158,235**	**2,537,078**

AM Peak Period: 2006 TTS Observed Trips - All Modes Combined

	PD1	Toronto	Durham	York	Peel	Halton	Hamilton	GTA+H
PD1	27,607	28,146	586	2,956	4,345	568	232	**64,440**
Toronto	184,454	596,054	10,597	74,890	53,765	5,074	1,047	**925,881**
Durham	16,158	37,105	161,266	16,223	2,920	439	172	**234,283**
York	38,627	103,612	3,947	235,592	18,944	1,709	318	**402,749**
Peel	38,836	71,561	1,133	18,960	357,546	19,575	2,522	**510,133**
Halton	14,152	10,725	234	2,475	37,471	117,523	10,026	**192,606**
Hamilton	2,478	2,052	142	451	5,422	22,220	139,552	**172,317**
GTA+H	**322,312**	**849,255**	**177,905**	**351,547**	**480,413**	**167,108**	**153,869**	**2,502,409**

Ratio of Predicted to Observed Total Trips

	PD1	Toronto	Durham	York	Peel	Halton	Hamilton	GTA+H
PD1	1.19	1.27	0.54	1.23	1.19	0.71	0.20	**1.21**
Toronto	1.14	0.97	1.25	1.15	1.11	1.08	1.26	**1.03**
Durham	0.99	1.24	0.95	1.06	1.21	0.66	0.69	**1.01**
York	1.06	1.01	1.31	1.01	0.93	0.81	0.80	**1.01**
Peel	0.92	1.09	0.87	1.02	0.97	1.04	1.00	**0.99**
Halton	1.05	1.08	0.54	0.83	0.94	0.90	1.14	**0.94**
Hamilton	1.01	1.13	0.44	0.85	0.86	1.06	1.02	**1.02**
GTA+H	**1.09**	**1.01**	**0.97**	**1.04**	**0.98**	**0.94**	**1.03**	**1.01**

As seen in Table 1, the total trips predicted by the model for all modes combined is within 1% of the observed trips as reported by the 2006 TTS. The modeled trip productions and trip attractions from and to the Region of York are within 4% and 1%, respectively, of the observed trips from the 2006 TTS database.

The model tends to over-predict total trip productions and trip attractions to and from PD1 by 21% and 9%, respectively. It over-predicts intra-PD1 trips by nearly 19% and trips from PD1 to the Rest of Toronto by nearly 27%, which is an indication of possible "compression" (higher than expected impedance for residents to travel to areas outside the City of Toronto) in the trip distribution stage of the model. Although trips from PD1 to York are over-predicted by nearly 23%, the number of trips is relatively small (671 trips).

In summary, the validation exercise completed using the YRTDF model for the base year (2006) indicates that although the total number of trips predicted by the model is very accurate (1%), there exists some variation at the Regional level. This variation is considered acceptable given the strategic nature of the Transportation Master Plan and the time needed for re-calibrating the model using the 2006 TTS data. Section 5.0 of this report lists some possible improvements to the YRTDF model while acknowledging the limitations of the current version.

3.0 BASE YEAR (2006) TRANSPORTATION CONDITIONS AND TRAVEL PATTERNS

3.1 INTRODUCTION

This section of the report documents base year (2006) transportation conditions and travel patterns prevalent in York Region. The analysis is based on 2006 TTS and Cordon Count Data hosted by the Data Management Group (DMG) at the University of Toronto, unless otherwise noted. For the purpose of this analysis, traffic volumes across key screenlines (**Figure 2**) in the Region of York were studied for the AM peak period only. **Table 2** illustrates the description of the screenlines.

Table 2. Description of Screenlines

Screenlines	Description
1	York - Simcoe Cordon
2	York - Durham Cordon
3	York - Peel Cordon
4	York - Toronto Cordon
5	South York Cordon
6	Highway 400 Cordon
7	Highway 404 Cordon
8	Georgina - Gwillimbury Cordon
9	Ravenshoe Cordon
10	Barthust Cordon
11	McCowan Cordon

3.2 AUTO TRAVEL

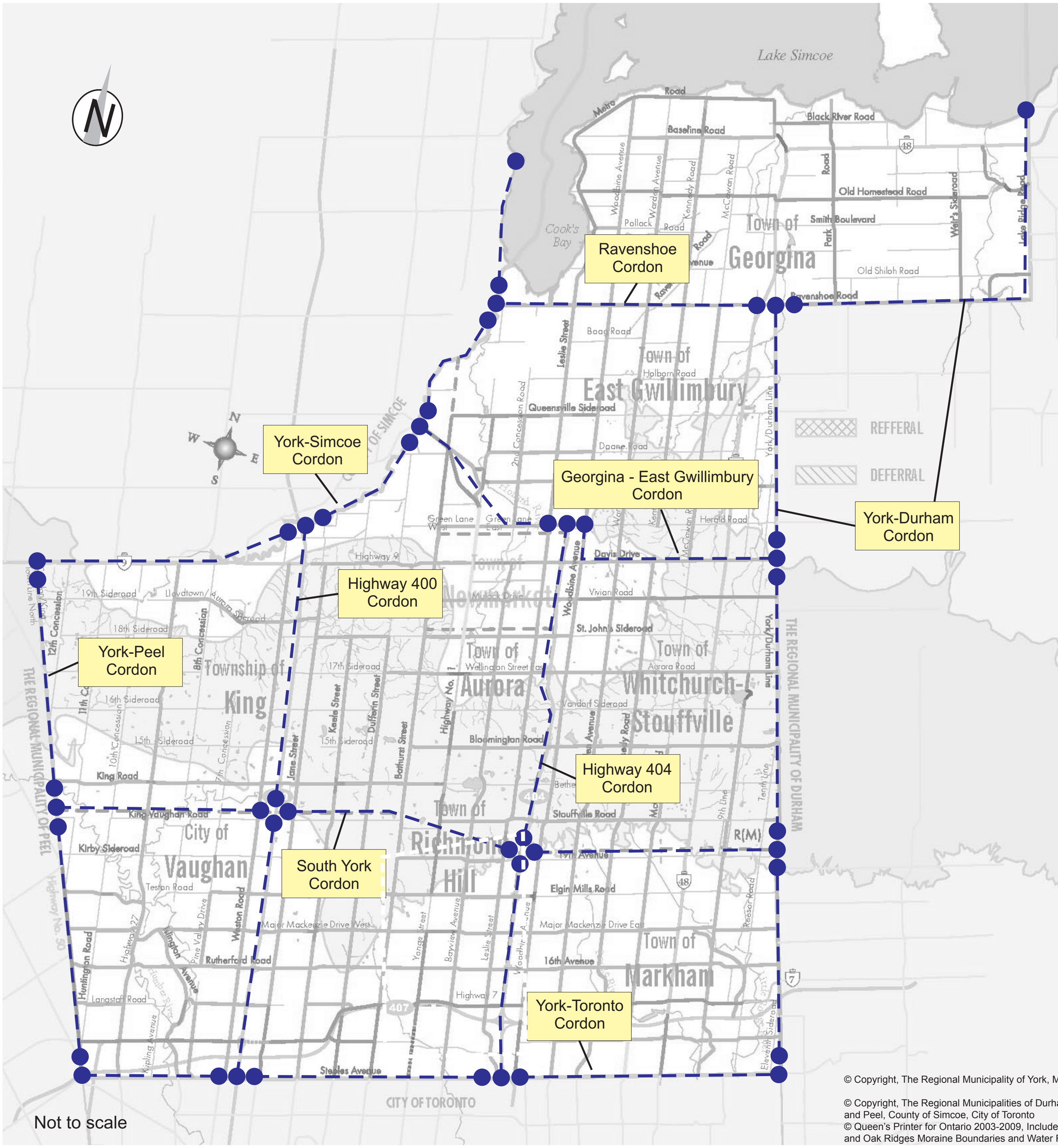
Table 3 – summarizes base year AM peak period trips to and from York Region made by the “auto driver and auto passenger” travel modes for the morning peak period (0600-0859). Other than intra-regional destinations, the City of Toronto is the primary attractor of trips originating from the two key regional corridors (Highway 7 and Yonge Street) and the rest of the Region. Similarly, the City of Toronto produces the majority of trips destined to the Region of York. **Figure 3** shows the extent of the two corridors.

The Highway 7 and Yonge Street corridors are very similar in terms of total trip productions in the AM peak period. However, the Highway 7 corridor attracts a little over 48,000 trips, which is more than double that attracted to the Yonge Street corridor. This pattern is a reflection of the employment base concentrated along the Highway 7 corridor.

Of the nearly 468,000 trips produced and attracted during the AM peak period by York Region, only 49% of the trips are intra-regional, which suggests relatively low self- containment (**Table 4**).

FIGURE 2

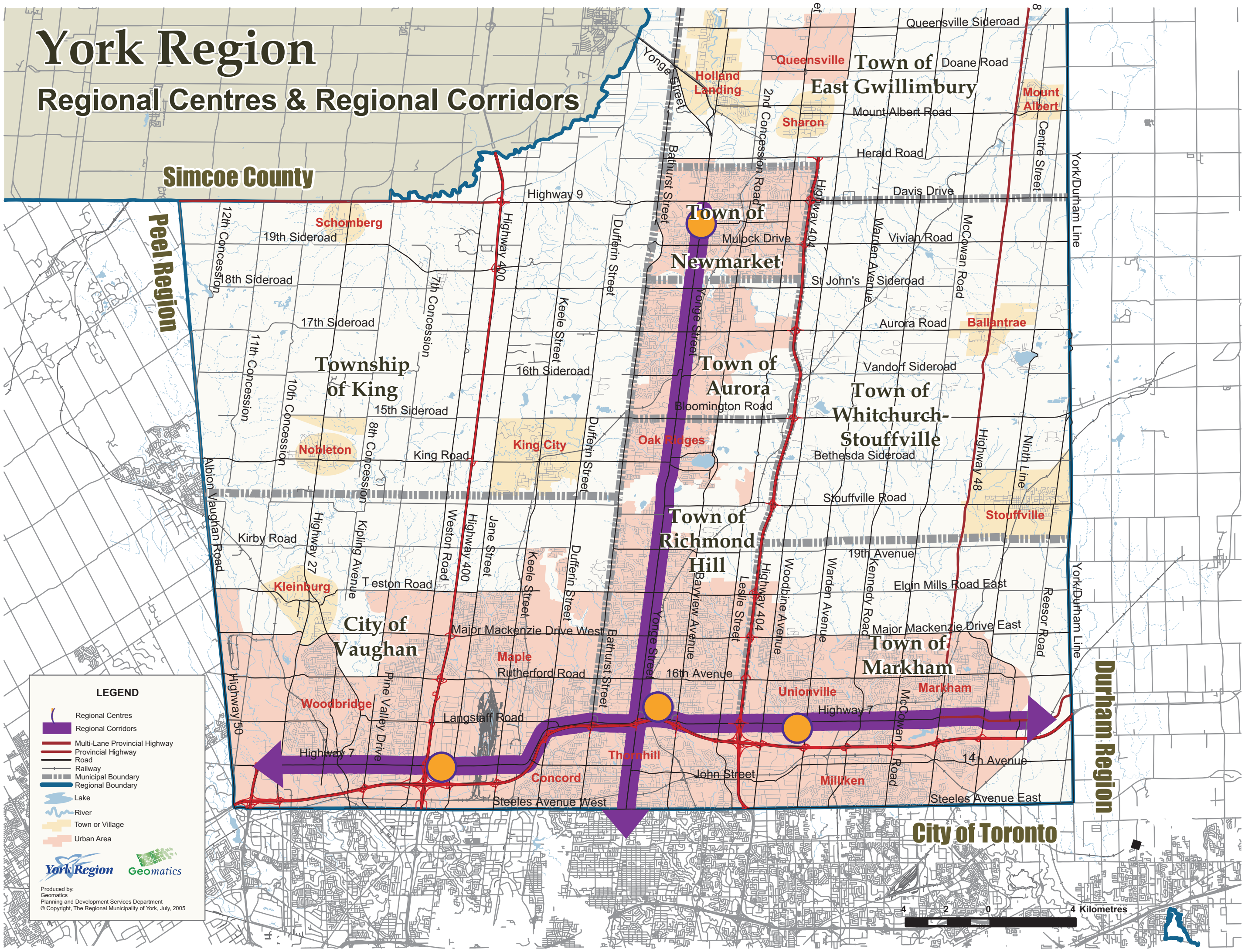
TRANSPORTATION MASTER PLAN UPDATE



CORDON COUNT SCREENLINES

FIGURE 3

TRANSPORTATION MASTER PLAN UPDATE



HIGHWAY 7 & YONGE STREET CORRIDORS

Table 3. AM peak period Auto Trips

To / From	Yonge Corridor	Highway 7 Corridor	Rest of York	Toronto	Durham	Peel	Halton	Hamilton	External	Total
Yonge Corridor	4,374	1,294	12,858	8,269	274	994	110	17	35	**28,225**
Highway 7 Corridor	877	5,930	10,599	8,258	457	1,584	175	59	42	**27,981**
Rest of York	13,916	21,006	157,879	89,849	3,140	16,096	1,425	227	282	**303,820**
Toronto	2,525	13,393	54,762	538,460	10,213	53,765	5,237	1,046	667	**680,068**
Durham	509	2,879	12,789	39,120	153,781	2,873	439	172	335	**212,897**
Peel	580	3,686	14,360	76,411	1,093	337,332	18,807	2,147	400	**454,816**
Halton	104	504	1,846	12,628	234	37,096	115,095	9,602	323	**177,432**
Hamilton	-	116	336	2,502	143	5,380	21,446	124,639	443	**155,005**
External	34	-	-	65	69	61	-	-	-	**229**
Total	**22,919**	**48,808**	**265,429**	**775,562**	**169,404**	**455,181**	**162,734**	**137,909**	**2,527**	**2,040,473**

Source: 2006 TTS Data, Data Management Group, University of Toronto.

Table 4. AM peak period Auto Trip Percentages

To / From	Yonge Corridor	Highway 7 Corridor	Rest of York	Toronto	Durham	Peel	Halton	Hamilton	External	Total
Yonge Corridor	15.5%	4.6%	45.6%	29.3%	1.0%	3.5%	0.4%	0.1%	0.1%	100.0%
Highway 7 Corridor	3.1%	21.2%	37.9%	29.5%	1.6%	5.7%	0.6%	0.2%	0.2%	100.0%
Rest of York	4.6%	6.9%	52.0%	29.6%	1.0%	5.3%	0.5%	0.1%	0.1%	100.0%
Toronto	0.4%	2.0%	8.1%	79.2%	1.5%	7.9%	0.8%	0.2%	0.1%	100.0%
Durham	0.2%	1.4%	6.0%	18.4%	72.2%	1.3%	0.2%	0.1%	0.2%	100.0%
Peel	0.1%	0.8%	3.2%	16.8%	0.2%	74.2%	4.1%	0.5%	0.1%	100.0%
Halton	0.1%	0.3%	1.0%	7.1%	0.1%	20.9%	64.9%	5.4%	0.2%	100.0%
Hamilton	0.0%	0.1%	0.2%	1.6%	0.1%	3.5%	13.8%	80.4%	0.3%	100.0%
External	14.8%	0.0%	0.0%	28.4%	30.1%	26.6%	0.0%	0.0%	0.0%	100.0%

3.3 TRANSIT TRAVEL

For analyzing transit travel patterns in the Region, the travel modes taken into account are Transit excluding GO Rail trips, GO Rail-only trips and Joint GO Rail and local transit. The school bus trips are presented in the subsequent table. **Table 5** summarizes the base year AM peak period trips to and from York Region (0600-0859) for all of the above modes combined.

As seen for the auto modes, the City of Toronto is the primary producer and attractor for transit trips to and from York Region. In terms of overall trip productions, the two corridors are fairly similar. The Highway 7 corridor attracts more total trips than the Yonge Corridor, specifically from Toronto. This is likely based on its proximity to the City and the density of employment.

Table 5. AM peak period Transit Trips

To / From	Yonge Corridor	Highway 7 Corridor	Rest of York	Toronto	Durham	Peel	Halton	Hamilton	External	Origins
Yonge Corridor	40	34	518	2,991	-	38	-	14	-	**3,635**
Highway 7 Corridor	41	138	392	2,760	-	22	-	-	-	**3,353**
Rest of York	788	771	4,404	29,887	80	195	-	-	-	**36,125**
Toronto	379	955	5,582	298,997	915	4,237	392	148	36	**311,641**
Durham	20	-	46	14,140	7,595	45	-	-	-	**21,846**
Peel	20	97	255	33,913	40	20,471	730	375	-	**55,901**
Halton	-	-	19	12,275	-	362	2,420	440	16	**15,532**
Hamilton	-	-	-	2,025	-	46	461	14,985	-	**17,817**
External	-	-	-	-	-	19	-	-	-	**19**
Destinations	**1,288**	**1,995**	**11,216**	**396,988**	**8,630**	**25,435**	**4,303**	**15,962**	**52**	**465,869**

To / From	Yonge Corridor	Highway 7 Corridor	Rest of York	Toronto	Durham	Peel	Halton	Hamilton	**Origins**
Yonge Corridor	149	42	1,308	369	-	-	-	-	**1,868**
Highway 7 Corridor	39	395	735	43	18	-	-	-	**1,230**
Rest of York	1,150	1,293	17,001	1,014	-	20	-	-	**20,478**
Toronto	75	97	248	11,735	16	111	33	-	**12,315**
Durham	-	-	95	356	12,897	-	-	-	**13,348**
Peel	-	100	124	445	-	26,338	115	58	**27,180**
Halton	-	66	-	35	-	449	8,878	397	**9,825**
Hamilton	-	-	-	-	-	17	38	12,459	**12,514**
Destinations	**1,413**	**1,993**	**19,511**	**13,997**	**12,931**	**26,935**	**9,064**	**12,914**	**98,758**

AM peak period School Bus Trips

- Source: 2006 TTS Data, Data Management Group, University of Toronto.

3.4 ACTIVE TRANSPORTATION

Table 6 summarizes the base year active transportation patterns for the AM peak period. Walking and Cycling trips were taken into account in analyzing active transportation patterns across the Region. A large proportion of the total active travel trips start and end within York Region, which is due to the limited trip length capacity of such a mode. The City of Toronto is the only adjacent municipality which produces and attracts walking and cycling trips to and from York Region.

Table 6. AM peak period Walking and Cycling Trips

To / From	Yonge Corridor	Highway 7 Corridor	Rest of York	Toronto	Durham	Peel	Halton	Hamilton	Origins
Yonge Corridor	1,443	-	1,128	78	-	-	-	-	**2,649**
Highway 7 Corridor	61	1,138	607	-	-	-	-	-	**1,806**
Rest of York	1,262	483	23,519	264	-	-	-	-	**25,528**
Toronto	18	24	262	121,692	-	118	-	-	**122,114**
Durham	-	-	-	-	23,773	-	-	-	**23,773**
Peel	-	-	-	85	-	45,150	65	-	**45,300**
Halton	-	-	-	-	-	19	15,671	-	**15,690**
Hamilton	-	-	-	-	-	-	-	22,524	**22,524**
Destinations	**2,784**	**1,645**	**25,516**	**122,119**	**23,773**	**45,287**	**15,736**	**22,524**	**259,384**

Source: 2006 TTS Data, Data Management Group, University of Toronto.

3.5 MODE SPLIT

Table 7 summarizes modal splits for trips originating from and destined to York Region. The numbers suggest that auto is the mode of choice for trips originating and destined to York Region.

Additionally, trips destined to the Region have a lower transit modal split for a number of reasons. First, the Region is served by four major 400 series highways, which provide high capacity auto alternatives and, second, the destinations in York tend to be dispersed, making transit less convenient than auto for many OD (origin destination) pairs. This is further facilitated by the fact that trips to York Region are travelling in the off-peak direction, which presents relatively low impedance in terms of auto travel times.

Table 7. AM peak period Mode Splits – Trip Productions and Trip Attractions

	Trip Origins in York Region			Trip Destinations in York Region		
Modes	Auto	Transit *	Walk / Bicycle	Auto	Transit *	Walk / Bicycle
Mode Split	78%	15%	7%	83%	9%	7%

**Transit includes the School Bus mode*

3.6 DEMAND TO CAPACITY RATIO

The demand to capacity analysis examines the capability of the auto network to address existing levels of transportation activity as well as to determine the magnitude of surplus capacity available in the auto network.

A demand to capacity analysis was completed for a number of York Region screenlines using the Region's EMME/2 model for the AM peak hour. The results are shown in **Table 8** and **Figure 4**. The screenlines were divided into sub-sections to reflect the urban nature of the Region, and to identify segments of an individual screenline that are either approaching or operating at capacity. For the purpose of this analysis, a demand to capacity ratio of greater than 0.8 was used as a threshold for identifying sub-sections of a screenline that were experiencing capacity constraints.

The York-Toronto screenline is exhibiting significant congestion due to the highly directional nature of traffic flows into the City of Toronto. Additionally, the northbound direction along the Highway 404 section of this screenline is also experiencing a high demand to capacity ratio, which is probably a function of the high-density employment lands located along Highway 404.

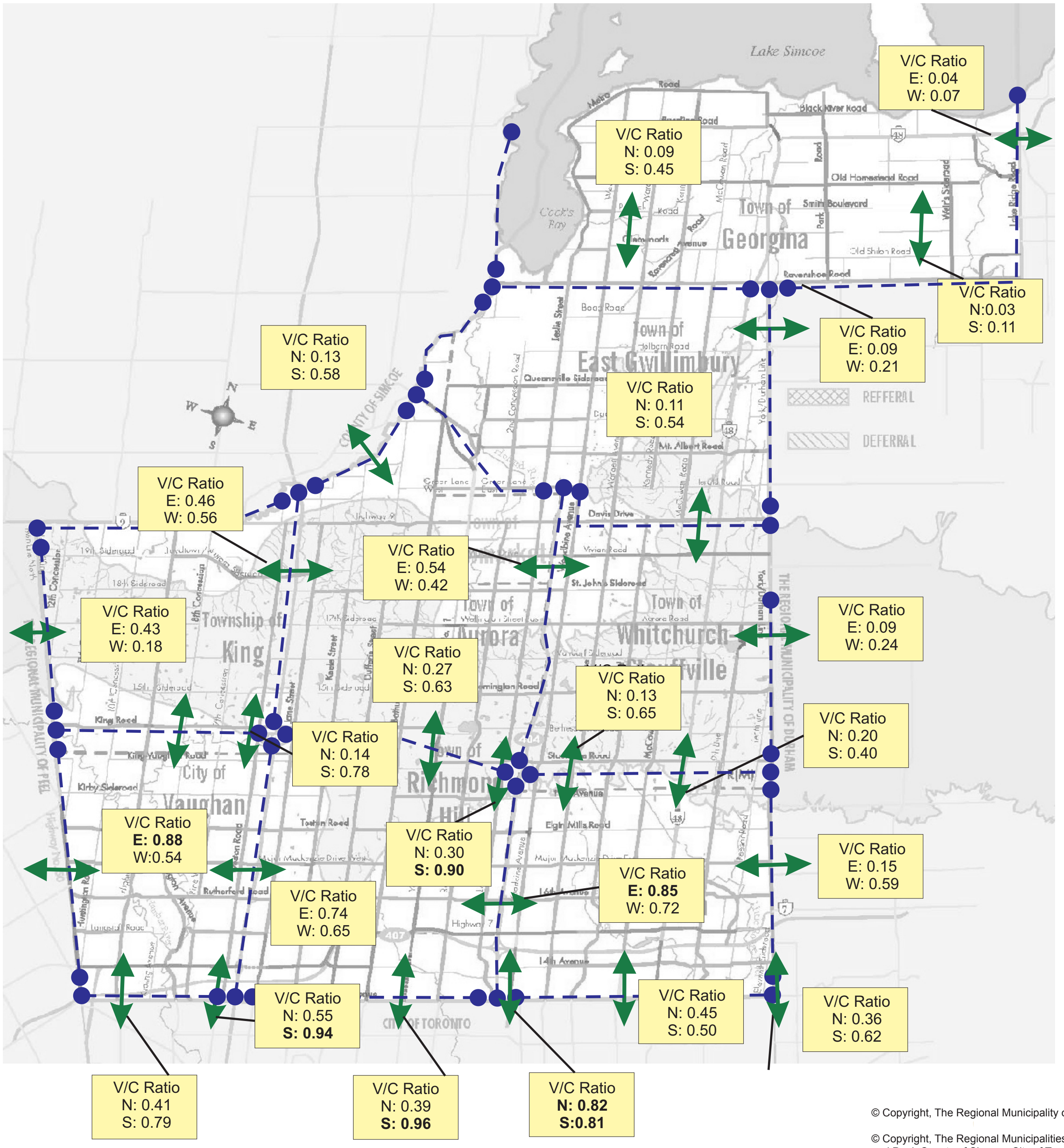
Three other screenlines (South York Cordon, Highway 404 Cordon, York-Peel Cordon) are also experiencing significant demand to capacity ratios along certain sub-sections in the peak direction (towards York Region).

For the remainder of the screenlines, there are higher varying levels of capacity available during the AM peak period.

Table 8. Demand to Capacity Ratio 2006

Screen Line	2006 Demand to Capacity Ratio	
	NB / EB	SB / WB
York-Simcoe Screenline 1	0.13	0.58
York-Durham Screenline 2	0.09	0.28
Markham Section	0.15	0.59
W.Stouffville Section	0.09	0.24
E.Gwillimbury Section	0.09	0.21
South Georgina Section	0.03	0.11
North Georgina Section	0.04	0.07
York-Peel Screenline 3	0.79	0.47
South Section	0.88	0.54
North Section	0.43	0.18
York-Toronto Screenline 4	0.53	0.79
West Vaughan Section	0.41	0.79
Highway 400 Section	0.55	0.94
Yonge Street Section	0.39	0.96
Highway 404 Section	0.82	0.81
Central Markham Section	0.45	0.50
East Markham Corridor	0.36	0.62
South York Screenline 5	0.20	0.71
South King Section	0.08	0.46
Highway 400 Section	0.14	0.78
Yonge Street Section	0.27	0.63
Highway 404 Section	0.30	0.90
Warden Avenue Section	0.13	0.65
Stouffvile Section	0.20	0.40
Highway 400 Screenline 6	0.68	0.63
South Section	0.74	0.65
North Section	0.46	0.56
Highway 404 Screenline 7	0.72	0.60
South Section	0.85	0.72
North Section	0.54	0.42
Georgina-E Gwillimbury Screen 8	0.11	0.54
Ravenshoe Screenline 9	0.09	0.45
Bathurst Screenline 10	0.58	0.85
McCowan Screenline 11	0.27	0.79

FIGURE 4



DEMAND TO CAPACITY RATIO (2006)

3.7 BASE YEAR AUTO NETWORK

The road network in the Region has been continuously extended and upgraded over time to cope with the expansion of the Region's developed areas. The existing travel patterns reveal three important linkages. First, the linkage to Toronto; second, the linkages among the various municipalities in the region; and third, the linkage to and from Peel Region.

The current road network in the Region is generally modeled on a grid system of major arterial roads spaced every 2 km in the urban areas. In rural areas of the Region, the major arterial grid is more widely spaced. However, the road network maintains the 2 km grid system with the help of major collectors and / or minor arterials. This allows the Region to upgrade the road network in the rural areas to that of the urban areas (Markham, Richmond Hill, Vaughan) when development occurs.

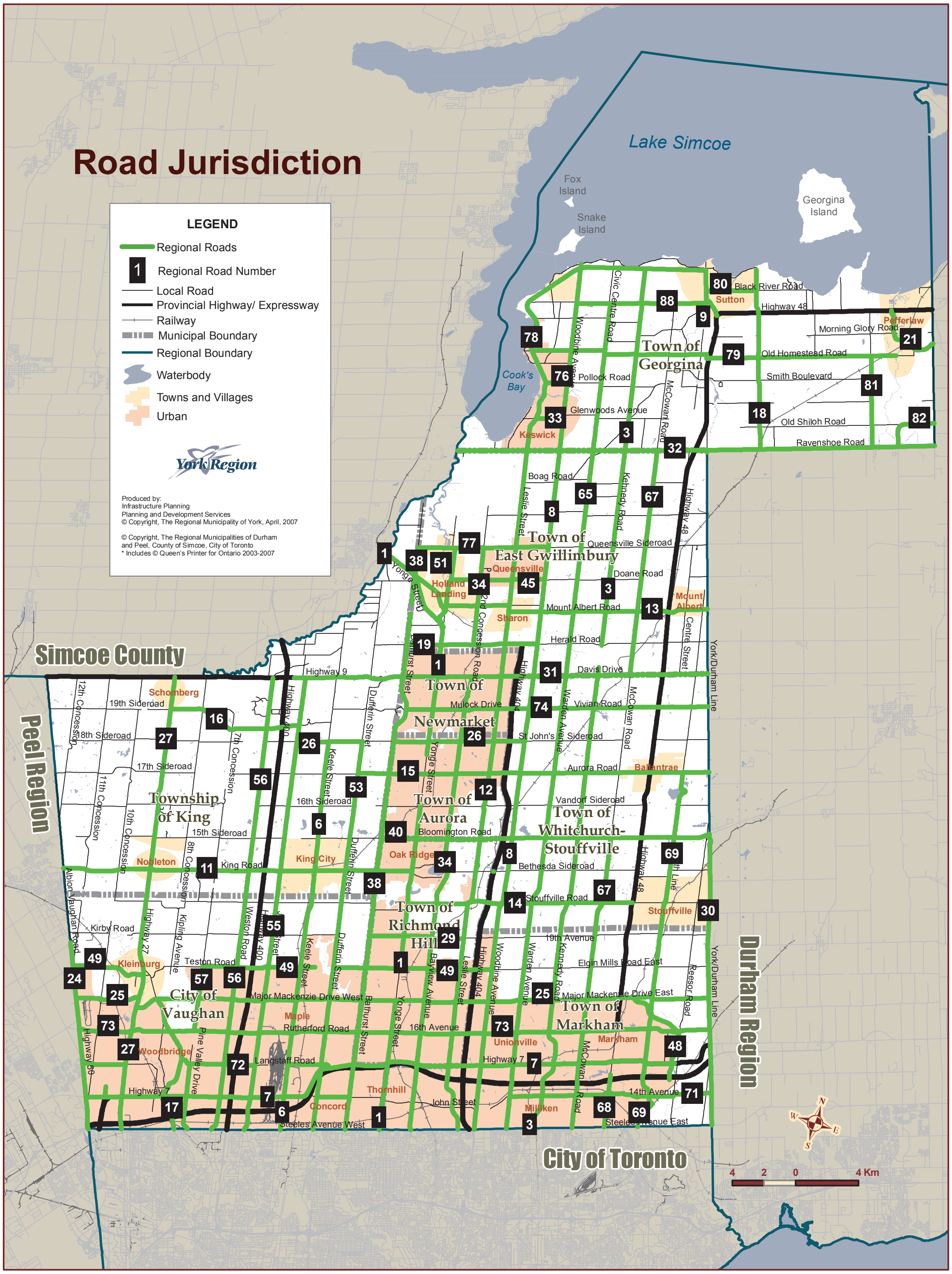
In addition to this well laid out grid pattern of major arterial roads, the Region is home to four 400 series highways. Three of these highways (Highway 427, Highway 400, Highway 404) are important north-south connections for residents and commercial vehicle traffic, whereas Hwy 407 (the longest electronic toll road in North America) provides excellent connectivity across the GTHA. **Figure 5** shows the 2006 Regional road network.

Although the Region has built a fairly effective grid of major arterials there exist some discontinuities in the road network, especially in the southern tier municipalities (Vaughan, Richmond Hill, and Markham). Of note, is the absence of a continuous east-west road between Steeles Avenue and Highway 7 west of Highway 404, which forces through traffic onto Yonge Street and consequently Highway 7. The missing Teston Road link between Dufferin and Keele street presents a challenge in terms of providing good east-west connectivity in this part of the Region, a problem that will be compounded as development intensifies in the northern areas in the City of Vaughan. Similarly, due to the termination of Langstaff Road on either side of the CP intermodal yard, through traffic divert to Highway 7 or Rutherford Road. This problem is evident once again further to the west, where Langstaff Road terminates at Islington Avenue.

In terms of north-south connectivity, the residents in the southern municipalities are presented with limited options west of Highway 400, with Pine Valley Drive discontinuous between Rutherford Road and Langstaff Road, Kipling Avenue terminating at Steeles Avenue and Martin Grove Road terminating at Highway 7. As a result of the above, significant volumes of traffic are diverted onto the remaining continuous north-south corridors such as Highway 27, Islington Avenue, Weston Road and Highway 400.

FIGURE 5

TRANSPORTATION MASTER PLAN UPDATE



ROAD JURISDICTION IN YORK REGION

3.8 BASE YEAR TRANSIT AND ACTIVE TRANSPORTATION NETWORK

The York Region transit network is also undergoing continuous expansion to meet the needs of the residents in the Region. Currently, the municipalities of Newmarket, Aurora, Vaughan, Richmond Hill and Markham have an effective network of transit lines operated by York Region Transit (YRT) and Viva. Viva currently operates five transit routes throughout the Region. Other surface transit services operated by YRT and the Toronto Transit Commission connect to the VIVA services.

The Viva routes are concentrated along Highway 7 and Yonge Street with connections to the Downsview, Finch and Don Mills subway stations. In addition to the above transit service, the Region is also served by three GO Transit Rail lines and a number of GO Bus routes. The following GO rail lines connect the Region to downtown Toronto:

- Barrie - Newmarket line;
- Richmond Hill line; and
- Stouffville line.

Recently, the Region has completed a comprehensive Pedestrian and Cycling Master Plan (PCMP) that outlines the active transportation infrastructure needs of the Region to 2031. The PCMP proposes an extensive cycling network mainly on Regional roads throughout York Region. Local municipalities are also developing local cycling master plans that complement the PCMP. Together, they will create an even more comprehensive system of pedestrian and cycling facilities across York Region.

3.9 COMMERCIAL VEHICLE TRAVEL

Goods movement is an important aspect of transportation system planning. Trucks have a significant impact on roadway capacity and operational performance. To guarantee an effective transportation network, it is essential to ensure that there is an appropriate network of truck routes across the Region linking the major industrial centers.

The Region's EMME/2 model, like most travel demand models in Canada, does not estimate or forecast commercial vehicle travel. Hence, the analysis is limited to existing conditions only. The data for this analysis was obtained from the DMG Cordon Count program, which is conducted every two years between May and June. The term "commercial vehicle" typically refers to medium and heavy vehicles. Light trucks were excluded from the analysis given the difficulty in establishing whether their usage is for personal or commercial travel. **Table 9** summarizes AM peak period data for commercial vehicles on the major corridors in the Region.

The table below indicates that Highway 400 serves as the key north-south commercial vehicle corridor carrying nearly 2,600 trucks in the AM peak period through York Region. Highway 407 serves as an important east-west truck route for commercial vehicles, carrying nearly 2,100 commercial vehicles in both directions. However, in terms of percentages, it carries the highest percentage of commercial vehicle traffic.

The 2006 Cordon Count Report prepared by MMM Group also noted that three of the five screenlines that recorded the highest percentage growth in commercial vehicle traffic between 1996 and 2006 were bordering York Region

(York-Peel Cordon, York-Simcoe Cordon, York-Durham Cordon). Similarly, two of the five screenlines with the highest numerical growth in commercial vehicle traffic from 1996 to 2006 were bordering York Region (York-Toronto Cordon, York-Peel Cordon).

The analysis completed in this section points to the growing importance of the Region as a commercial gateway in relation to the GTHA. Further, it also stands to play a very important role in the Greater Golden Horseshoe area due to the presence of a highly effective and high capacity transportation system that connects a number of municipalities and Regions. York Region is cognizant of this fact and has recognized the need to implement major infrastructure improvements that will move not only people, but also goods in a sustainable manner.

Table 9. 2006 Truck Volumes

Station Description	Direction	Truck Medium	Truck Heavy	Truck Heavy With Trailer	Total Truck	Total Vehicles	Percentage of Truck
Hwy 400 North of Steeles Ave West	N	499	723	27	1,249	18,723	7%
Hwy 400 North of Steeles Ave West	S	516	769	25	1,310	24,301	5%
Sub-Totals		**1,015**	**1,492**	**52**	**2,559**	**43,024**	**6%**
Hwy 404 North of Steeles Ave East	N	275	377	6	658	17,624	4%
Hwy 404 North of Steeles Ave East	S	270	333	1	604	26,007	2%
Sub-Totals		**545**	**710**	**7**	**1,262**	**43,631**	**3%**
Hwy 407 East of Highway 400	E	486	584	29	1,099	13,704	8%
Hwy 407 East of Highway 400	W	454	485	47	986	12,490	8%
Sub-Totals		**940**	**1,069**	**76**	**2,085**	**26,194**	**8%**
Hwy 7 East of Highway 400	E	102	154	2	258	8,363	3%
Hwy 7 East of Highway 400	W	145	169	4	318	4,698	7%
Sub-Totals		**247**	**323**	**6**	**576**	**13,061**	**4%**

4.0 MODEL APPLICATION

4.1 TESTING OF LAND USE SCENARIOS

During the course of this Transportation Master Plan Update, a number of different land use concepts for 2031 were tested as part of Phase 1 of the project. The intent was to use the travel demand model to quantify the impacts of each land use concept to help in determining a short list of possible future land use scenarios that the Regional staff would detail for further analysis.

> "You can start with land use, or you can start with transportation; in either case, the basic feedback lead inevitably to a hierarchy of central places and transportation links connecting them" (Moore and Thorsnes)

It is well understood and documented that change in transportation technology, investment and service characteristics can change the overall accessibility of the system and that of a particular location with respect to its competitors. Changes to the built environment, specifically land use, as identified in the Province's requirement of 40% land use intensification, can drastically affect activity patterns by altering trip generation, trip distribution (destination choice) and modal split, for both passenger and freight trips. These changes can be quantified by estimating the shift in the number of trips, trip lengths and mode choices, amongst other variables. For the purpose of this TMPU, it was important to quantify the impact that each of the different land use scenarios was expected to have on the transportation infrastructure.

As a result of the above, four different land use scenarios were identified for Phase 2 testing. These are:

1. 2031 30% Intensification – Only 30% of the new growth by 2031 will be in areas of the Region that are within existing built boundaries. The rest are in designated green fields and areas requiring boundary expansion;

2. 2031 40% Intensification – Only 40% of the new growth by 2031 will be in areas of the Region that are within existing built boundaries. The rest are in designated green fields and areas requiring boundary expansion;

3. 2031 50% Intensification – Only 50% of the new growth by 2031 will be in areas of the Region that are within existing built boundaries. The rest are in designated green fields and areas requiring boundary expansion; and

4. 2031 No Expansion – 100% of the new growth by 2031 will be in areas of the Region that are within existing built boundaries.

The remainder of Section 4.1 summarizes the key difference between the four 2031 land use scenarios using the metrics reported from the travel demand model. The 2031 road and transit network developed by the 2002 TMP was used for this analysis and it was kept constant across each of the land use scenarios.

4.1.1 Individual Travel Characteristics

The 2031-30% land use scenario was used as a base to estimate the change expected in auto and transit travel between each scenario. As shown in **Figure 6**, the trend across the land use scenarios is logical. First, as the land use intensification increases, the percent growth in vehicle-kilometres traveled (VKT) by auto decreases, with a complementary increase in percent growth for transit trips per capita. Second, greater magnitudes of decrease in VKT per capita are accompanied by larger percent increases in transit trips per capita.

In addition, the actual VKT has decreased and the transit trips per capita has increased between 2006 and the four land use scenarios as shown in **Table 10**.

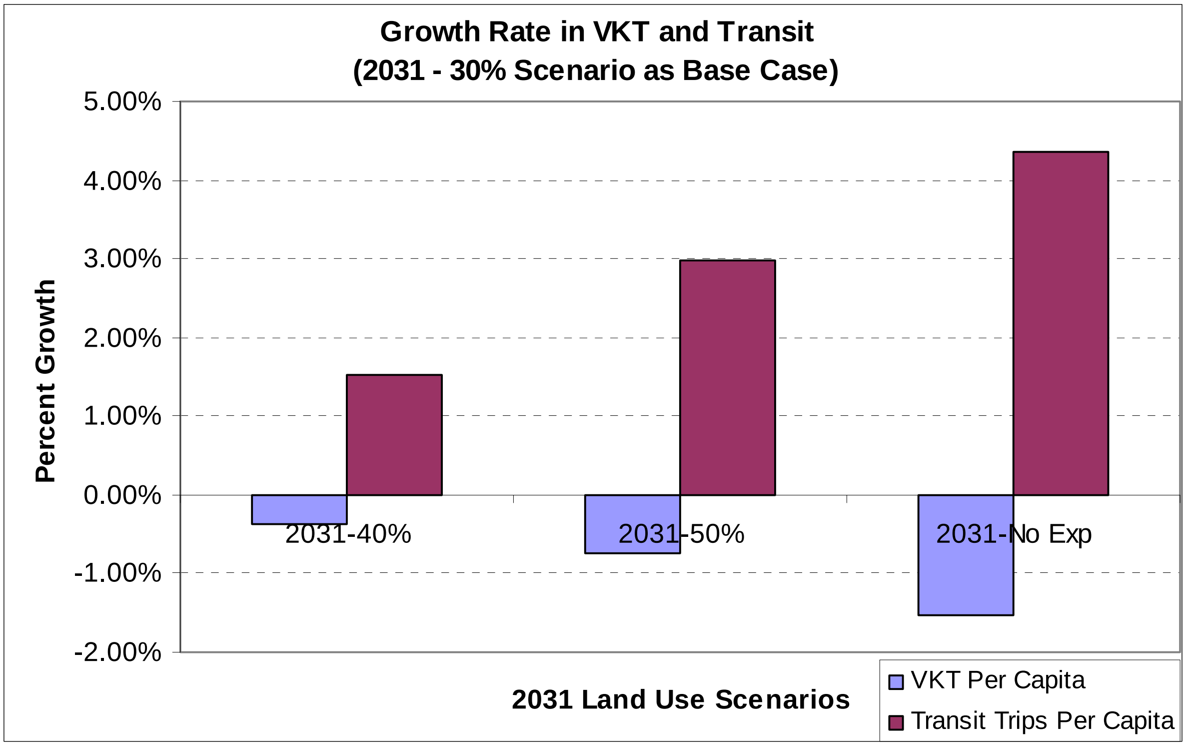


Figure 6. Auto and Transit Travel

Table 10. York Region VKT and Transit Trips Per Capita – AM Peak Period

Performance Measures	2006	2031-30%	2031-40%	2031-50%	2031-No Exp
VKT Per Capita	2.67	2.66	2.65	2.63	2.59
Transit Trips Per Capita	0.051	0.066	0.067	0.069	0.072

4.1.2 Attractiveness of Transit (transit excludes school bus trips)

In general, transit mode shares are expected to increase across all the 2031 scenarios for each of the origin-destination pairs shown in **Figure 7**. The largest growth in transit mode share is expected between the Region of York and the Regional Centers and Corridors, as shown in **Table 11**.

Figure 7. AM Peak Period Transit Modal Splits (2006 – 2031)

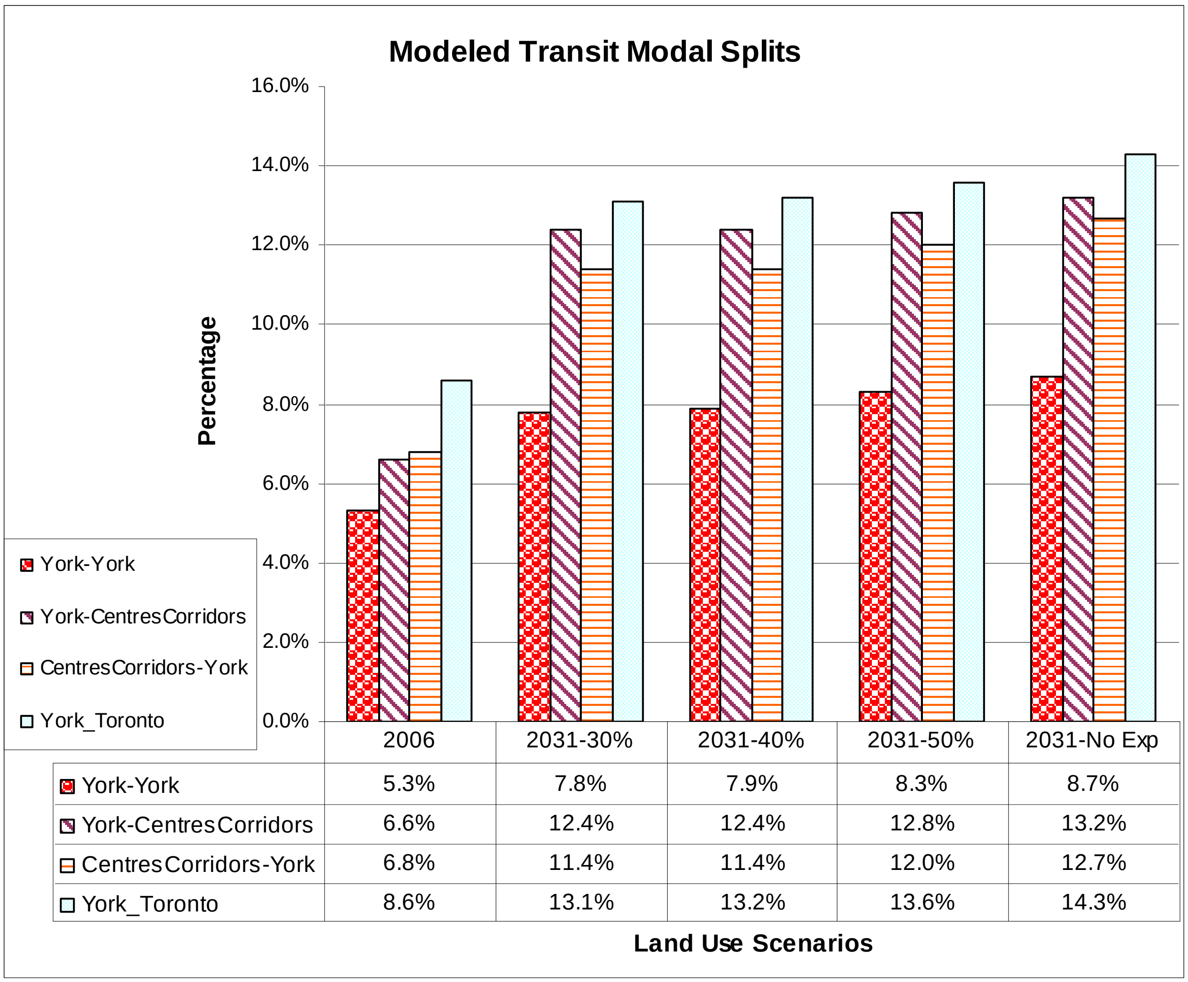


Table 11 . Growth in Mode Shares (Relative to 2006 - Base Case)

Performance Measures	2031-30%	2031-40%	2031-50%	2031-No Exp
Mode Share (York-York)	47%	49%	57%	64%
Mode Share (York-Centres/Corridors)	88%	88%	94%	100%
Mode Share (Centres/Corridors-York)	68%	68%	76%	87%
Mode Share (York-Toronto)	52%	53%	58%	66%

Although the growth in transit mode splits shown in Table 13 is quite significant when compared to 2006, it is not noteworthy in terms of actual numbers (11% to 14% for the four 2031 land use scenarios as compared to 5% to 8.5% in 2006). The above results represent the attractiveness of transit only due to changes in land use. To fully appreciate the expected changes in travel behavior, the 2031 transportation infrastructure would need to complement the land use intensification proposed for 2031. Section 5.0 documents changes to the 2031 travel patterns with respect to a transportation system that is sensitive to the preferred 2031 land use as well as to policy implications.

4.1.3 System-wide Impact

As seen in **Table 12**, a one percent drop in vehicle kilometers traveled (VKT) is associated with a more than two percent drop in vehicle hours traveled (VHT). This difference is magnified further as the intensity in the land uses increases.

Table 12. System-wide Performance

Performance Measures	2031-30%	2031-40%	2031-50%	2031-No Exp
VKT (AM Peak Hour)	4,003,610	3,980,280	3,942,976	3,887,215
Change*		-0.6%	-1.5%	-2.9%
VHT (AM Peak Hour)	80,591	79,399	7,728	75,142
Change*		-1.48%	-3.55%	-6.76%

** 2031-30% land use scenario used as base case*

4.1.4 Bike and Pedestrian Travel

The York Region Model does not estimate bike and pedestrian travel in the modal split sub-model. Thus, a simple approach that uses travel distance as an indicator of bike and pedestrian travel was postulated to estimate the number of bike and pedestrian trips each land use scenario can be expected to generate. **Figure 8** below shows the number of trips for each scenario (at the 2031 horizon) that are expected to be less than 5 km. This threshold (5km or less) represents the assumption that the probability of making a non-motorized trip, such as cycling and walking reduces as the trip length increases beyond 5 km.

The current (2006) York Region Model significantly over predicts the number of short distance trips (those that are less than or equal to 5km) for the 2006 horizon. This results in a significant over-prediction of cycling and walking trips when compared to the 2006 TTS data. Thus, a correction factor was applied to estimate the number of non-motorized trips for the four 2031 land use scenarios.

As expected, there are marginal differences between the 30% and 40% intensification scenarios. The 50% and “no expansion” scenarios are expected to witness a nearly 2% and 5% increase in non-motorized trips when compared to the 2031 30% intensification scenario, respectively.

Figure 8. Non - Motorized Trip Making

York EMME/2 Model Auto Driver/Passenger Trips(<=5km)	2006	2031-30%	2031-40%	2031-50%	2031-No Expansion
York - GTA	94,295	112,562	113,891	115,205	119,401
GTA - York	95,169	114,209	115,468	116,682	120,730
York - York	91,178	109,414	110,651	111,818	115,742
Total	280,642	336,185	340,010	343,705	355,873

2006 TTS Data Auto Driver / Passenger Trips (<=5km)	Driver/Pass Trips (<=5 km)	Total Cycle/Walk Trips	Ratio Cycle/Walk Trips
York - GTA	4,515	148	3%
GTA - York	4,648	105	2%
York - York	79,302	18,427	23%
Total	**88,465**	**18,680**	**21%**

Cycle and Walk Trips	2006 TTS	2006 Model Estimated	Correction Factor	2006 Annual Trips	2031-30% Annual Trips *	2031-40% Annual Trips *	2031-50% Annual Trips *	2031-No Expansion Annual Trips *
York - GTA	148	3,091	0.047882		441,677	446,892	452,048	468,512
GTA - York	105	2,150	0.048839		315,017	318,490	321,838	333,004
York - York	18,427	21,187	0.869749		55,281,202	55,906,194	56,495,818	58,478,411
Total	**18,680**	**26,427**	**-**	**46,700,000**	**56,037,896**	**56,671,575**	**57,269,704**	**59,279,927**

* Annual Trips
AM Pk Hour to Daily Expansion Factor 10
Daily to Yearly Expansion Factor 250

4.1.5 Summary

The transportation analysis has so far shown marginal differences in expected travel patterns between the 30% intensification and 40% intensification scenarios. Thus, the transportation impacts from these two scenarios are expected to be similar on a Regional basis. Logically, one can expect that the 40% intensification scenario would produce more sustainable travel behavior on a local level as the intensity increases. This trend is also seen in the results for the 50% and “no expansion” scenarios. Presumably York Region and the local municipalities would also introduce a policy framework that would focus growth along transit corridors. The Regional model is not designed to be sufficiently sensitive to capture such impacts.

Based on the above analysis of the performance measures across the four land use scenarios, the 2031 no expansion scenario is the most preferred from a purely transportation perspective, followed by the “50% intensification” scenario. There are significant differences between the two scenarios, specifically in terms of transit attractiveness and system-wide impacts on travel time and kilometres traveled, as seen in Tables 2 and Table 3.

The transportation metrics analyzed and reported in this section were fed into a broader analytical framework for selecting the preferred land use scenario that reflects other factors besides transportation, including municipal servicing, human services, environmental, fiscal, economic and stakeholder acceptability.

Towards the end of Phase 2 of this project, the Region chose the “40% intensification scenario” as the recommended 2031 land use scenario. The modeling carried out in Phase 3 reflects this recommended land use scenario.

4.2 METHODOLOGY FOR DEVELOPING 2031 RECOMMENDED TRANSIT AND AUTO NETWORKS

Traditionally, future road and transit networks are developed by accounting for projected screenline capacity deficiencies on a horizon year (2031) network that includes committed and recommended transportation projects. The 2002 TMP adopted a somewhat similar approach to developing a recommended network while using a **“Transit Focus”** policy in order to meet the Region’s Official Plan target of 33% transit usage during peak periods. The 2002 TMP tried to achieve this by developing a better “balanced” network, through significant emphasis on major transit projects along with continued road network expansions with the necessary policies and programs needed to support it.

For the purpose of this Transportation Master Plan Update, a **“Transit First”** approach was adopted. The key difference between the two approaches is the realization that a “balanced” network of roads and transit cannot achieve the Region’s Official Plan targets and make the transportation system truly sustainable. In other words, for one transportation mode to succeed, the capacity and consequently the level-of-service on competing modes have to be constrained or limited.

This approach represents a fundamental shift in the traditional decision-making process used for developing future recommended networks, for the following reasons:

1. As noted above, it acknowledges that a “balanced” road and transit network cannot achieve sustainability targets outlined by the Region;

2. It initiates the decision-making process by heavily favouring a particular transportation mode (transit in this case) with the intention of forecasting the “theoretically maximum” usage of the transit mode (2031 Bold Transit Network);

3. The “constrained” transportation mode (auto mode) includes only those committed projects that are already in the planning or design phase. This creates a heavily transit-oriented horizon year network and a congested auto network; and

4. It employs an iterative procedure whereby transit projects (the favoured transportation mode) that do not exhibit sufficient ridership levels needed to support that particular transit technology are moved to a “lower rung” in the transit technology ladder, while new road projects are added to the network to reduce auto congestion in alternate iterations of the model run.

The process described above is analogous to techniques used in finding optimal solutions for equations with two unknowns, where one parameter is normalized (nullifying the effect of the parameter), which leaves only one unknown parameter to be estimated.

In this case, impacts from changes to the transit infrastructure were not normalized but were “controlled” in order to isolate the effects of improvements made to the auto network. The other key advantage of this process is in the knowledge that since the “theoretical maximum” usage of transit in the Region had been reached using the “2031 Bold Transit Network”, any new model run will either maintain those transit demand levels or drop them. This eliminates the uncertainty involved in the direction of transit usage (increase or decrease) because of changes to the road and transit network. Further, it allows the analyst to specify a threshold, if needed, for minimum transit usage across the system to stop the iterative decision-making process.

The logic of the decision-making process for this stage of the analysis is shown in **Figure 9**. The changes to the network prior to each model run were a function of a number of mode-specific and system-wide metrics. For example, the magnitude of improvements introduced in the auto network in every alternate model run depends on the performance of the auto system metrics and the characteristics of the sub-area being targeted for improvement. The list of road projects used for testing was derived from the 2002 TMP.

In addition, the following road issues were tested. Section 5.2.2 documents each of these road issues in detail.

- Bradford Bypass;
- GTA West Corridor;
- Hwy 427 extension to the GTA West Corridor;
- Hwy 427 extension to Highway 9;
- Mid-York East-West Corridor;
- North Markham East-West Arterial;
- 400 Series Highways Mid-block crossings;
- Transit / HOV Lanes; and
- Extension of Teston Road between Dufferin Street and Keele Street

The metrics used for assessing each model run are documented in **Section 4.4**.

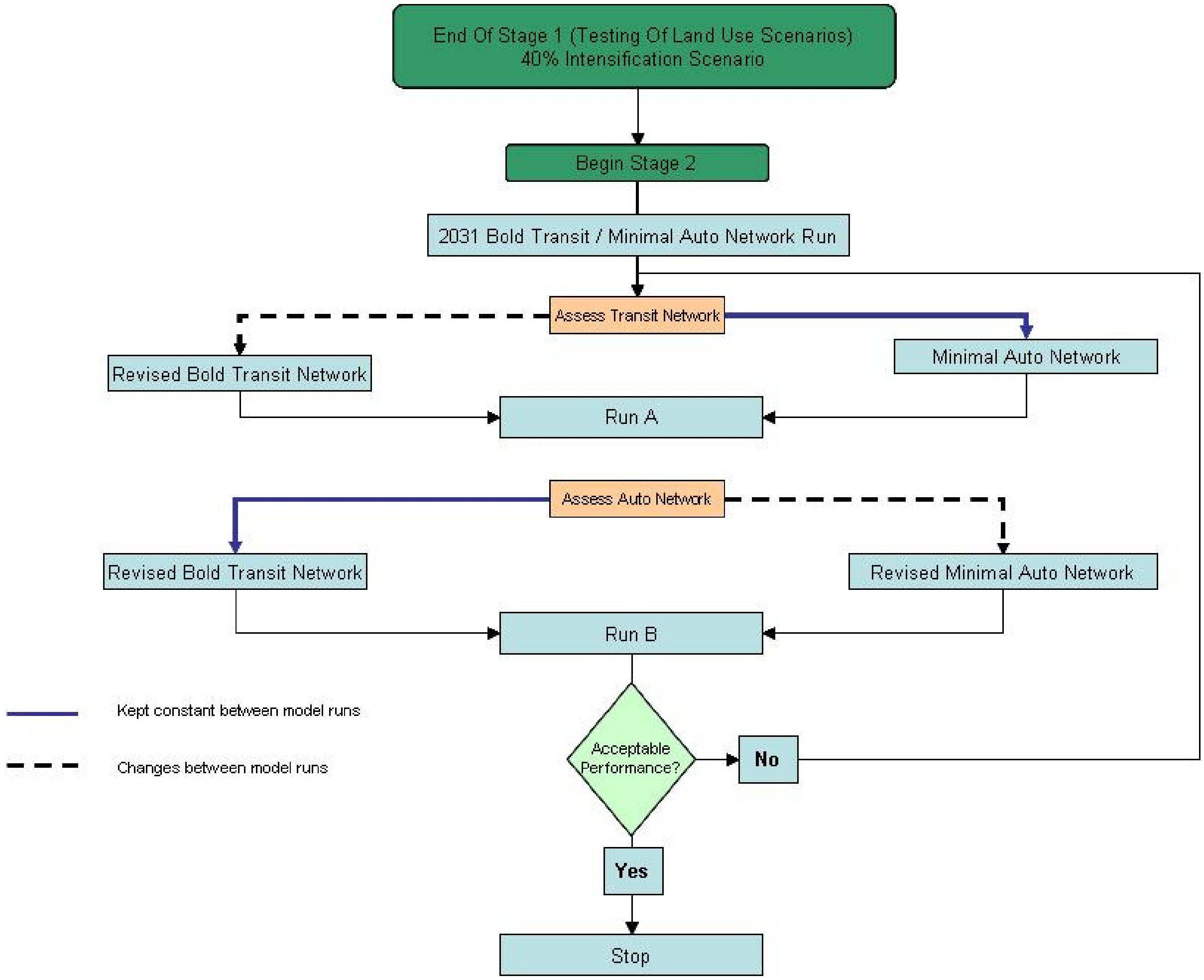


Figure 9. 2031 Recommended Network Development Process

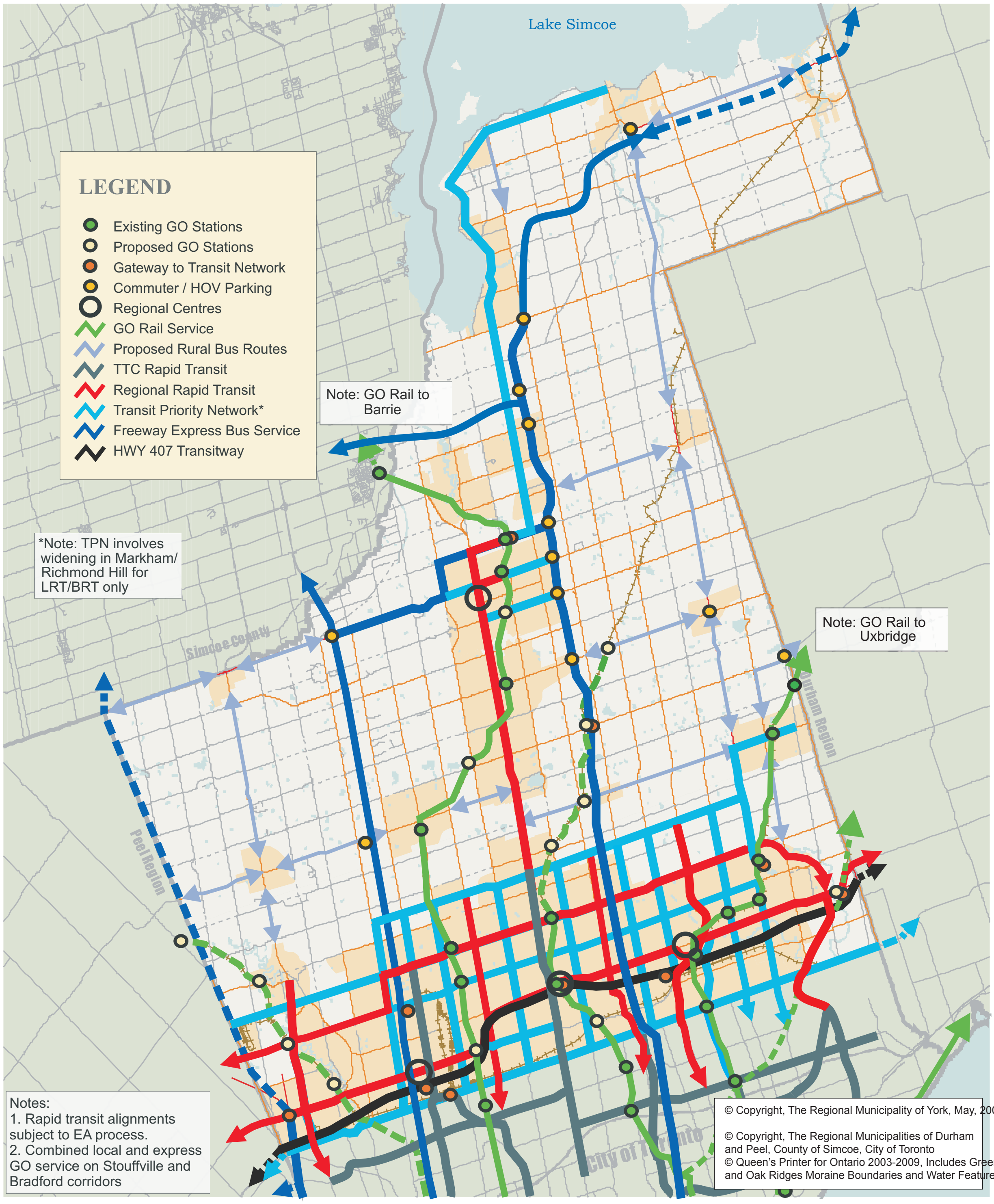
4.3 FUTURE NETWORK CONCEPTS

The first step in the process involved creating the “2031 Bold Transit Network” and “2031 Minimal Auto Network”. These two networks represent the favoured (transit) and constrained (auto) networks for initial model run testing. The salient features of the two networks are listed below.

4.3.1 2031 Bold Transit Network

- The goal was to develop a grid of Rapid Transit Corridors (RTCs) to serve the southern tier municipalities in the Region, as shown in **Figure 10**;
- The RTCs on Highway 27 and on the proposed Donald Cousens Parkway are intended to create a loop system that increases connectivity and attractiveness;

FIGURE 10


Lake Simcoe
LEGEND
Existing GO Stations
Proposed GO Stations
Gateway to Transit Network
Commuter / HOV Parking
Regional Centres
GO Rail Service
Proposed Rural Bus Routes
TTC Rapid Transit
Regional Rapid Transit
Transit Priority Network*
Freeway Express Bus Service
HWY 407 Transitway
Note: GO Rail to Barrie
*Note: TPN involves widening in Markham/ Richmond Hill for LRT/BRT only
Simcoe County
Note: GO Rail to Uxbridge
Durham Region
Peel Region
City of Toronto
Notes:
1. Rapid transit alignments subject to EA process.
2. Combined local and express GO service on Stouffville and Bradford corridors
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- Strong connectivity with the City of Toronto's "Transit City" initiative, linking to each north-south TTC project;

- Extensions of the Yonge and Spadina subways to Elgin Mills Road and Major Mackenzie Drive, respectively;

- Interspersed between these RTCs, an extensive Transit Priority Network (TPN) was proposed on the major arterial roads, with the intention to improve "conventional bus" and other auxiliary transit (HOV) connections to these RTCs; and

- A linear system of freeway express bus service on Highways 400, 404 and 407 along with five GO Rail Lines and a number GO Bus routes complete the "2031 Bold Transit Network."

4.3.2 2031 Minimal Auto Network

- The 2031 Minimal Auto Network includes the following road assumptions:

- Existing base year (2006) auto network;

- Road projects in the Region's 10-year Capital Works Plan with EA approval or study completed; and

- Committed projects from the Ministry of Transportation (MTO) such as the extension of Highway 404 to Ravenshoe Road, the Highway 427 extension to Major Mackenzie Drive and the provision or extension of HOV lanes on Highway 400 and Highway 404, respectively.

4.4 SYSTEM AND MODE-SPECIFIC METRICS FOR ASSESSING ROAD AND TRANSIT NETWORKS

At the outset of this Transportation Master Plan Update, 11 sustainability principles and key performance measures that help in quantifying these principles were developed. These performance measures (mode-specific and system-wide metrics) were used for assessing auto and transit performance for every iteration of the model. A description of the metrics and the sustainability principles that it adheres to are documented in **Table 13**.

Table 13. Key Performance Metrics

Principle	Key Performance Measures	Note
1. Integrate Transportation And Land Use Planning	Average Auto and Transit trip lengths (centers / corridors)	System-wide
	Overall Average Auto and Transit Trip lengths	
	Average Auto and Transit trip times	
	Overall Average Auto and Transit Trip times	
2. Protect and Enhance our Environment and Cultural Heritage	% of lane-kms of congested roads in the Greenbelt	System-wide
	Environmental constraints	
3. Support our Economic Well-Being	Overall % of lane-kms of congested roads	System-wide
	Congested Speeds (centers/corridors)	
	V/C plots along screenlines (broken up by urban area segments)	System wide and project specific
4. Provide Access and Mobility to Everyone	Modal Split (centers/corridors overall)	System-wide
	Transit Trips per Capita (annually)	
5. Adopt Energy Efficient (Carbon Neutral) Transportation System	VKT in Region (annual)	System-wide
	VHT in Region (annual)	
6. Put Pedestrian and Transit First	Estimated Pedestrian / bicycle trips (proportion of trips less than 5 km)	System-wide
7. Implement and Support Transportation Demand Management Initiatives	Average Vehicle Occupancy	Cannot be estimated from EMME/2 Model
8. Implement and Support Transportation Supply Management Initiatives	Transit volume thresholds for different transit technologies (LRT, BRT, subway extension)	Project specific
9. Ensure Fiscal Sustainability and Equitable Funding	Comparison of capital and operation costs	Documented in Chapter 8 of the TMPU document
9. Further Encorage Communications, Consultation and Public Engagement		Cannot be estimated from EMME/2 Model
11. Conduct On-going Performance Measurement and Monitoring		Cannot be estimated from EMME/2 Model

Three of the eleven principles cannot be measured using the EMME/2 model due to either the structure of the YRTDF model or the non-network nature of the metric. For example, Principle 7 is a transportation network measure using average vehicle occupancy as a metric. However, it cannot be measured because the YRTDF model cannot currently estimate HOV demand. Principle 9 is documented in Chapter 8 of the YRTMPU document, whereas, Principle 10 and Principle 11 are non-network related.

4.4.1 Transit Ridership Thresholds

In order to develop the 2031 transit network and the different transit technologies (TPN, BRT/LRT, Subway) across the Region, a detailed analysis was carried out to establish transit ridership thresholds for each technology. The primary source for reviewing and developing the transit threshold for each technology was the "Transit Capacity and Quality Manual", 2nd Edition, published by the Transportation Research Board. It is important to note that the final ridership thresholds shown in Table 14 are cognizant of the perceptions of commuters and the public in York Region, as well as local conditions and experiences gained from the Viva project implemented by the York Region Rapid Transit Corporation. The final transit ridership thresholds were developed in consultation with York Region Rapid Transportation staff. **Table 14** documents the thresholds used in the analysis.

Table 14. Transit Ridership Thresholds

Mode	Demand (passengers/hour)	Desirable Vehicle Loading	Frequency (minutes)
Conventional Bus	20-400	10-30	30-5
Transit Priority Network (TPN)*	400-1,000	35-55	5.5-3.5
Bus Rapid Transit (BRT)	1,000-2,400	55-100	3.5-2.5
Light Rail Transit LRT)	2,400-8,400	270-400	6.5-3
Subway	> 8,400	1,250	< 8

**The TPN constitutes HOV lanes and transit signal priority plus queue jump lanes for regular buses*

As noted in Table 14, the BRT / LRT transit technology category has a considerable ridership range. This was done to account for the significantly different "grades" (BRT light, full BRT, LRT at-grade, LRT grade-separated etc.) of rapid transit service that can exist within the system. Detailing these different technologies and their final transit corridors is expected to be completed as part of the Transit Environmental Assessments that will be carried out for each of the major transit projects. Further, the type of rapid transit technology is heavily influenced by factors other than transit ridership alone, such as right-of-way acquisition, construction feasibility, and detailed environmental analysis etc, which are beyond the strategic nature of this Transportation Master Plan Update.

4.4.2 Volume to Capacity (V/C) Ratio Thresholds

As noted in Section 4.2, for the transit mode to succeed in fulfilling its sustainability goals, the auto mode needs to be constrained. However, once the "theoretical maximum" transit usage across the screenlines has been established (iteration #1 of the model runs), it is essential to address, at least partially, "chronically" congested (V/C>1.0) sub-sections of those screenlines where auto demand has exceeded auto capacity, even with significant transit infrastructure in place. In order to do so, sub-sections of screenlines that are expected to approach or operate at capacity by the 2031 horizon year were defined using three V/C ratio thresholds. First, a V/C ratio between 0.8 and 0.9, which indicates that the screenline is beginning to experience congestion; second, 0.9 and 1.0, which indicates that the screenline is experiencing significant traffic volumes across the cordon with very limited surplus capacity; finally, a V/C ratio of greater than 1.0 indicates that traffic volumes have exceeded the available capacity in the respective cordon, resulting in excessive delay to motorists.

The above V/C ratio screening was applied to each alternate model run to test the performance of the auto network.

5.0 2031 RECOMMENDED NETWORKS

5.1 NETWORK OBJECTIVES

5.1.1 2031 Transit Network Objective

The decision-making process noted in Section 4.2 was used for developing the 2031 transit network. The key goal of the recommended transit network was to develop a form of sustainable transportation that provides accessibility for all age groups. The proposed inter-connected Rapid Transit Corridors (RTCs), subways and transit priority networks are intended to provide a cost effective and efficient transportation system that maximizes transit mobility throughout the Region. Along with furthering the Region's sustainability vision, the recommended transit network has the following goals:

- Make transit the "mode of choice" for both residents and commuters into, out of and within the Region;
- Enhance integration between YRT, Viva and other regional transit service providers such as GO Transit, the Toronto Transit Commission, and operators in Durham and Peel Region;
- Provide transit choices to residents in the rural areas of the Region by establishing rural bus routes that connect these residents to high capacity and high speed transit services;
- Develop a high speed and high capacity transit network along the major east-west and north-south corridors to reflect the future re-development and growth potential of the Region; and
- Support the economic development goals of the Region and constituent municipalities.

5.1.2 2031 Auto Network Objective

The future recommended auto network had two primary objectives. The first objective was to increase the attractiveness of transit as the preferred mode of travel, especially in the southern tier municipalities of the Region. It accomplished this by resticting all roadway expansions that were for the sole use of single occupant vehicles (SOV) to four lanes in the urbanized area of the Region. Further, any roadway expansions to six lanes were reserved for either accomodating RTCs or a TPN such as HOV/transit lanes.

The second objective was to ensure the availability of a high capacity and well connected auto network that would serve the growing areas of the Region. In these areas, two-lane arterial roads are proposed to be widened to four-lanes for improving accessibility and capacity.

In general, Regional roads in the rural areas of the Region will remain in their present form as two-lane rural arterial roads to maintain basic accessibility as well as provide inter-regional links.

The decision-making process developed for this TMPU and consequently the recommended 2031 transit and auto network is contingent on the fact that people living and working in the Region and the GTAH will change their travel behavior in response to changes in the urban structure and form, and the supporting transportation infrastructure. While this is true to a certain extent, it is prudent to include policy based factors that play an equal if not bigger role in changing travel behavior.

Thus, the TMPU tested quantifiable policy-based initiatives on the 2031 transit and auto network that was based on transportation infrastructure improvements only. The results of these two scenarios are summarized below.

5.2 SCENARIO 1: 2031 NETWORK-NO POLICY BASED INITIATIVES (TRANSPORTATION INFRASTRUCTURE CHANGES ONLY)

5.2.1 Transit Network

The recommended 2031 transit network without any policy based initiatives is shown in **Figure 11**. The "transit first" philosophy of the TMPU is apparent in this grid of transit infrastructure.

The east-west RTCs are focused along Highway 7, Major Mackenzie Drive and Steeles Avenue, whereas, the north-south RTCs are focused along Jane Street, Leslie/Don Mills, Warden, 9th Line and Yonge Street based on the ridership thresholds established for this TMPU. The majority of other major east-west and north-south arterial roads are expected to have some form of TPN measure to serve auxillary transit (HOV) and regular bus services. The transit network also includes two TTC subway extensions; the Spadina subway to Jane Street and the Yonge subway to Highway 7.

The final peak ridership estimates for each of the recommended transit projects under this scenario is shown in **Table 15** and changes to the system-wide metrics are shown in **Table 16.** As the intensity (transit technology) of the transit network is lowered and improvements to the auto network are introduced, the metrics tend to shift towards a more "auto friendly" environment (evident in the results for the "bold" transit network compared to those of the recommended network), which is consistent with the logic of the decision-making model developed for the purpose of this study.

Notes:
1. Rapid transit alignments subject to EA process.
2. Combined local and express GO service on Stouffville and Bradford corridors

2031 TRANSIT NETWORK (NO POLICY-BASED INITIATIVES)

Table 15. Peak Ridership Estimates

Transit Project	From	To	Bold Transit Network Peak Hour SB / WB	Bold Transit Network Peak Hour NB / EB	Bold Transit Network Technology	Run 4 Peak Hour SB / WB	Run 4 Peak Hour NB / EB	Run 4 Technology
Yonge Subway	19th Ave E/W corridor	Major Mac	3,261	452	LRT/BRT	3,144	464	LRT/BRT
	Major Mac	Hwy 7	7,453	284	LRT/BRT	7,303	299	LRT/BRT
	Hwy 7	Steeles Ave	10,670	468	Subway	10,509	488	Subway
Spadina	Hwy 7	Steeles Ave	4,655	831	LRT/BRT	4,814	836	LRT/BRT
Yonge	19th Ave E/W corridor	Davis Dr	3,036	435	LRT/BRT	2,954	430	LRT/BRT
	Davis Dr	Green Lane	110	69	Conventional Bus	553	36	TPN
Hwy 7	York/Durham Bndry	Kennedy LRT	1,617	365	LRT/BRT	1,640	488	LRT/BRT
	Kennedy LRT	Yonge St	2,456	2,935	LRT/BRT	2,336	3,110	LRT/BRT
	Yonge St	Dufferin St	920	495	TPN	874	455	TPN
	Dufferin St	Jane St	947	498	TPN	885	495	TPN
	Jane St	York / Peel Bndry	682	399	TPN	680	387	TPN
19 Avenue E/W corridor	Hwy 48	Yonge St	15	264	Conventional Bus	217	234	Conventional Bus
	Yonge St	Weston Rd	191	155	Conventional Bus	167	167	Conventional Bus
Jane	19th Ave E/W corridor	Major Mac	68	58	Conventional Bus	98	86	Conventional Bus
	Major Mac	Hwy 7	1,953	217	LRT/BRT	1,513	313	LRT/BRT
Davis	Yonge St	Hospital	516	177	TPN	490	175	TPN
Green Ln	Yonge St	GO Station	56	72	Conventional Bus	437	33	TPN
Major Mac	Markham	Kennedy	2,113	281	LRT/BRT	2,035	316	LRT/BRT
	Kennedy	Yonge St	2,411	700	LRT/BRT	2,400	714	LRT/BRT
	Yonge St	Weston Rd	1,048	881	LRT/BRT	1,028	865	LRT/BRT
DCP	Major Mac	Hwy 7	85	72	Conventional Bus	60	70	Conventional Bus
	9th Line	Steeles Ave	208	45	Conventional Bus	162	60	Conventional Bus
Weston	Major Mac	Rutherford Rd	757	110	TPN	767	110	TPN
	Rutherford Rd	Steeles Ave	586	230	TPN	899	5	TPN
Rutherford	Weston Rd	Hwy 27	76	110	Conventional Bus	63	140	Conventional Bus
Hwy 27	Nashville Rd	Hwy 7	289	135	Conventional Bus	258	115	Conventional Bus
	Hwy 7	Steeles Ave	414	184	TPN	344	260	Conventional Bus
Keele	19th Ave E/W corridor	Major Mac	248	134	Conventional Bus	5	5	Conventional Bus
	Major Mac	Hwy 7	351	395	Conventional Bus	671	5	TPN
	Hwy 7	Steeles Ave	388	360	Conventional Bus	773	591	TPN
Dufferin	19th Ave E/W corridor	Major Mac	243	115	Conventional Bus	6	6	Conventional Bus
	Major Mac	Steeles Ave	550	370	TPN	255	322	Conventional Bus
Bathurst	19th Ave E/W corridor	Major Mac	481	169	TPN	888	5	TPN
	Major Mac	Hwy 7	549	147	TPN	909	5	TPN
	Hwy 7	Steeles Ave	447	94	TPN	965	5	TPN
Bayview	19th Ave E/W corridor	Major Mac	123	7	Conventional Bus	640	5	TPN
	Major Mac	Hwy 7	368	222	Conventional Bus	590	5	TPN
	Hwy 7	Steeles Ave	1,167	76	LRT/BRT	421	5	TPN
Leslie	19th Ave E/W corridor	Major Mac	737	118	TPN	579	69	TPN
	Major Mac	Hwy 7	626	184	TPN	422	93	TPN
	Hwy 7	Steeles Ave	478	629	TPN	414	805	TPN
Kennedy	19th Ave E/W corridor	Major Mac	56	33	Conventional Bus	46	32	Conventional Bus
	Major Mac	Hwy 7	176	29	Conventional Bus	155	24	Conventional Bus
	Hwy 7	Steeles Ave	277	191	Conventional Bus	260	166	Conventional Bus
Warden	Hwy 7	Steeles Ave	817	651	TPN	828	680	TPN
Steeles Ave	Markham	Kennedy	965	179	TPN	954	180	TPN
	Kennedy	Leslie St	1,128	215	LRT/BRT	1,127	213	LRT/BRT
	Leslie St	Yonge St	739	338	TPN	743	337	TPN
	Yonge St	Jane St	670	730	TPN	669	740	TPN
	Jane St	Weston Rd	300	174	Conventional Bus	292	171	Conventional Bus
	Weston Rd	York/Peel Bndry	157	189	Conventional Bus	157	187	Conventional Bus
16 Avenue	Markham	Leslie St	267	115	Conventional Bus	5	5	Conventional Bus
	Leslie St	Jane St	370	410	TPN	186	95	Conventional Bus
	Jane St	Weston Rd	229	400	TPN	5	5	Conventional Bus
14 Avenue	9th Line	Warden	398	89	Conventional Bus	559	5	TPN
HWY 9	HWY 400	Yonge St	520	164	TPN	621	5	TPN
9th Line	14th Ave	HWY 7	412	19	TPN	5	5	Conventional Bus
	Hwy 7	Via Bur Oak Ave-Major Mac	1,013	944	LRT/BRT	700	5	TPN

Table 16. Comparison of system-wide metrics – No Policy-based Metrics

Key Performance Measures	2006 Modeled	2031 Bold Network	2031 Recommended Network - Infrastructure Only
Vehicle km of travelled in York Region (a.m. peak hour)	2,481,000	3,886,084	3,974,128
Relative Increase in VKT	-	0.88	0.93
2031 Annual VKT savings(Million KM)	-	485	264
Vehicle hours of travelled (a.m. peak hour) in York Region	46,000	82,200	80,800
Relative Increase in VHT	-	1.09	1.05
Transit trips per capita (a.m. peak period)	0.051	0.075	0.073
2031 Annual YRT/Viva passenger km increase (million km)	-	41.2	17.3
Transit passenger km except GO Rail in York Region (a.m. peak period)	-	1,374,525	1,342,221
Transit Modal Split(York-York)	5.3%	9.7%	9.5%
Transit Modal Split (York-Centres&Corridors)	6.6%	14.7%	14.4%
Transit Modal Split (Centres&Corridors-York)	6.8%	13.0%	12.7%
Transit Modal Split(York-Toronto(except PD1))	8.6%	15.4%	15.1%
Self-Containment in York Region (% of trips beginning and ending in York)	58.7%	63.0%	62.9%
York vehicle km of travel per capita (a.m. peak hour)	2.67	2.58	2.64
% of veh-km-travelled with (v/c>1) within York Region (a.m. peak hour)	12.60%	23.64%	20.44%

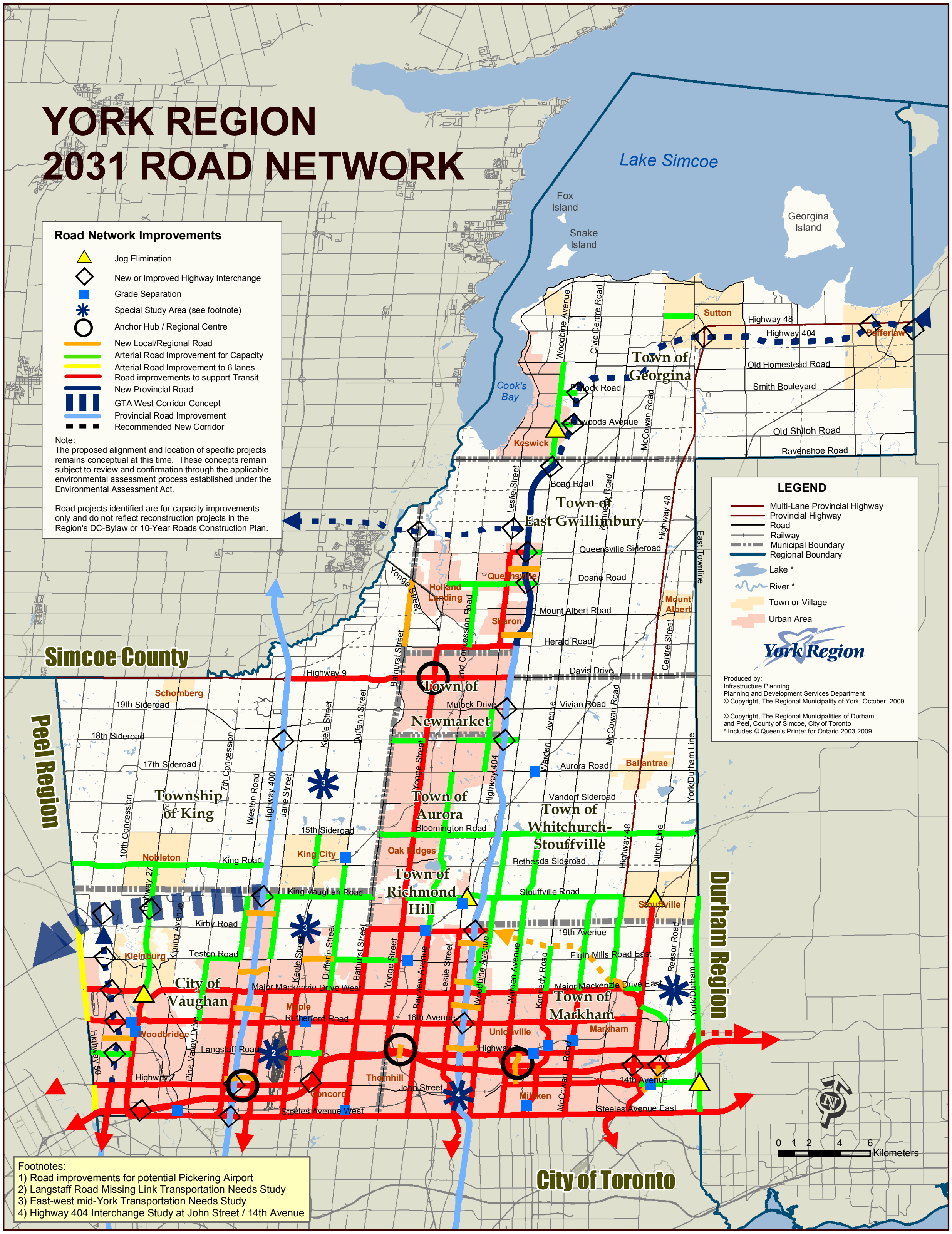
Note: Transit Modal Split represents the percentage of transit trips relative to the total number of trips by all modes (auto, transit, walking, cycling, etc.) for various trip origins and destinations as follows:

- York – York: Trips with origins in York Region and destinations within York Region

- York – Centres & Corridors: Trips with origins in York Region which are destined to the 4 Regional Centres (Markham, Richmond Hill, Vaughan, and Newmarket) and Highway 7 and Yonge Street Corridors
- York – PD1: Trips from York Region to the downtown area of Tronto (Planning District 1 (PD1))
- York – GTA-H: Trips from York Region to the Greater Toronto and Hamilton Area (GTA-H)

5.2.2 Auto Network

The recommended 2031 auto network is shown in **Figure 12** and the V/C ratio performance is shown in **Table 17**. As mentioned in Section 5.1.2, all the major road improvements recommended on the Regional auto network are expected to directly (six lane roads with two lanes for RTC or TPN) or in-directly improve transit service (expansion of two lane roads to four lanes to improve bus service) in the Region. The inclusion of improvements to the auto network is expected to increase the vehicle kilometres travelled per capita to 2.64 for the recommended network from 2.58 in the “bold” transit network concept. This additional auto capacity is expected to lower the amount of congestion (as measured by the percentage of vehicle kilometres traveled with a V/C ratio greater than 1.0) to 20.44% for the recommended network from 23.64% in the “bold” transit network.



2031 RECOMMENDED ROAD NETWORK

Table 17. V/C Ratio Performance – No Policy-Based Initiatives

Screen Line	2006 Base Network		2031 Bold Transit Network		2031 Recommended Network No Policy Initiatives	
	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
York-Simcoe Screenline 1	0.13	0.58	0.18	0.90	0.13	0.71
York-Durham Screenline 2	0.09	0.28	0.21	0.42	0.21	0.42
Markham Section	0.15	0.59	0.27	0.66	0.27	0.66
W.Stouffville Section	0.09	0.24	0.26	0.34	0.25	0.34
E.Gwillimbury Section	0.09	0.21	0.26	0.25	0.29	0.24
South Georgina Section	0.03	0.11	0.03	0.17	0.04	0.17
North Georgina Section	0.04	0.07	0.10	0.20	0.10	0.20
York-Peel Screenline 3	0.79	0.47	0.87	0.50	0.81	0.46
South Section	0.88	0.54	0.93	0.54	0.87	0.52
North Section	0.43	0.18	0.56	0.27	0.49	0.15
York-Toronto Screenline 4	0.53	0.79	0.58	0.92	0.56	0.90
West Vaughan Section	0.41	0.79	0.50	0.94	0.51	0.95
Highway 400 Section	0.55	0.94	0.56	0.97	0.55	0.98
Yonge Street Section	0.39	0.96	0.44	1.12	0.43	1.11
Highway 404 Section	0.82	0.81	0.88	1.06	0.86	1.00
Central Markham Section	0.45	0.50	0.51	0.59	0.50	0.59
East Markham Corridor	0.36	0.62	0.43	0.70	0.42	0.69
South York Screenline 5	0.20	0.71	0.22	0.84	0.23	0.82
South King Section	0.08	0.46	0.06	0.75	0.06	0.69
Highway 400 Section	0.14	0.78	0.19	0.95	0.21	0.96
Yonge Street Section	0.27	0.63	0.33	0.73	0.35	0.77
Highway 404 Section	0.30	0.90	0.27	1.05	0.25	1.00
Warden Avenue Section	0.13	0.65	0.21	0.78	0.21	0.79
Stouffville Section	0.20	0.40	0.17	0.44	0.17	0.45
Highway 400 Screenline 6	0.68	0.63	0.86	0.83	0.80	0.83
South Section	0.74	0.65	0.92	0.89	0.89	0.91
North Section	0.46	0.56	0.66	0.61	0.47	0.53
Highway 404 Screenline 7	0.72	0.60	0.89	0.74	0.89	0.78
South Section	0.85	0.72	0.91	0.85	0.95	0.92
North Section	0.54	0.42	0.84	0.57	0.80	0.57
Georgina-E Gwillimbury Screen 8	0.11	0.54	0.12	0.46	0.11	0.49
Ravenshoe Screenline 9	0.09	0.45	0.10	0.39	0.10	0.40
Bathurst Screenline 10	0.58	0.85	0.71	0.85	0.68	0.82
McCowan Screenline 11	0.27	0.79	0.41	0.97	0.42	0.96

To better understand the results in Table 17, the three V/C ratio categories defined earlier in Section 4.4.2 were used. The V/C ratio results shown in Table 18 are consistent with expectations. The capacity constraints across the screenlines tend to reduce as new auto improvement projects are introduced in the network.

Additionally, the TMPU analyzed a number of specific road projects that were identified for special attention, which were listed in Section 4.2. Each of the projects is expected to be of significant regional influence in terms of cost, environmental issues, movement of goods and impact on existing land use patterns. The recommendation for each of these projects is summarized below.

Bradford Bypass

The Bradford Bypass is a planned freeway that is expected to connect Highway 400 and Highway 404 through the Town of East Gwillimbury. Based on the analysis completed for this TMPU, this connection is highly recommended for the following reasons:

- It will reduce the magnitude of traffic infiltration through small towns and municipalities that are adjacent to Highway 400 and Highway 404. For example, the Town of East Gwillimbury is expected to witness significant traffic infiltration without the Bradford Bypass, which will severely congest corridors such as Green Lane;

- It will reduce the number of new road infrastructure projects needed in the Town of East Gwillimbury to counteract this traffic infiltration such as extending Doane Road between Yonge Street and Holland Landing Road;

- It is expected to provide commercial vehicle traffic with a high speed and high capacity option that negates the need for them to travel on major arterials in the northern municipalities; and

- It is a key piece of infrastructure for accommodating future travel demand from Simcoe County.

GTA West Corridor

The GTA West Corridor (GWC) is a strategic link designed to better serve the Urban Growth Centers to the west of the GTA such as Downtown Milton, Brampton City Centre, Vaughan Corporate Centre and Downtown Guelph. The following benefits are to be gained by including the GTC in the 2031 network:

- Divert traffic from Highway 400 and provide a bypass of the urban areas of the City of Vaughan;

- Serve as an inter-regional corridor for person and commercial vehicle traffic; and

- Enhance the recommended expressway bus service on the 400 series highways.

Hwy 427 Extension to the GTA West Corridor

The extension of Highway 427 to the GTA West Corridor is contingent on the inclusion of the GTA West Corridor. The benefits are expected to be similar to those of the GTA West Corridor.

Hwy 427 Extension to Highway 9

The extension of Highway 427 to Highway 9 is recommended beyond the 2031 horizon. It is expected to relieve congestion on Highway 400 and improve goods movement through the Region.

Mid-York East-West Corridor

Two additional arterial lanes of capacity are recommended between Highway 400 and Bathurst Street to meet the growth in travel demand. One option that could be studied is the expansion of King-Vaughan Road with an interchange at Highway 400 and the GTA West Corridor. Other alternatives should also be considered as part of a special transportation needs study for the mid-York area.

North Markham East-West Arterial

Two additional E-W arterial lanes of capacity are recommended between Bathurst Street and Ninth Line to support the growth in travel demand in north Markham. One option could be the extension of the Donald Cousins Parkway from its existing northerly terminus at Major Mackenzie Drive, to connect to 19th avenue west of Warden Avenue. This will allow transit services into north Markham while providing connections to the north-south RTCs and commuter rail services such as GO Transit.

Mid-block Crossings of 400 Series Highways

The future auto network recommends a total of nine mid-block crossings to facilitate options for active transportation, to give routing options for local trips and to provide continuity to transit services, amongst other factors.

Teston Road between Keele Street and Dufferin Street

The four lane extension of Teston Road between Keele Street and Dufferin Street is warranted to support east-west network connectivity. The extension is expected to provide more efficient utilization of the Teston Road – Highway 400 interchange. In the absence of this connection, the Region would have to provide additional east-west capacity on links south of Teston Road to accommodate the growing traffic demand.

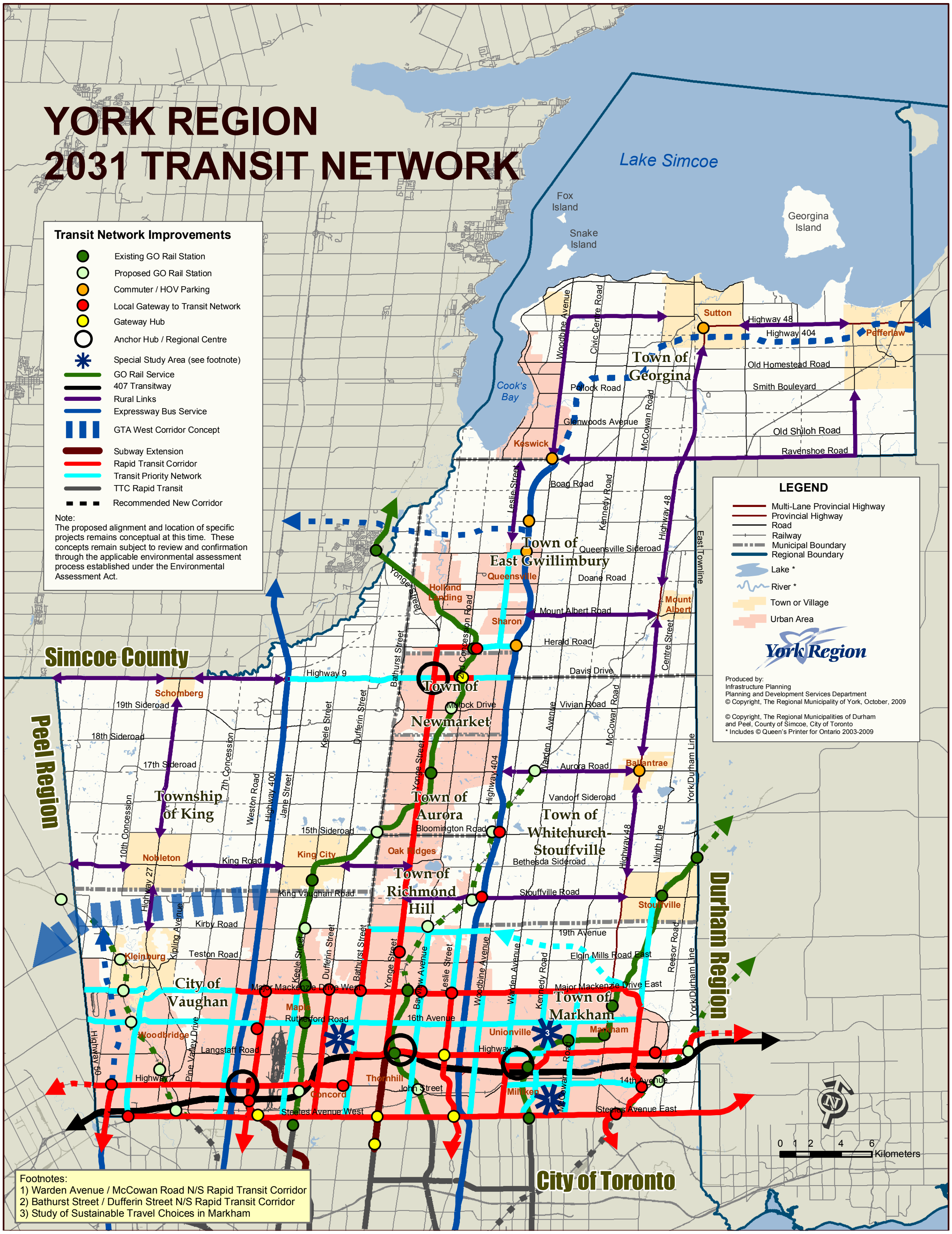
5.3 SCENARIO 2: 2031 NETWORK – POLICY BASED INITIATIVES

In the second scenario, the 2031 road and transit network developed in the first scenario was used as a base with a change to the parking rates used in the model. This is a critical variable in the model as it represents out-of-pocket travel costs for the auto mode, and can be influenced based on policies adopted by the Region as well as different municipalities in the GTAH. These were as follows:

- Parking rates – future parking rates in the model were doubled in the City of Toronto (CBD and other traffic zones in the model that currently have a parking rate) and in the centres and corridors of the various Regions in the GTAH. This doubling of parking rates is also expected to account for increasing vehicle operating costs in the future horizon years such as the cost of fuel, insurance etc.

5.3.1 Transit Network

The 2031 transit network as a result of these policy-based initiatives is shown in **Figure 13**. Of note is the addition of three more north-south corridors (Bathurst/Dufferin, Leslie Street and Warden Street) as well as a much larger stretch of Steeles Avenue in the RTC category under Scenario 2.



2031 RECOMMENDED TRANSIT NETWORK

The final peak ridership estimates for each of the recommended transit projects under Scenario 2 is shown in **Table 18**, and changes to the system-wide metrics are shown in **Table 19.** As noted earlier, the results are consistent with the logic of the decision-making model shown in section 4.2.

The results in Table 19 indicate that the policy-based initiatives are expected to have a significant impact on transit modal splits. As opposed to Scenario 1, the annual vehicle kilometers traveled (VKT) savings are expected to be substantially higher, whereas, vehicle hours of traveled (VHT) would actually decrease in Scenario 2 when compared to the 2031 "Bold" transit network.

5.3.2 Auto Network

The auto network recommended in Scenario 1 was kept constant for assessing the impact of policy based initiatives in Scenario 2. This was necessary to isolate the influence of these policy-based initiatives on travel patterns in the Region, specifically transit use.

Reassessing the auto network as part of Scenario 2 is not warranted given that a majority of the road network improvements are expected to directly or indirectly improve transit usage, as noted earlier. Thus, the recommended auto network from Scenario 1 is retained to serve the travel needs of the residents and commuters to and from the Region of York and also provides an effective transportation network for goods movement. **Table 20** shows the V/C ratio performance across each of the screenlines for Scenario 2.

The 2002 TMP noted that the Region's Official Plan wants to achieve a transit modal split target of 33 percent during the peak periods. None of the future networks ("bold" transit and the two recommended transit networks under scenario 1 and scenario 2) achieve such a high transit usage percentage during the peak period. However, transit usage during the peak period in 2031 represents a quantum leap over existing base year (2006) conditions. In Scenario 1, transit modal splits are expected to nearly double as shown in Table 16 with the centres and corridors expected to witness the largest increases, by greater than 100 percent in some cases. The results for Scenario 2 indicate that transit modal splits in the Region can be increased even further by affecting transportation economics for the 2031 horizon year.

The network developed for Scenario 2 (policy-based initiatives) is the final recommended transit and road network for the 2031 horizon year.

Table 18. Peak Ridership Estimates

Transit Project	From	To	Bold Transit Network Peak Hour SB / WB	Bold Transit Network Peak Hour NB / EB	Bold Transit Network Technology	Run 4 Peak Hour SB / WB	Run 4 Peak Hour NB / EB	Run 4 Technology	Run 6 Peak Hour SB / WB	Run 6 Peak Hour NB / EB	Run 6 Technology
Yonge Subway	19th Ave E/W corridor	Major Mac	3,261	452	LRT/BRT	3,144	464	LRT/BRT	3,602	606	LRT/BRT
	Major Mac	Hwy 7	7,453	284	LRT/BRT	7,303	299	LRT/BRT	7,475	441	LRT/BRT
	Hwy 7	Steeles Ave	10,670	468	Subway	10,509	488	Subway	10,800	728	Subway
Spadina	Hwy 7	Steeles Ave	4,655	831	LRT/BRT	4,814	836	LRT/BRT	5,051	1,209	LRT/BRT
Yonge	19th Ave E/W corridor	Davis Dr	3,036	435	LRT/BRT	2,954	430	LRT/BRT	3,377	558	LRT/BRT
	Davis Dr	Green Lane	110	69	Conventional Bus	553	36	TPN	656	5	TPN
Hwy 7	York/Durham Bndry	Kennedy LRT	1,617	365	LRT/BRT	1,640	488	LRT/BRT	2,008	619	LRT/BRT
	Kennedy LRT	Yonge St	2,456	2,935	LRT/BRT	2,336	3,110	LRT/BRT	2,478	4,280	LRT/BRT
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	Leslie St	Yonge St	739	338	TPN	743	337	TPN	1,360	422	LRT/BRT
	Yonge St	Jane St	670	730	TPN	669	740	TPN	952	1,926	LRT/BRT
	Jane St	Weston Rd	300	174	Conventional Bus	292	171	Conventional Bus	320	221	Conventional Bus
	Weston Rd	York/Peel Bndry	157	189	Conventional Bus	157	187	Conventional Bus	55	234	Conventional Bus
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HWY 9	HWY 400	Yonge St	520	164	TPN	621	5	TPN	650	197	TPN
9th Line	14th Ave	HWY 7	412	19	TPN	5	5	Conventional Bus	320	232	Conventional Bus
	Hwy 7	Via Bur Oak Ave-Major Mac	1,013	944	LRT/BRT	700	5	TPN	878	1,369	LRT/BRT

Table 19. Comparison of system-wide metrics – Including Policy-based Metrics

Key Performance Measures	2006 Modeled	2031 Bold Network	2031 Recommended Network - Policy Initiatives
Vehicle km of travelled in York Region (a.m. peak hour)	2,481,000	3,886,084	3,916,802
Relative Increase in VKT	-	0.88	0.9
2031 Annual VKT savings(Million KM)	-	485	408
Vehicle hours of travelled (a.m. peak hour) in York Region	46,000	82,200	75,900
Relative Increase in VHT	-	1.09	0.9
Transit trips per capita (a.m. peak period)	0.051	0.075	0.082
2031 Annual YRT/Viva passenger km increase (million km)	-	41.2	128
Transit passenger km except GO Rail in York Region (a.m. peak period)	-	1,374,525	1,553,757
Transit Modal Split(York-York)	5.3%	9.7%	12.4%
Transit Modal Split (York-Centers & Corridors)	6.6%	14.7%	21.3%
Transit Modal Split (Centers & Corridors-York)	6.8%	13.0%	16.7%
Transit Modal Split(York-Toronto(except PD1))	8.6%	15.4%	17.1%
Transit Modal Split(York - (GTA+H))	11.7%	17.4%	19.2%
Self-Containment in York Region (% of trips beginning and ending in York)	58.7%	63.0%	62.8%
York vehicle km of travel per capita (a.m. peak hour)	2.67	2.58	2.6
% of veh-km-travelled with (v/c>1) within York Region (a.m. peak hour)	12.60%	23.64%	16.36%

Note: Transit Modal Split represents the percentage of transit trips relative to the total number of trips by all modes (auto, transit, walking, cycling, etc.) for various trip origins and destinations as follows:

- York – York: Trips with origins in York Region and destinations within York Region
- York – Centres & Corridors: Trips with origins in York Region which are destined to the 4 Regional Centres (Markham, Richmond Hill, Vaughan, and Newmarket) and Highway 7 and Yonge Street Corridors
- York – PD1: Trips from York Region to the downtown area of Tronto (Planning District 1 (PD1))
- York – GTA-H: Trips from York Region to the Greater Toronto and Hamilton Area (GTA-H)

Table 20. Comparison of system-wide metrics – Including Policy-based Metrics

Screen Line	2006 Base Network		2031 Bold Transit Network		2031 Recommended Network- Including Policy Initiatives	
	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
York-Simcoe Screenline 1	0.13	0.58	0.18	0.90	0.13	0.73
York-Durham Screenline 2	0.09	0.28	0.21	0.42	0.21	0.42
Markham Section	0.15	0.59	0.27	0.66	0.27	0.65
W.Stouffville Section	0.09	0.24	0.26	0.34	0.24	0.34
E.Gwillimbury Section	0.09	0.21	0.26	0.25	0.27	0.25
South Georgina Section	0.03	0.11	0.03	0.17	0.04	0.17
North Georgina Section	0.04	0.07	0.10	0.20	0.10	0.20
York-Peel Screenline 3	0.79	0.47	0.87	0.50	0.82	0.46
South Section	0.88	0.54	0.93	0.54	0.84	0.51
North Section	0.43	0.18	0.56	0.27	0.70	0.19
York-Toronto Screenline 4	0.53	0.79	0.58	0.92	0.54	0.89
West Vaughan Section	0.41	0.79	0.50	0.94	0.50	0.93
Highway 400 Section	0.55	0.94	0.56	0.97	0.53	0.96
Yonge Street Section	0.39	0.96	0.44	1.12	0.41	1.08
Highway 404 Section	0.82	0.81	0.88	1.06	0.83	0.99
Central Markham Section	0.45	0.50	0.51	0.59	0.48	0.59
East Markham Corridor	0.36	0.62	0.43	0.70	0.40	0.68
South York Screenline 5	0.20	0.71	0.22	0.84	0.23	0.77
South King Section	0.08	0.46	0.06	0.75	0.06	0.63
Highway 400 Section	0.14	0.78	0.19	0.95	0.21	0.91
Yonge Street Section	0.27	0.63	0.33	0.73	0.33	0.72
Highway 404 Section	0.30	0.90	0.27	1.05	0.26	0.98
Warden Avenue Section	0.13	0.65	0.21	0.78	0.21	0.76
Stouffville Section	0.20	0.40	0.17	0.44	0.15	0.42
Highway 400 Screenline 6	0.68	0.63	0.86	0.83	0.79	0.83
South Section	0.74	0.65	0.92	0.89	0.88	0.90
North Section	0.46	0.56	0.66	0.61	0.44	0.57
Highway 404 Screenline 7	0.72	0.60	0.89	0.74	0.87	0.76
South Section	0.85	0.72	0.91	0.85	0.93	0.88
North Section	0.54	0.42	0.84	0.57	0.77	0.56
Georgina-E Gwillimbury Screen 8	0.11	0.54	0.12	0.46	0.11	0.48
Ravenshoe Screenline 9	0.09	0.45	0.10	0.39	0.10	0.40
Bathurst Screenline 10	0.58	0.85	0.71	0.85	0.66	0.80
McCowan Screenline 11	0.27	0.79	0.41	0.97	0.42	0.94

6.0 RECOMMENDED ROAD AND TRANSIT PROJECTS

Documented below is a list of road and transit projects recommended as part of this TMPU along with the timeline for implementing the project. **Figure 14** to **Figure 16** show the recommended major transit and road project extent and phasing. It is expected that the Rapid Transit Corridors (RTCs) identified as part of this TMPU will be studied in detail to distinguish whether LRT or BRT is feasible in these corridors.

6.1 PROPOSED TRANSIT PHASING

6.1.1 Short-Term (5 Year Plan)

Subway Extension

There are two subway extensions planned into York Region. These are:

- Spadina Subway extension: The Toronto - York Spadina Subway Extension is an 8.6km extension from Downsview Station north-west through York University, and north to the Vaughan Corporate Centre in York Region.
- Yonge Street Subway Extension (to the Richmond Hill Centre): The Toronto City Council and York Regional Council approved a Staff Report with amendments supporting the submission of an Environmental Project Report as part of the Transit Project Assessment Process. A Notice of Completion was issued and published on February 2nd, 2009.

Bus Rapid Transit (EA Approved)

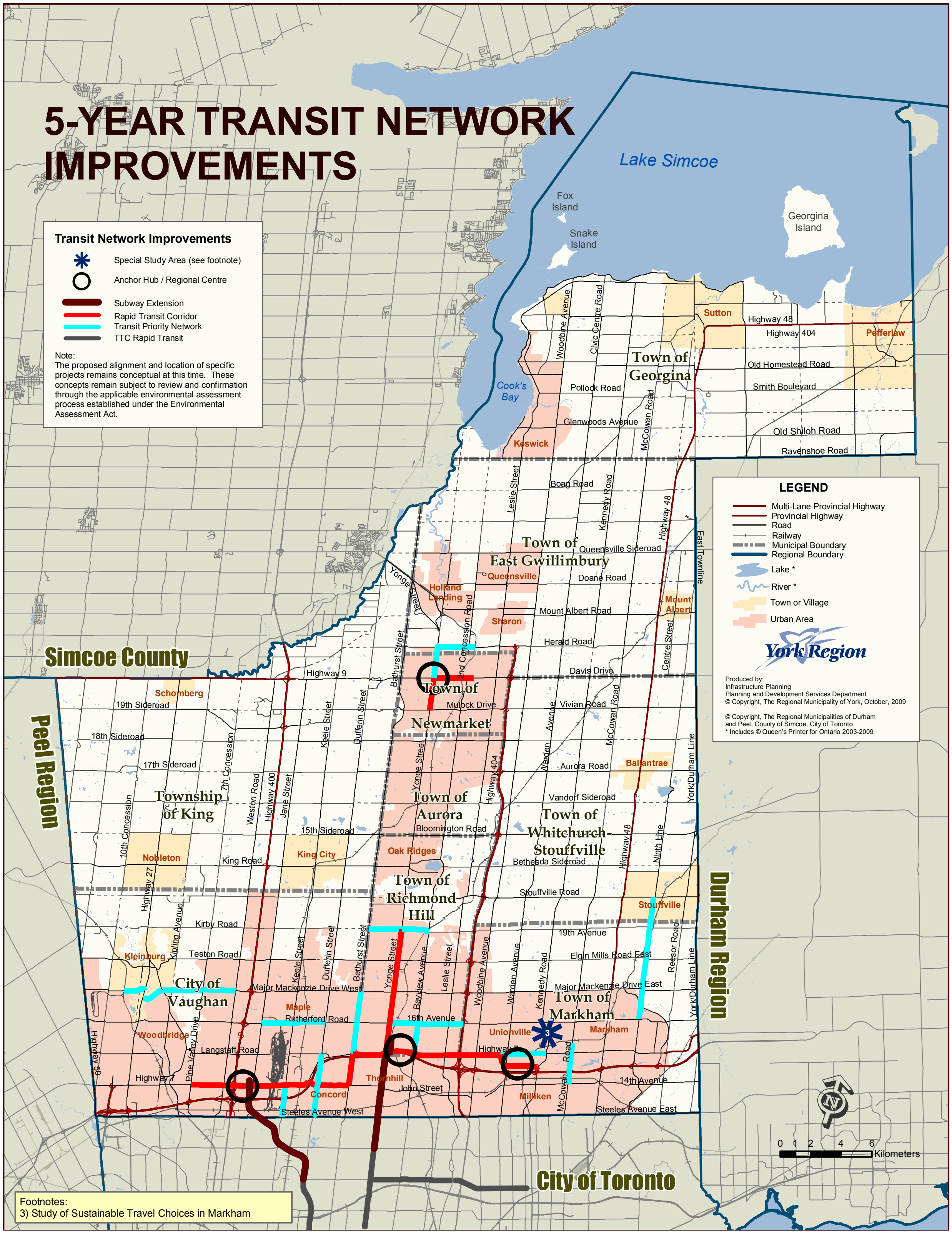
York Region recently completed a Municipal Class Environmental Assessment evaluating the potential for bus rapid transit service on Yonge Street from 19th Avenue to Davis Drive in Newmarket and extending further north to Green Lane in East Gwillimbury, including rapid transit on Davis Drive and Green Lane. This completes the Environmental Assessment for all four rapid transit corridors identified in the 2002 TMP. This will allow York Region to embark on the VivaNext implementation of rapidways along the following segments of the Viva network:

- Highway 7 from Pine Valley Drive to the Richmond Hill Centre;
- Highway 7 from the Richmond Hill Centre to the Markham Centre;
- Yonge Street from the Richmond Hill Centre to 19th Avenue;
- Yonge Street from Mulock Drive to Davis Drive; and
- Davis Drive from Yonge Street to the Southlake Regional Health Centre.

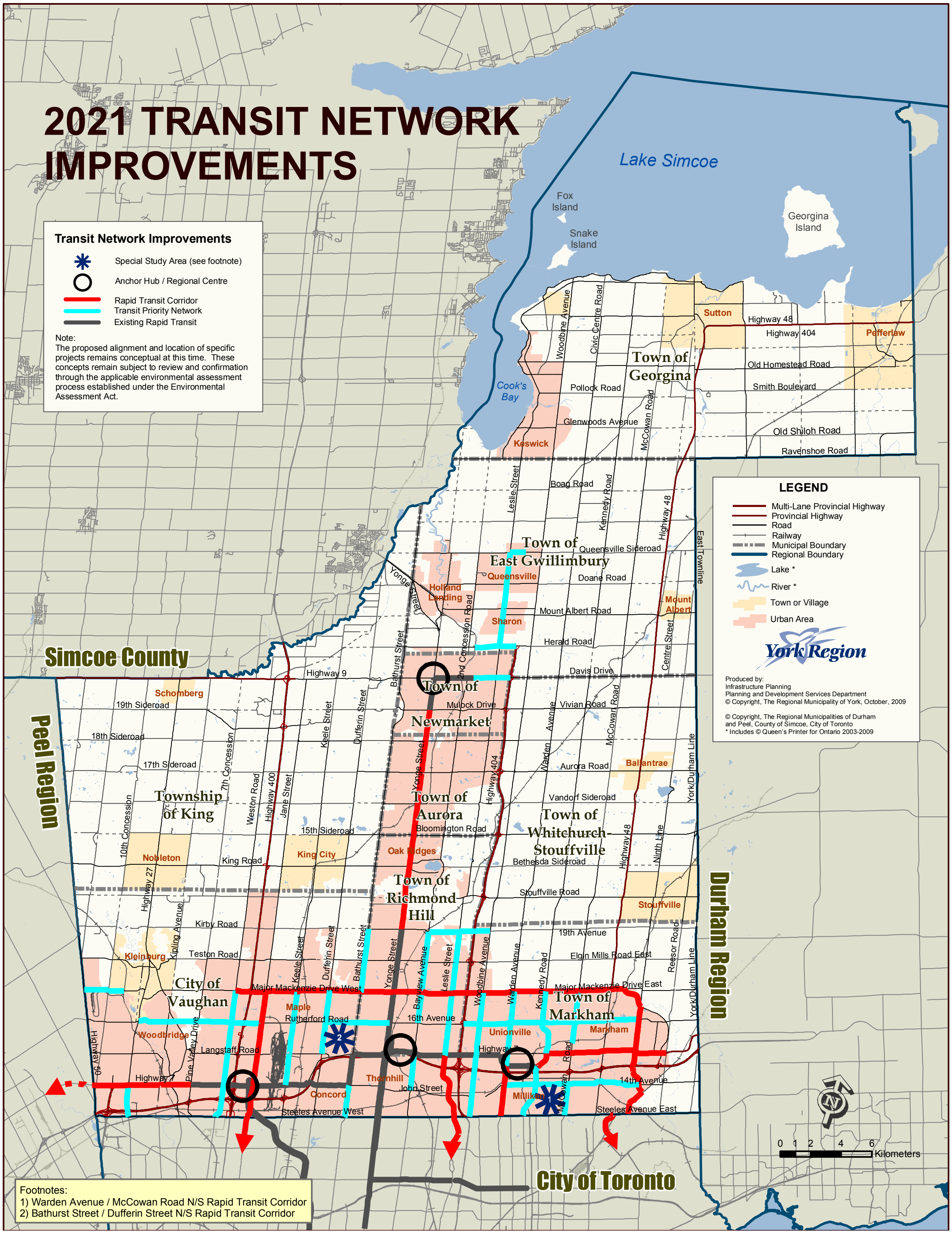
Transit Priority Network

The transit priority network recommended as part of this TMPU for the short-term is intended to complement the EAs in progress on major arterials in the southern tier municipalities. The following road segments have been identified for TPN:

- 16th Avenue from Highway 404 to Yonge Street;
- McCowan Road from 14th Avenue to North of Highway 7;
- Bayview Avenue from Highway 7 to 16th Avenue;
- Bathurst Street from Highway 7 to Major Mackenzie Drive;
- Dufferin Street from Steeles Avenue to Langstaff Road;
- Keele Street from Steeles Avenue to Highway 7;
- Rutherford Road from Dufferin Street to Jane Street;
- Major Mackenzie Drive from Weston Road to Highway 27;
- Nashville Road from Highway 27 to East of Huntington Road;
- Ninth line from 16th Avenue to Stouffville Road;
- Highway 7 from Warden Avenue to Kennedy Road;
- 19th Avenue from Bayview Avenue to Bathurst Street'
- Davis Drive from GO station to Highway 404 ;
- Yonge Street from Davis Drive to Green Lane and
- Green Lane from Yonge Street to East Gwillimbury GO Station.



5-YEAR TRANSIT NETWORK IMPROVEMENTS


2021 TRANSIT NETWORK IMPROVEMENTS
Transit Network Improvements
Special Study Area (see footnote)
Anchor Hub / Regional Centre
Rapid Transit Corridor
Transit Priority Network
Existing Rapid Transit
Note:
The proposed alignment and location of specific projects remains conceptual at this time. These concepts remain subject to review and confirmation through the applicable environmental assessment process established under the Environmental Assessment Act.
LEGEND
Multi-Lane Provincial Highway
Provincial Highway
Road
Railway
Municipal Boundary
Regional Boundary
Lake *
River *
Town or Village
Urban Area
York Region
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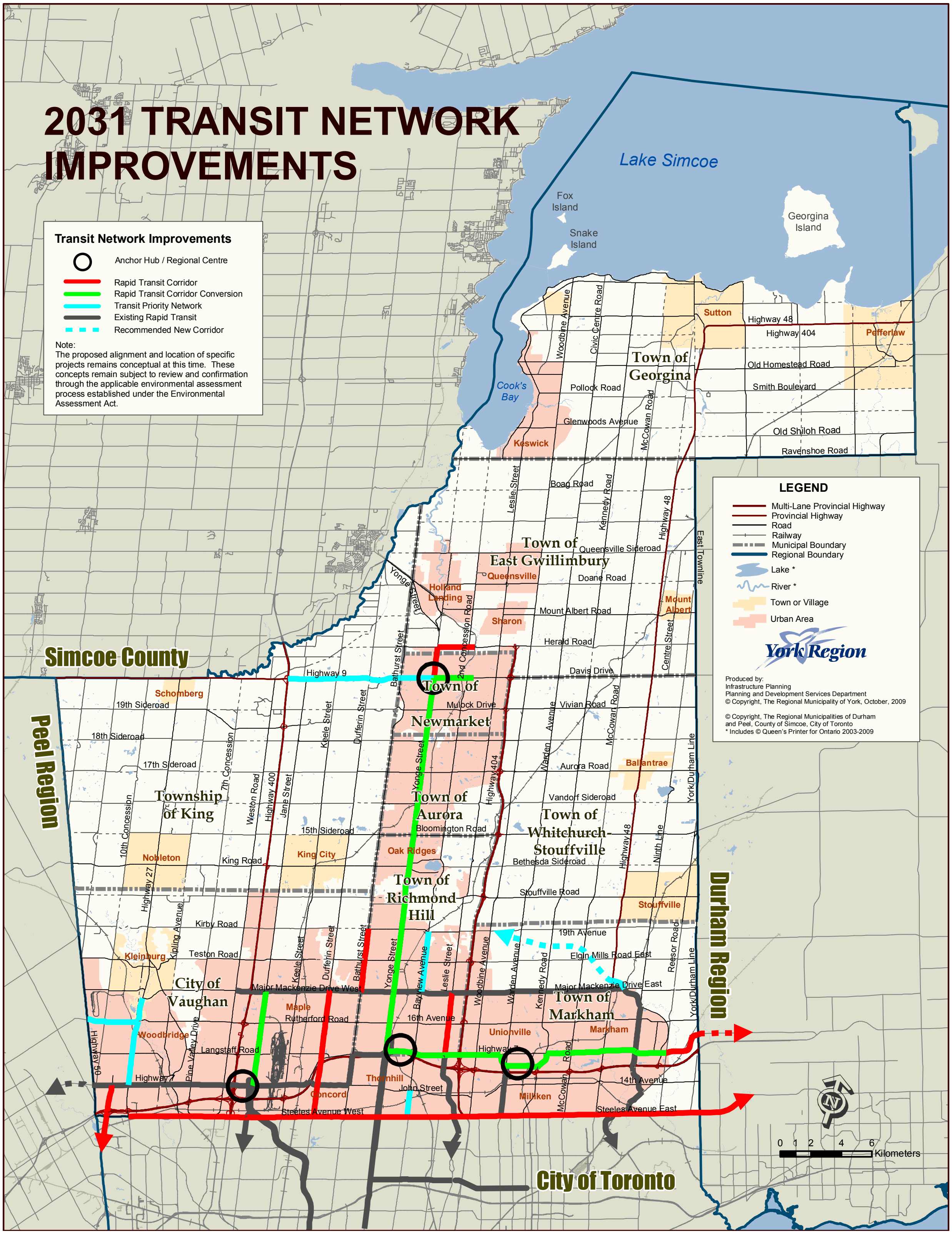
Lake Simcoe
Simcoe County
Peel Region
Durham Region
City of Toronto
Town of Georgina
Town of East Gwillimbury
Town of Newmarket
Town of Aurora
Town of Whitchurch-Stouffville
Township of King
Town of Richmond Hill
City of Vaughan
Town of Markham
0 1 2 4 6 Kilometers
Footnotes:
1) Warden Avenue / McCowan Road N/S Rapid Transit Corridor
2) Bathurst Street / Dufferin Street N/S Rapid Transit Corridor


2031 TRANSIT NETWORK IMPROVEMENTS
Transit Network Improvements
Anchor Hub / Regional Centre
Rapid Transit Corridor
Rapid Transit Corridor Conversion
Transit Priority Network
Existing Rapid Transit
Recommended New Corridor
Note:
The proposed alignment and location of specific projects remains conceptual at this time. These concepts remain subject to review and confirmation through the applicable environmental assessment process established under the Environmental Assessment Act.
LEGEND
Multi-Lane Provincial Highway
Provincial Highway
Road
Railway
Municipal Boundary
Regional Boundary
Lake *
River *
Town or Village
Urban Area
York Region
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Fox Island
Snake Island
Georgina Island
Cook's Bay
Simcoe County
Peel Region
Durham Region
City of Toronto
Town of Georgina
Town of East Gwillimbury
Town of Newmarket
Township of King
Town of Aurora
Town of Whitchurch-Stouffville
Town of Richmond Hill
City of Vaughan
Town of Markham
Sutton
Pefferlaw
Keswick
Queensville
Holland Landing
Mount Albert
Sharon
Schomberg
Ballantrae
Nobleton
King City
Oak Ridges
Stouffville
Kleinburg
Maple
Woodbridge
Unionville
Markham
Thornhill
Concord
Milliken
Highway 9
Highway 48
Highway 404
Highway 400
Highway 27
Highway 50
Highway 7
Yonge Street
Bathurst Street
Keele Street
Dufferin Street
Leslie Street
Bayview Avenue
Woodbine Avenue
Warden Avenue
Kennedy Road
McCowan Road
Markham Road
Major Mackenzie Drive West
Major Mackenzie Drive East
Rutherford Road
16th Avenue
14th Avenue
Langstaff Road
John Street
Steeles Avenue West
Steeles Avenue East
Elgin Mills Road East
19th Avenue
Stouffville Road
Bethesda Sideroad
Bloomington Road
Vandorf Sideroad
Aurora Road
Mulock Drive
Vivian Road
Davis Drive
Herald Road
Mount Albert Road
Doane Road
Queensville Sideroad
Boag Road
Glenwoods Avenue
Pollock Road
Old Homestead Road
Smith Boulevard
Old Shiloh Road
Ravenshoe Road
19th Sideroad
18th Sideroad
17th Sideroad
15th Sideroad
King Road
Kirby Road
Teston Road
Weston Road
Jane Street
Pine Valley Drive
Kipling Avenue
10th Concession
7th Concession
York/Durham Line
East Townline
Ninth Line
Reesor Road
Centre Street
Civic Centre Road
Woodbine Avenue
0 1 2 4 6 Kilometers

6.1.2 Mid-term (2021)

Rapid Transit Corridor (LRT/BRT)

Rapid Transit (RTC) has been identified on following corridors based on a number of factors including potential ridership. These are:

- Leslie Street Rapid Transit Corridor (Steeles Avenue to Highway 7), which would serve as an extension of the Don Mills LRT proposed as part of the Toronto Transit City initiative. Outside of the Central Business District in the City of Toronto, the area in the vicinity of the Leslie Street and Highway 7 intersection in York Region has one of the largest concentrations of professional and technical jobs in the Greater Toronto Area. This represents a strong base of captive riders that are currently using YRT, Viva or the TTC to access this area, or using private vehicles as the preferred mode of choice because of the lack of a high speed, high capacity and reliable transit alternative.

- Jane Street Rapid Transit Corridor (Steeles Avenue to Major Mackenzie Drive). The RTC along this corridor by 2021 is foreseen as an extension of the Jane LRT line proposed by the City of Toronto. It is expected to greatly improve mode choices for the population and employment at the Vaughan Corporate Centre (VCC) and adjoining areas.

- Major Mackenzie Drive from Ninth Line to Weston Road: Major Mackenzie Drive is expected to become one of the more densely populated corridors in Vaughan, Richmond Hill and Markham, with the highest densities adjacent to Highway 400, Yonge Street and McCowan Road. The significant population and employment growth projected along Major Mackenzie Drive and in the three municipalities in general, combined with high levels of traffic congestion projected in the immediate area, justifies the need to consider rapid transit service along this corridor by 2021. Close to 1,700 riders are projected to use this transit line in the peak hour and peak direction.

- Yonge Street from 19th Avenue to Mulock Drive: This is part of Viva Phase 2 and is expected to be constructed post-2014.

- Ninth Line from Steeles Avenue to Major Mackenzie Drive: This section of the rapid transit corridor would supplement the proposed 2021 RTC network, improving connections to the Cornell community and Markham-Stouffville Hospital. It would form a north-south connection to the future rapid transit line on Major Mackenzie Drive and Toronto's Transit City elements leading to the Malvern rapid transit station. By 2021, over 1,000 riders are projected to use this line in the peak hour and peak direction.

- Highway 7 from Pine Valley Drive to Highway 50 and Highway 7 from Markham Centre to Donald Cousen's Parkway: This would serve as an extension of the RTC services planned on Highway 7 between Pine Valley Drive and Markham Centre. The peak point ridership in the peak hour and peak direction is expected to be close to 900 riders on the west leg of this extension, whereas the east leg of this extension is expected to witness slightly over 1,000 riders in the peak hour and peak direction.

Transit Priority Network

A number of transit priority projects are recommended by 2021 to support the rapid transit corridors and in general improve mobility in the urban areas of the Region. These are shown as blue lines in Figure 15.

Special Study Areas

The transit network also includes two special study areas:

1. Warden Ave/McCowan Road North-South Rapid Transit Corridor – to determine the most logical rapid transit route serving Markham through the Warden Ave and McCowan Road corridor in order to connect appropriately with Toronto's Transit City plan and Metrolinx's regional rapid transit network plan.

2. Bathurst Street/Dufferin Street North-South Rapid Transit Corridor – to determine the rapid transit route alignment in the Bathurst Street and Dufferin Street corridor based on more detailed transit ridership forecasts, network connectivity and area development potential.

6.1.3 Long-term (2031)

Rapid Transit (LRT/BRT)

- Warden Avenue between Highway 7 and Steeles Avenue: The Warden Avenue rapid transit line is contingent on the implementation of the Steeles Avenue rapid transit corridor. It would provide a north-south rapid transit connection between the Highway 7 and Steeles Avenue rapid transit corridors improving mobility and accessibility to the new Markham Centre business park at Warden Avenue - just north of Highway 407, as well as to the Markham Civic Centre, the Unionville High School and the Markham Theatre. The ridership for this line is projected to be nearly 1,300 riders in the peak hour and peak direction.

- Dufferin / Bathurst Corridor: This corridor through Vaughan and Richmond Hill is one of York Region's most congested, with traffic volumes ranging between 40,000 and 45,000 vehicles per day. Medium density residential and commercial activity extends along much of Bathurst Street, with lower densities existing along Dufferin Street. Significant population and employment growth along Bathurst Street is projected north of Steeles Avenue up to Major Mackenzie Drive; and along Dufferin Street between Rutherford Road and 19th Avenue. As a result of this projected growth, and in response to the nearly 1,200 riders in the peak hour and peak direction projected to use transit along this corridor, rapid transit service along Dufferin Street from Highway 7 to Major Mackenzie Drive and on Bathurst Street between Major Mackenzie Drive and 19th Avenue is proposed.

- Yonge Street between Davis Drive and Green Lane;

- Green Lane between Yonge Street and the East Gwillimbury GO Station;

- Leslie Street from Highway 7 to Major Mackenzie Drive;
- Highway 7 from Ninth Line to York/Durham Boundary
- Steeles Avenue from Highway 27 to York/Durham Boundary

Transit Priority Network

- Following segments have been identified for TPN:
- Highway 9 from Highway 400 to Yonge Street;
- Markham By-pass from Tenth Line to Warden Avenue;
- Bayview Avenue from Steeles Avenue to John Street and from Major Mackenzie Drive to 19^{th} Avenue;
- Highway 27 from Highway 7 to Major Mackenzie Drive and
- Rutherford Road from Highway 50 to Highway 27.

6.2 PROPOSED ROADWAY PHASING

Based on the proposed enhancements to the Regional roadways, a phasing plan has been developed which will provide a schedule for the roadway widening and new road links that are necessary to accommodate the future growth in Regional population. Many of these roadways are required to support the introduction of transit priority routes along arterial corridors.

The phasing plans which have been developed can be found in **Figures 17**, **18** and **19**. A description of each of these figures is outlined below.

6.2.1 Short-Term (5 Year Plan)

Figure 17 outlines the enhancements to the road network which will occur in the first five years of implementation. These enhancements include:

East-West Improvements (4 laning)

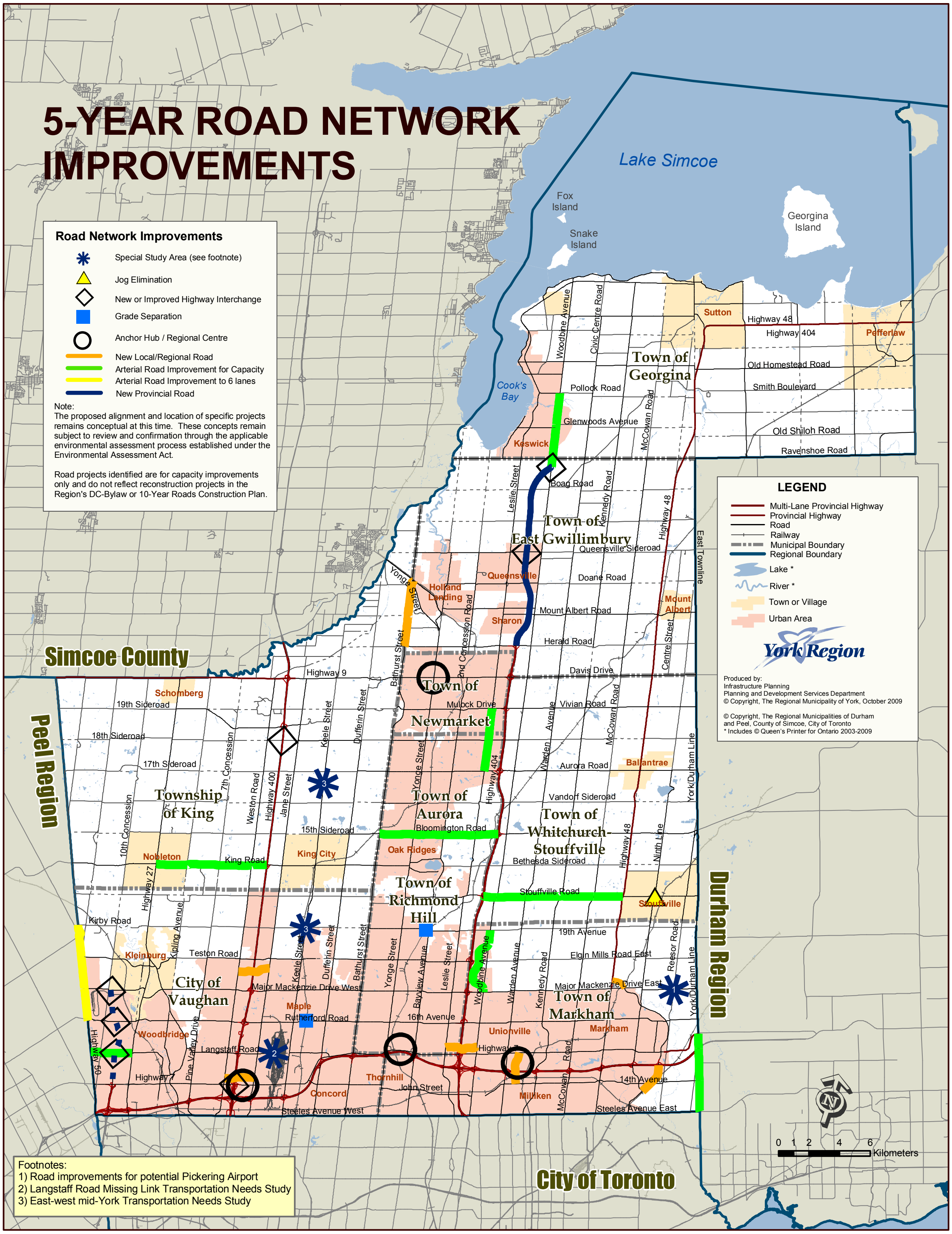
- Bloomington Road between Bathurst Street and Highway 404;
- King Road between Highway 27 and Highway 400;
- Langstaff Road between Highway 50 and Highway 27;
- Stouffiville Road from Highway 404 to Highway 48;
- Markham By-pass extension between Highway 407 to Steeles Road;
- Markham By-pass from Major Mackenzie Drive to Highway 48;
- Mid block crossing Highway 400 to Applewood Crescent and Block 33 south of Teston Road and Highway 404 north of Highway 7.

North-South Improvements (4 laning)

- Leslie Street from Auroro Road to Mulock Drive;
- Highway 407 crossings at Birchmount Road 7;
- York/Durham line from Steeles Avenue to Highway 7;
- Woodbine Avenue from Ravenshoe Road to Morton Avenue and from Major Mackenzie Drive to 19th Avenue ;
- Bathurst Street from Green lane to Highway 11

North-South Improvements (6 laning)

- Highway 50 between Rutherford Road and Mayfield Road


5-YEAR ROAD NETWORK IMPROVEMENTS
Road Network Improvements
Special Study Area (see footnote)
Jog Elimination
New or Improved Highway Interchange
Grade Separation
Anchor Hub / Regional Centre
New Local/Regional Road
Arterial Road Improvement for Capacity
Arterial Road Improvement to 6 lanes
New Provincial Road
Note:
The proposed alignment and location of specific projects remains conceptual at this time. These concepts remain subject to review and confirmation through the applicable environmental assessment process established under the Environmental Assessment Act.
Road projects identified are for capacity improvements only and do not reflect reconstruction projects in the Region's DC-Bylaw or 10-Year Roads Construction Plan.
LEGEND
Multi-Lane Provincial Highway
Provincial Highway
Road
Railway
Municipal Boundary
Regional Boundary
Lake *
River *
Town or Village
Urban Area
York Region
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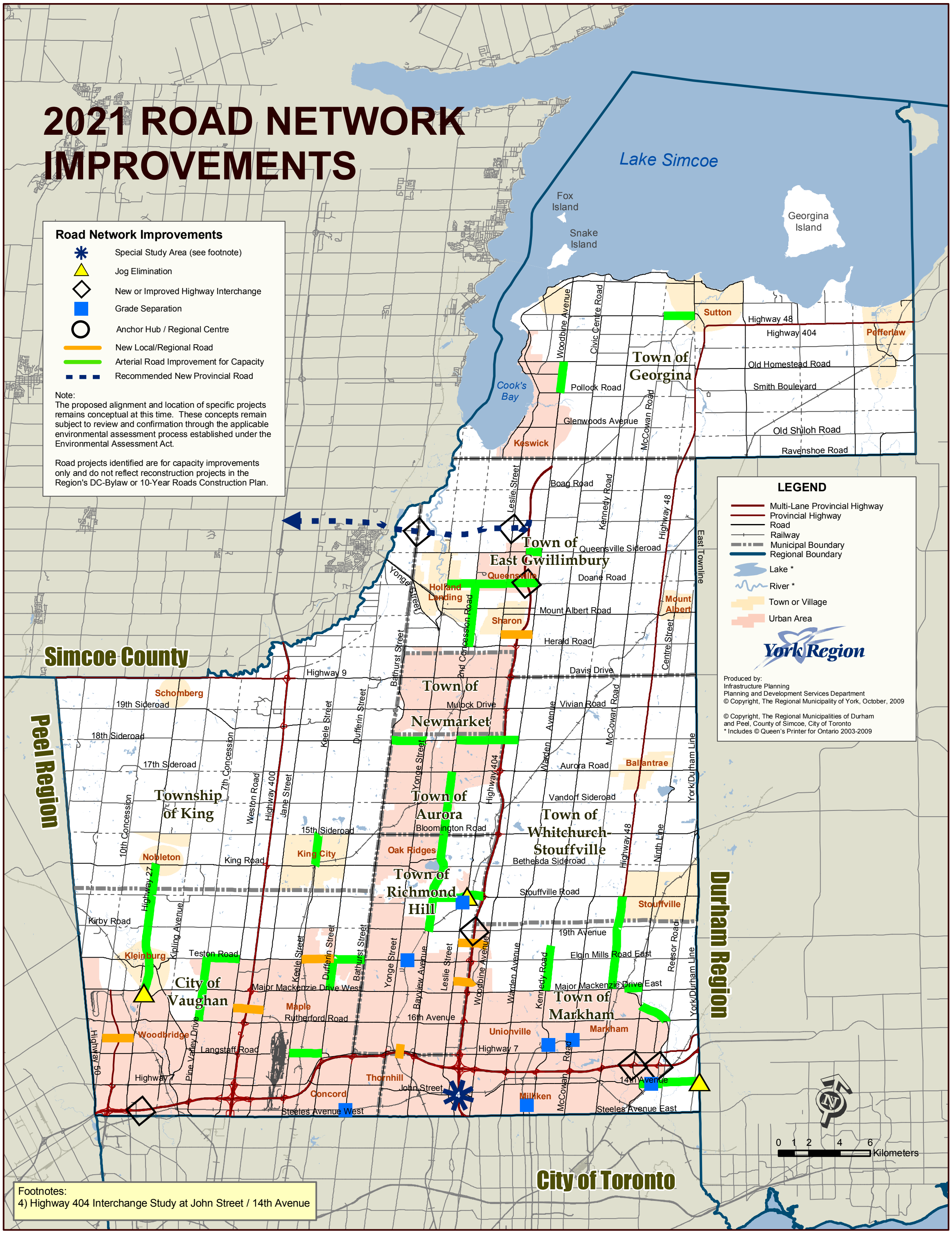
Lake Simcoe
Cook's Bay
Simcoe County
Peel Region
Durham Region
City of Toronto
Town of Georgina
Town of East Gwillimbury
Town of Newmarket
Township of King
Town of Aurora
Town of Whitchurch-Stouffville
Town of Richmond Hill
City of Vaughan
Town of Markham
0 1 2 4 6 Kilometers
Footnotes:
1) Road improvements for potential Pickering Airport
2) Langstaff Road Missing Link Transportation Needs Study
3) East-west mid-York Transportation Needs Study


2021 ROAD NETWORK IMPROVEMENTS
Road Network Improvements
Special Study Area (see footnote)
Jog Elimination
New or Improved Highway Interchange
Grade Separation
Anchor Hub / Regional Centre
New Local/Regional Road
Arterial Road Improvement for Capacity
Recommended New Provincial Road
Note:
The proposed alignment and location of specific projects remains conceptual at this time. These concepts remain subject to review and confirmation through the applicable environmental assessment process established under the Environmental Assessment Act.
Road projects identified are for capacity improvements only and do not reflect reconstruction projects in the Region's DC-Bylaw or 10-Year Roads Construction Plan.
LEGEND
Multi-Lane Provincial Highway
Provincial Highway
Road
Railway
Municipal Boundary
Regional Boundary
Lake *
River *
Town or Village
Urban Area
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Cook's Bay
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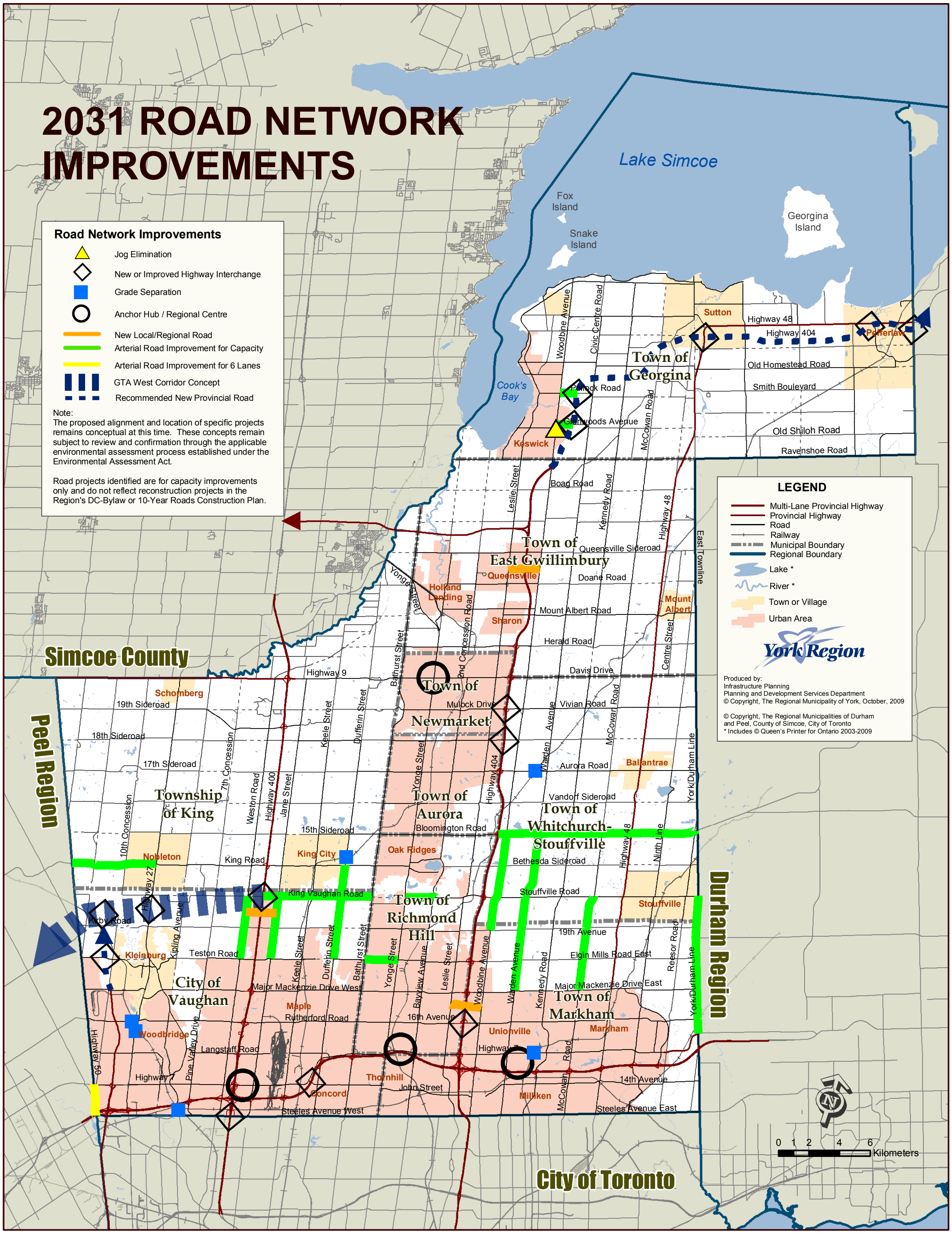
Peel Region
Durham Region
City of Toronto
Town of Georgina
Town of East Gwillimbury
Town of Newmarket
Township of King
Town of Aurora
Town of Whitchurch-Stouffville
Town of Richmond Hill
City of Vaughan
Town of Markham
0 1 2 4 6 Kilometers
Footnotes:
4) Highway 404 Interchange Study at John Street / 14th Avenue



2031 ROAD NETWORK IMPROVEMENTS

6.2.2 Mid-term (2021)

Figure 18 outlines the enhancements to the road network which are to occur by 2021. These enhancements will include:

East-West Improvements (4 laning)

- 14th Avenue between Ninth Line and York/Durharm line;
- Doane Road from Yonge Street to Leslie Street and Highway 404 interchange;
- Langstaff Road from Keele Street to Dufferin Street;
- Queensville Sideroad from Leslie Street to Woodbine Avenue;
- St. John Sideroad from Bathurst Street to Yonge Street and from Bayview Avenue to Highway 404;
- Stouffville Road from Bayview Avenue to Highway 404;
- Teston Road from Pine Valley Drive to Weston Road and from Keele Street to Bathurst Street;
- Baseline Road from McCowan Road to Dalton Road;
- DCP between Ninth Line and Ressor Road
- Highway 404 mid block crossing north of Major Mackenzie Drive ,Elgin Mills Road and Green Lane;
- Highway 400 mid block crossing north of Rutherford Road and;
- Highway 427 mid block crossing north of Langstaff Road

North-South Improvements (4 laning)

- Bayview Avenue from 19th Avenue to Wellington Street;
- Dufferin Street from Major Mackenzie Drive to Teston Road;
- Highway 27 from Major Mackenzie Drive to north to King Road;
- Keele Street from King Road to 15th Sideroad;
- Kennedy Road from Major Mackenzie Drive to North of Elgin Mills Road;
- Pine Valley Drive from Rutherford Road to Teston Road;

- 2^{nd} Concession from Green Lane to Doane Road;
- Woodbine Avenue from Morton Avenue to Old Homestead Road;
- Highway 48 between Major Mackenzie Drive and Stouffville Road and
- Highway 407 mid block crossing between Yonge Street and Bayview Avenue.

6.2.3 Long-term (2031)

Figure 18 outlines the roadway network improvements which will be made by the year 2031. The proposed improvements provide further rural connections throughout the Region, as follows:

East-West Improvements (4 laning)

- Bloomington Road from Highway 404 to Durham Region;
- Glenwoods Avenue from Woodbine Avenue to Highway 404 extension;
- King Road from Highway 27 to York/Peel boundary;
- Pollock Road from Woodbine Avenue to Highway 404;
- Stouffville Road from Yonge Street to Bayview Avenue;
- Teston Road from Bathurst Street to Yonge Street;
- King Vaughan Road between Bathurst Street and Highway 400;
- Highway 404 mid block crossing north of 16^{th} Avenue and Doane Road;
- Elgin Mills Road between Bathurst Street and Yonge Street and
- Highway 400 mid block crossing north of Kirby Road.

North-South Improvements (4 laning)

- Dufferin Street from Teston Road to King Road;
- Jane Street from Teston Road to King Vaughan Road;
- McCowan Road from Major Mackenzie Drive to Stouffville Road;
- Wardan Avenue from Major Mackenzie Drive to Bloomington Road;
- Weston Road from Teston Road to King Vaughan Road;

- Woodbine Avenue from 19th Avenue to Bloomington Road and
- York/Durham line from Highway 7 to Stouffville Road.

North-South Improvements (6 laning)

- Highway 50 between Steeles Avenue and Highway 7
-

6.2.4 Other Road Improvements

In addition to the improvements listed above, there are also improvements in the area of jog elimination, reconstruction and rail-road grade separation that are needed to provide capacity and efficiency to the road network. These projects are as follows:

- 9th Line jog elimination at Stouffville Road
- 14th Avenue jog elimination at York\Durham boundary and CNR grade separation east of Ninth line
- Major Mackenzie Road jog elimination at Highway 27
- Stouffville Road jog elimination at Leslie Street
- Aurora Road build CNR grade separation east of Woodbine Avenue
- 16th Avenue build CNR grade separation east of Keele Street
- 19th Avenue build CNR grade separation at Bayview intersection
- Dufferin Street build CNR grade separation north of King Road
- Elgin Mills Road build CNR grade separation east of Yonge Street
- Islington Avenue build CNR grade separation north of Steeles Avenue
- Kennedy Road build CNR grade separation north of Steeles Avenue and Highway 7
- Leslie Street jog elimination and grade separation from Stouffville Road
- McCowan Street build CNR grade separation north of Bullock Drive, and
- Rutherford Road build CNR grade separation east of Keele.
- Kennedy Road build CNR grade separation west of Kennedy Road
- Bathurst Street build CNR grade separation north of Steeles Avenue

- New Interchange at Highway 427 and Major Mackenzie Drive, Rutherford Road and Langstaff Road
- New interchange at Highway 400 and 18th Sideroad and Interchange improvements at Highway 7 and Steeles Avenue
- New interchange at Bradford Bypass and Leslie Street and Bathurst Street
- Interchange improvements at Highway 407 and Martingrove, Centre Street, Ninth Line and Markham Bypass
- New Interchange improvements on Highway 404 and 16th Avenue,19th Avenue, St. John's Sideroad, Vivian Road, Queensville Sideroad, Doane Road, and Ravenshoe Road.
- New interchanges along Highway 404 extension