



**GTA
West**

GTA West Corridor
Environmental Assessment



**GTA West Corridor Planning and
Environmental Assessment Study**

**Transportation Model
Technical Background Report**

Draft for Consultation

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**McCORMICK RANKIN
CORPORATION**
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Table of Contents

	page
1. INTRODUCTION	3
2. GGHM MODELING PROCESS	3
2.1 Greater Golden Horseshoe (GGH) Model Set up.....	3
2.2 Land Use	4
2.3 Transportation Network.....	10
2.4 Commercial Vehicle Demand Forecasting.....	13
2.5 Modeling Group 1 and Group 2 Initiatives.....	15
2.6 Traffic Assignment Methodology	18
3. ALTERNATIVES EVALUATION	19
3.1 Assessment of Commuter Travel Characteristics	19
3.2 Base Case Congestion	21
3.3 Detailed Screenline Assessment.....	26
3.4 Summer Congestion	29
3.5 Commercial Vehicle Traffic to and from Simcoe County	29
3.6 Modal Integration & Linking Population and Growth Centres	32
4. SENSITIVITY ANALYSIS.....	34
4.1 Dedicated Truck Facility	34
4.2 Connection to the NGTA Corridor.....	39
4.3 Guelph to Cambridge Improvement Needs.....	42
4.4 GTA West Corridor Connection to Highway 410.....	46

List of Exhibits

Exhibit 1: 2031 GTA West Study Population and Employment Forecasts	6
Exhibit 2: 2031 GTA West Study Area Population Growth	9
Exhibit 3: 2031 GTA West Study Area Employment Growth	9
Exhibit 4: Lane Configurations on Inter-Regional Facilities under GTA West Base Case and Group 3 and 4 alternatives	11
Exhibit 5: Overall Commercial Vehicle Modelling Inputs and Process	15
Exhibit 6: 2031 Auto Demand Reduction under Groups 1 and 2 (%).....	17
Exhibit 7: 2031 Auto Trip Reduction – Groups 1 and 2	18
Exhibit 8: GGHM Original and Modified Roadway Link Capacities.....	19
Exhibit 9: 2031 PM Peak Hour Transit Mode Share for Regional Trips.....	20
Exhibit 10: 2031 PM Peak Hour Regional Self-Containment	20
Exhibit 11: Description of Congestion Type, Level of Service (LOS) and Volume/Capacity (V/C) Ratio	22
Exhibit 12: 2031 Base Case AM Peak Congestion Levels on Inter-Regional Facilities	23
Exhibit 13: 2031 Base Case PM Peak Congestion Levels on Inter-Regional Facilities	23
Exhibit 14: GTA West Preliminary Study Area Screenlines	24
Exhibit 15: 2031 Base Case Screenline Evaluation	25

Exhibit 16: Detailed 2031 PM Peak Screenline Assessment of Base Case and GTA West Alternatives – All Facilities at the Screenline..... 27

Exhibit 17: Detailed 2031 PM Peak Screenline Assessment of Base Case and GTA West Alternatives – Inter-Regional Facilities at the Screenline..... 28

Exhibit 18: 2031 Summer Peak Hour Screenline Evaluation– Inter-Regional Facilities..... 29

Exhibit 19: 2031 Base Case PM Peak Hour Distribution of Truck Traffic to and from Simcoe County 30

Exhibit 20: 2031 GTA West 4-3 PM Peak Hour Distribution of Truck Traffic to and from Simcoe County 31

Exhibit 21: 2031 GTA West 4-4 PM Peak Hour Distribution of Truck Traffic to and from Simcoe County 32

Exhibit 22: Change in Travel Times Between Urban Growth Centres..... 33

Exhibit 23: 2031 PM Peak Hour Truck Volumes between Highway 401 and Highway 400 35

Exhibit 24: Routing of PM Peak Hour Truck Demand using the GTA West truck-only facility (West of Highway 410)..... 36

Exhibit 25: 2031 PM Peak Hour Origins and Destinations of the Truck Demand using the GTA West truck-only facility 36

Exhibit 26: 2031 PM Peak Hour Screenline Evaluation for GTA West 4-3 Alternative Scenarios 37

Exhibit 27: 2031 PM Peak Hour Truck traffic diversion from the existing facilities to the GTA West truck only corridor 38

Exhibit 28: 2031 PM Peak Hour GTA West 4-3 with NGTA 4-3 Alternative Evaluation - People and Goods Movement..... 39

Exhibit 29: 2031 PM Peak Hour – With NGTA Connection to Highway 401..... 40

Exhibit 30: 2031 PM Peak Hour Screenline Evaluation With and Without Connection to NGTA Corridor..... 41

Exhibit 31: 2031 PM Peak Hour People & Goods Movement Evaluation – With and Without NGTA Connection..... 42

Exhibit 32: 2031 PM Peak Hour Origin-Destination Patterns of CR 24 / 124 Future Auto Traffic Volumes under Base Case 43

Exhibit 33: 2031 PM Peak Hour Origin-Destination Patterns of County Road 24 / 124 Future Auto Traffic Volumes under GTA West 4-3..... 44

Exhibit 34: 2031 PM Peak Hour Origin-Destination Patterns of County Road 24 / 124 Future Truck Traffic Volumes under Base Case..... 44

Exhibit 35: 2031 PM Peak Hour Origin-Destination Patterns of County Road 24 / 124 Future Truck Traffic Volumes under GTA West 4-3..... 45

Exhibit 36: 2031 PM Peak Hour County Road 24/124 Future Traffic Volume Forecasts and Level of Service under Base Case 45

Exhibit 37: 2031 PM Peak Hour County Road 24/124 Future Traffic Volume Forecasts and Level of Service under GTA West 4-3 46

Exhibit 38: 2031 PM Peak Hour Traffic Volumes with and without GTA West 4-3 interchange at Highway 410..... 47

Exhibit 39: 2031 PM Peak Hour Traffic movement between defined origin-destination nodes 48

Exhibit 40: 2031 PM Peak Hour Vehicle-kilometers of travel on the various segments of inter-regional facilities..... 49

Exhibit 41: 2031 PM peak Hour Roadway Segment V/C ratios with and without GTA West 4-3 interchange at Highway 410 50

Appendices

Appendix A. LOCAL AND REGIONAL ROAD NETWORK ASSUMPTIONS
RTP AND GTA West BASE CASE SCENARIOS

1. INTRODUCTION

Throughout the course of the NGTA and GTAW corridor EA studies, the project team has updated base information used in these studies as new data or analysis tools have become available.

The travel demand forecasting work supporting the *Area Transportation System Problems and Opportunities Report* identified the transportation deficiencies and potential opportunities for solutions to serve existing and future transportation demand in the GTA West. The *Draft Overview of Forecasting Travel Demand Analysis* technical background report provided an overview of the travel demand forecasting and analysis assumptions used and the modelling work completed to support the *Area Transportation System Problems and Opportunities Report*.

Since that time, new information has become available from the Ontario Ministry of Transportation's (MTO) Greater Golden Horseshoe Model (GGHM) and updated land use forecasts have been developed as part of the Growth Plan conformance exercises being completed by Regional and Local Municipalities. Updated assumptions regarding planned improvements to Regional and Local Municipal roads and transit networks from their respective Transportation Master Plans have also been reviewed and incorporated into the GGH travel demand model. The updated modeling methodology and assumptions have been used to complete the assessment of alternatives to assist in the development of the Transportation Development Strategy under Phase I of the GTA West EA study process. The results of the updated modeling work do not significantly differ from the forecasts prepared as part of the earlier phase of work, as indicated by similar transportation deficiencies forecast for 2031.

The intent of this report is to:

- provide an overview of the travel demand modeling approach and key modeling assumptions used;
- summarize the forecasting results that support the findings and conclusions in Chapter 4 of the *Transportation Development Strategy Report*; and
- document the results of a series of sensitivity tests undertaken as part of the assessment process.

As the GTA West Corridor EA Study proceeds through the subsequent stages of the EA process, the Ministry will continue to update the modelling and travel demand forecasting work as required to support these subsequent stages of the study.

2. GGHM MODELING PROCESS

2.1 Greater Golden Horseshoe (GGH) Model Set up

The Ontario Ministry of Transportation's (MTO) Greater Golden Horseshoe Model (GGHM) was used to forecast future travel demands for the transportation analysis. The GGHM as developed and validated has been used by Metrolinx in the development of the Regional Transportation Plan (RTP), and is also being used by MTO in major planning studies throughout the Greater Golden Horseshoe area. The model utilizes a detailed transportation network including both transit and roadway infrastructure and forecasts trip making by all modes of travel based on planned population and employment growth, land use densities, socio-economic and demographic information, current and future transportation costs (representing fuel costs, tolls, parking costs, transit fares, vehicle operating costs, etc), and transportation network performance for all travel modes.

An updated version of the GGH model (V2.2) was used for the modeling and analysis undertaken for assessment and evaluation of Transportation Alternatives to support the GTAW Transportation Development Strategy. As a continuation of the MTO's efforts to refine the GGH Model, the previous version of the GGHM (V2.1) has undergone refinements that included recalibration of some model components. In addition to recalibration of some components to the passenger demand, this version also included upgrades to the commercial vehicle component. The previous version V2.1 was used in the earlier phases of the GTA West and NGTA studies.

The main differences in terms of the passenger demand component of the V2.2 model from the previous version – is in the modal choice and the trip distribution steps of the model. The mode choice model in the GGHM uses a nested logit model with a utility function that includes network level-of-service and land use sensitive variables such as urban density, neighborhood type, etc. The trip distribution model is based on a Gravity Model formulation that uses the “logsum” variable from the mode choice component as a measure of impedance (or accessibility).

The structure of the mode choice model had been designed with a view to making the model sensitive to various land use specific variables, in order to be responsive when forecasting and evaluating sustainable transportation policies, and to better represent how travel behavior is affected by urban landscape, street network layout, etc. The model is also designed to be able to model attractiveness to active transportation modes using urban densities and area typologies as key variables. While most of these features were already built into the earlier version of the GGH Model, several refinements were made in V2.2, such as re-defining some of the classifications and other variables before recalibrating the model. The resulting model parameters were more robust and had more reasonable elasticity implied values-of-time.

More significant refinements were in the area of trip distribution. The “logsum” variable, which measures accessibility between every zone-pair in the network, is computed as the log of sum of exponentials of utilities of each available mode for every zone-pair. With the recalibration of the mode choice model, this variable was re-estimated to recalibrate the trip distribution model. Also, different market segmentations and specifications were tested before arriving at the final trip distribution model.

One of the major refinements is in the spatial segmentation used in the home-work linkage¹ distribution model to differentiate urban and rural areas within each region/county in the GGH. This segmentation within the model was more appropriate for reflecting the existing work travel distribution pattern as well in forecasting future distribution patterns and levels of self-containment within sub-regions. Finally, the other major improvement in the work trip distribution models is the reduced reliance on k-factors to replicate observed trip patterns.

2.2 Land Use

The land use developed for the Metrolinx RTP was used as the starting point for the Study. The population and employment forecasts used in the RTP were developed prior to each municipality initiating updates to their Official Plans to conform to the new policy directions outlined in the Provincial Growth Plan (*Places to Grow*). Therefore, the original modeling work for the RTP used population and employment growth totals that were consistent with the regional municipal allocations outlined in Schedule 3 of the Growth Plan. However, the allocation of future growth within each municipality was estimated using a top down approach, based on the policies outlined in the Growth Plan.

Since the adoption of the RTP in 2008, all of the municipalities have embarked upon their Growth Plan conformance reviews, and many of them have completed their own assessment of where future population and employment growth will be located in their communities based on the policies outlined in the Growth Plan and the planning policies contained in their respective Official Plans. These growth forecasts, developed from the bottom-up, represent the most recent land use forecasts available and were therefore incorporated into the detailed travel demand forecasting work undertaken for this study. The land use allocation at the Traffic Analysis Zone (TAZ) level within an individual region was translated to the GGH Model TAZ system by developing an equivalency between the two zone systems. A TAZ is a spatial modeling unit representing an area with relatively homogenous land uses where trips are generated based on the land use within the zone.

The following are the sources that provided regional land use allocations of the 2031 population and employment within the GGH Model area for GTA West and NGTA transportation modeling:

- **Region of Peel:** Region of Peel Planning Department provided the population and employment at the TAZ level, which was converted to the GGH Model zone system.
- **Region of York:** Region of York Planning and Development Services provided the York Region's Official Plan population and employment that are used in the York Region Travel Demand Model and Transportation Master Plan.
- **City of Guelph and County of Wellington:** Population and employment for Guelph were provided by the City of Guelph. The City of Guelph growth forecasts were consistent with the Places to Grow population and employment targets. The City of Guelph population and employment were converted to GGH Model zone system. The rest of the growth for the Region of Wellington was distributed within the various zones in Wellington County.
- **Region of Waterloo:** Population and employment forecasts from the Region of Waterloo's Transportation Master Plan were used.
- **Region of Halton:** Population and employment forecasts from Sustainable Halton Preferred Land Use Option 2C were used.
- **Region of Hamilton:** The City of Hamilton's Planning and Economic Development Department provided the population and employment forecasts used in the Region's GRIDS (Growth Related Integrated Development Strategy) Integrated Infrastructure Master Plan. However, the Region noted that the employment numbers might be revised in the near future.
- **Region of Niagara:** Population and employment forecasts used for Niagara Region were based on the Region of Niagara Option D Land Use scenario. The Regional totals were adjusted to match the 2031 Places to Grow population and employment targets, while ensuring that there is no negative growth in local municipalities between 2006 to 2031.
- **Region of Durham:** Population and employment forecasts from the Draft Growing Durham Plan were adjusted to the 2031 Places to Grow population and employment levels.
- **Simcoe County:** Population and employment forecasts from the *Simcoe Area: A Strategic Vision for Growth* were used.

The population and employment estimates for the rest of the GGH Model area were retained from the Regional Transportation Plan (RTP) model.

Exhibit 1 summarizes the 2031 population and employment forecasts and lower tier allocations for the municipalities within the GGH Model area that were updated for the GTA West study.

Exhibit 1: 2031 GTA West Study Population and Employment Forecasts

Regional Municipality	Local Municipality	2031 Population	2031 Employment
Durham	Ajax	137,680	49,290
	Brock	14,020	5,010
	Clarington	140,350	38,420
	Oshawa	197,030	90,790
	Pickering	225,690	76,720
	Scugog	25,400	9,480
	Uxbridge	26,970	8,970
	Whitby	192,880	71,310
Durham Total		960,000	350,000
Halton	Burlington	196,650	105,580
	Halton Hills	93,950	42,550
	Milton	232,510	114,530
	Oakville	256,900	127,350
Halton Total		780,010	390,000
Hamilton	Hamilton	659,990	300,010
Hamilton Total		659,990	300,010
Niagara	Fort Erie	37,210	14,570
	Grimsby	29,990	9,430
	Lincoln	27,710	11,830
	Niagara Falls	97,660	45,790
	Niagara-on-the-Lake	20,760	11,480
	Pelham	21,200	5,240
	Port Colborne	22,830	7,730
	St. Catharines	143,800	72,100
	Thorold	25,970	9,670
	Wainfleet	7,770	1,630
	Welland	61,120	23,210
	West Lincoln	15,000	5,320
Niagara Total		511,000	218,000
Peel	Brampton	741,850	317,570
	Caledon	109,790	47,440
	Mississauga	788,360	504,990
Peel Total		1,640,000	870,010

Regional Municipality	Local Municipality	2031 Population	2031 Employment
Simcoe	Adjala-Tosorontio	13,000	1,800
	Barrie	210,000	101,000
	Bradford West Gwillimbury	50,500	17,500
	Clearview	19,100	5,100
	Collingwood	33,400	13,500
	Essa	21,500	9,000
	Innisfil	58,000	12,800
	Midland	22,400	14,600
	New Tecumseth	56,000	26,300
	Orillia	41,000	21,000
	Oro-Medonte	27,000	6,000
	Penetanguishene	11,000	6,100
	Ramara	13,000	2,200
	Severn	17,000	4,400
	Springwater	24,000	5,600
	Tay	11,300	1,880
	Tiny	12,500	1,730
Wasaga Beach	26,300	3,500	
Simcoe Total		667,000	254,000
Waterloo	Cambridge	167,170	102,380
	Kitchener	320,730	129,240
	North Dumfries	16,760	7,720
	Waterloo	149,830	95,680
	Wellesley	12,610	2,980
	Wilmot	24,290	7,760
	Woolwich	37,610	20,230
Waterloo Total		729,000	365,990

Regional Municipality	Local Municipality	2031 Population	2031 Employment
Wellington	Centre Wellington	52,730	17,000
	Erin	18,840	5,490
	Guelph	168,690	98,430
	Guelph/Eramosa	20,910	6,970
	Mapleton	15,460	6,890
	Minto	13,200	5,600
	Puslinch	13,320	6,800
	Wellington North	17,850	10,820
Wellington Total		321,000	158,000
York	Aurora	70,100	34,190
	East Gwillimbury	87,560	34,400
	Georgina	70,350	21,240
	King	34,980	11,950
	Markham	428,440	240,890
	Newmarket	96,860	49,430
	Richmond Hill	241,520	99,320
	Vaughan	409,700	265,580
	Whitchurch-Stouffville	60,490	23,030
York Total		1,500,000	780,030

Exhibits 2 and 3 illustrate the distribution of future population and employment growth, respectively, in the GTA West study area.

Exhibit 2: 2031 GTA West Study Area Population Growth

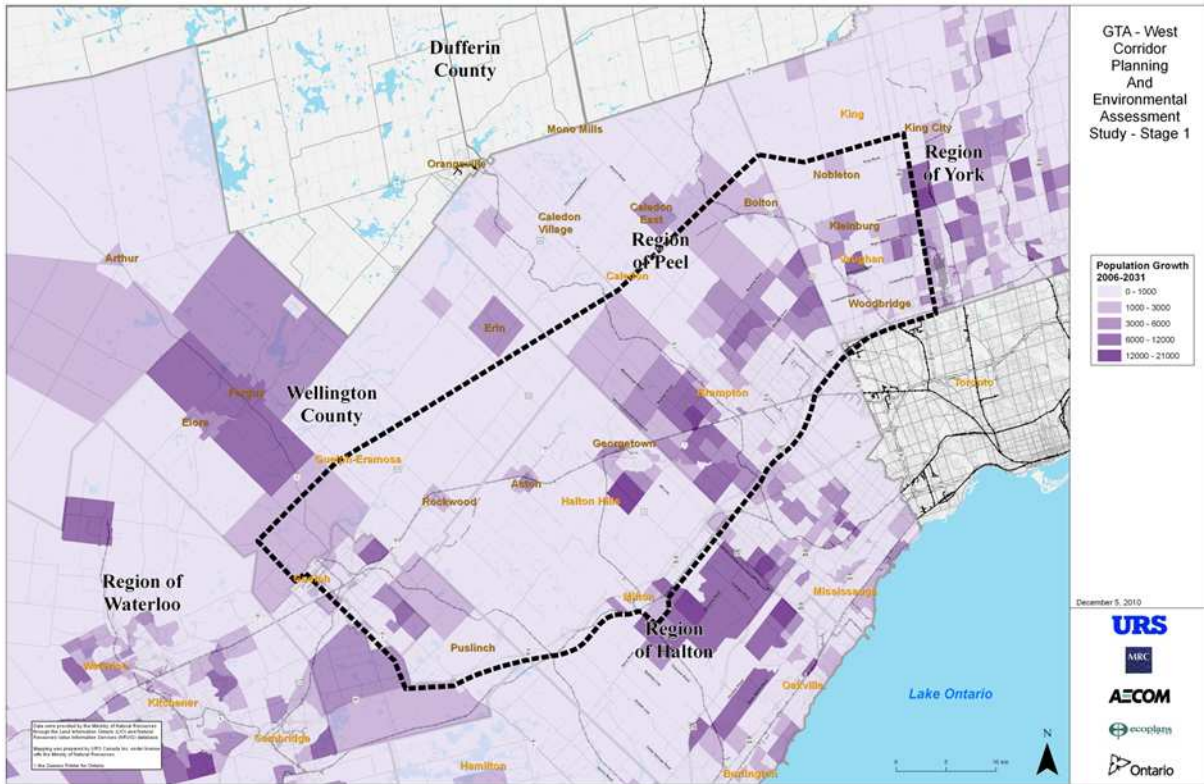
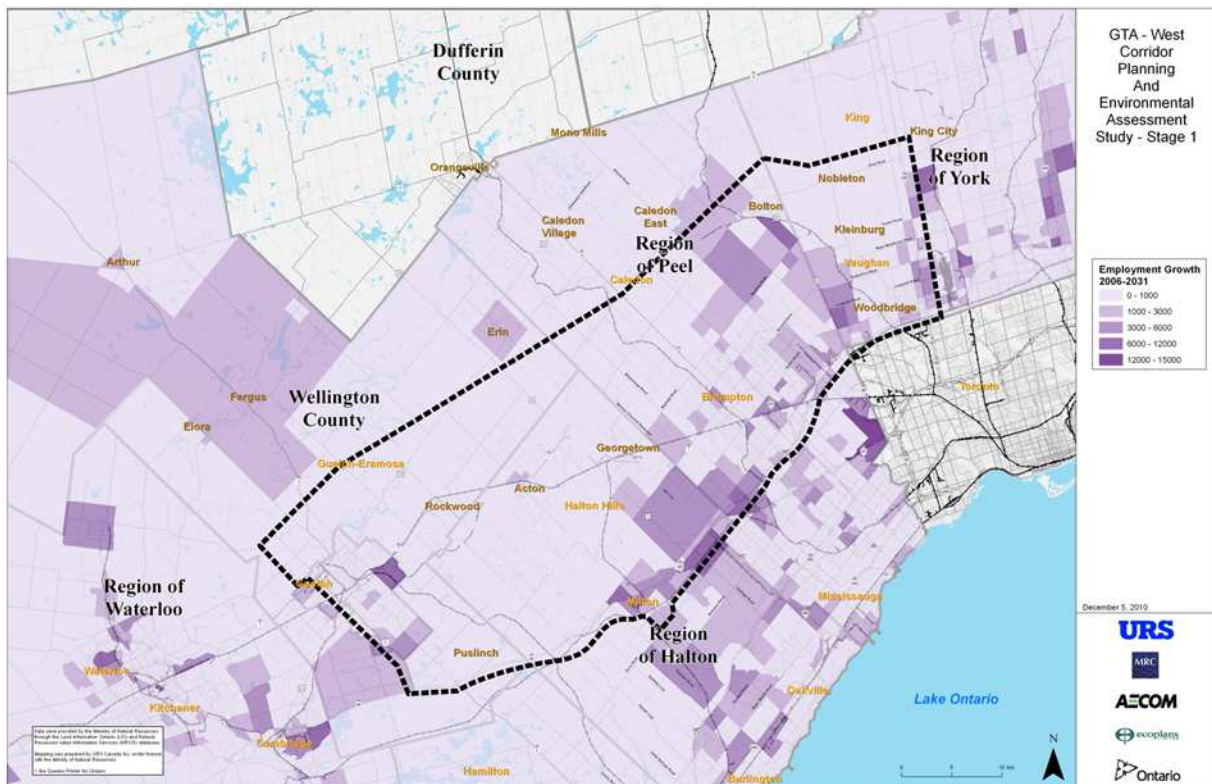


Exhibit 3: 2031 GTA West Study Area Employment Growth



2.3 Transportation Network

The Base Case scenario was identified as a benchmark for comparing other “improvement” alternatives. The Base Case is considered the status quo, where improvements to the transportation system would be limited to the implementation of approved Provincial, Regional and local Municipal initiatives. This includes the broad range of infrastructure improvements listed below that are planned to be implemented by 2031:

- The Metrolinx Regional Transportation Plan (Metrolinx RTP), which identifies a \$50 billion transit investment in the Greater Toronto and Hamilton Area (GTHA), including new express and commuter rail services, bus and light rail transit services;
- GO Transit’s Strategic Plan, GO 2020, which proposes increased service frequencies and provides new rail service extensions to Guelph, Kitchener/Waterloo and Niagara; and
- The Ministry of Transportation’s planned and committed improvements including projects identified in the Southern Ontario Highway Program (2006-2010) and the High Occupancy Vehicle (HOV) Lanes Plan (2007). Other planned improvements to the Provincial Highway network, beyond the projects noted above were not considered to be included in the Base Case.

In addition to the provincial transportation network improvements, the Base Case was updated to include road, transit and active transportation programs identified through approved Transportation Master Plans, Official Plans or Development Charge Background Studies completed by Regional / Lower Tier municipalities. Local and regional roads in the RTP model were updated based on information provided by the following regions:

- Halton Region: Updates based on 2007 Development Charge Study and the Draft HP BATS Corridor Study
- Durham Region: Updates based on 2008 Development Charge Study
- Peel Region: Updates based on Peel Long Range Transportation Plan (2005) & Peel Capital Plan (2009)
- York Region: Updates based on York Region Transportation Model
- Wellington County/City of Guelph: Updates based on Guelph-Wellington Transportation Study
- City of Hamilton: Updates based on information from City of Hamilton
- Niagara Region: Updates based on Niagara Region 2031 Transportation Model

The complete list of changes to local and regional road network is presented in **Appendix A**.

The roadway network improvements for each of the GTA West alternatives were defined by the improvements over and above those improvements included in the Base Case roadway network. **Exhibit 4** shows the lanes on inter-regional facilities under Base Case and Group 3 and 4 alternatives.

Exhibit 4: Lane Configurations on Inter-Regional Facilities under GTA West Base Case and Group 3 and 4 alternatives

Facility	Description	Lane Configuration						
		Base Case	GTAW 3-1	GTAW 4-1	GTAW 4-2	GTAW 4-3	GTAW 4-4	GTAW 4-5
Highway 400	Highway 9 to King Rd	6 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV
	King Rd to Major Mackenzie Rd	8 GPL + 2 HOV	10 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV
	Major Mackenzie Rd to Highway 407 ETR	10 GPL	12 GPL	12 GPL	12 GPL	12 GPL	12 GPL	12 GPL
Highway 407 ETR	Highway 400 to Highway 427	10 GPL	16 GPL	10 GPL	10 GPL	10 GPL	10 GPL	10 GPL
	Highway 427 to Highway 410	10 GPL	14 GPL	10 GPL	10 GPL	10 GPL	10 GPL	10 GPL
	Highway 410 to Highway 401/407 ETR	10 GPL	12 GPL	10 GPL	10 GPL	10 GPL	10 GPL	10 GPL
Highway 401	Highway 6 to RR25	6 GPL	10 GPL	10 GPL	10 GPL	10 GPL	8 GPL	8 GPL
	RR25 to Highway 407 ETR	6 GPL	10 GPL + 2 HOV	10 GPL + 2 HOV	10 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV	8 GPL + 2 HOV
Highway 410	Highway 407 ETR to Bovaird Dr	8 GPL	8 GPL	8 GPL	8 GPL	8 GPL	8 GPL	8 GPL
	Bovaird Dr to Mayfield Rd	4 GPL	8 GPL	8 GPL	8 GPL	8 GPL	8 GPL	8 GPL
	Mayfield Rd to New Corridor	-	-	8 GPL	8 GPL	8 GPL	8 GPL	8 GPL
Highway 427	Highway 407 ETR to Rutherford Rd	6 GPL	8 GPL	8 GPL	8 GPL	8 GPL	8 GPL	8 GPL
	Rutherford Rd to Major Mackenzie Rd	4 GPL	6 GPL	8 GPL	8 GPL	8 GPL	8 GPL	8 GPL
	Major Mackenzie Rd to New Corridor	-	-	8 GPL	8 GPL	8 GPL	8 GPL	8 GPL
HPBATS	Highway 40/407 ETR to Sideroad 5	8 GPL	8 GPL	8 GPL	N/A ¹	8 GPL	8 GPL	8 GPL
	Sideroad 5 to Mayfield Rd	4 GPL	4 GPL	6 GPL	N/A	N/A	N/A	N/A
	Sideroad 5 to GTAW Corridor	N/A	N/A	N/A	N/A	6 GPL	4 GPL	6 GPL

1. Under GTA West 4-2, HP BATS was assumed to be replaced by the GTA West corridor

N/A – Not Applicable

An overview of Group 3 and 4 alternatives is presented below.

Overview of Group #3

Group #3 includes all of the elements from Group #1 and Group #2 as well as the widening of the following existing provincial inter-regional transportation facilities in various combinations:

- Highway 401;
- Highway 410;
- 407 ETR;
- Highway 400;
- Highway 427;
- County Road 124 / Regional Road 24 / Highway 9;
- Highway 7;
- Highway 6;
- Mayfield Road / Kirby Road; and
- Trafalgar Road.

Roadway widening alternatives include:

- Highway widening; or
- Highway and arterial road widening.

Three alternatives were developed under Group #3 that considered the widening of existing road infrastructure beyond the planned program. The degree of widening required under each Group #3 Alternative was based on the number and type of roadways to be widened. Under Alternative 3-1, where the preliminary study area's provincial highways only are widened, lane requirements are as follows:

- Highway 401 – additional two to four lanes;
- Highway 427 – additional two lanes;
- 407 ETR – additional two to six lanes;
- Highway 410 – additional zero to four lanes; and
- Highway 400 – additional two to four lanes.

The degree of widening that would be required to address the future transportation needs forms part of the basis for comparing Group #3 and Group #4 Alternatives, as discussed further below.

Overview of Group #4

Group #4 includes all of the elements from Group #1 and Group #2 (see section 2.5 for discussion about Group #1 and #2 initiatives) and potentially some of the highway widening and improvements identified in Group #3, as well as the following new corridor alternatives:

- New corridor connecting either:
 - Highway 400 to Highway 410; GTA West 4-1
 - Highway 400 to Highway 401 / 407 ETR; GTA West 4-2

- Highway 400 to Highway 401 west of Milton; GTA West 4-3
- Highway 400 to north of Guelph; GTA West 4-4 or
- Highway 400 to south of Guelph: GTA West 4-5

These selected corridors represent the introduction of major capacity improvements in areas that have been identified as having significant transportation deficiencies. One of the key deficiencies along the Highway 401 corridor occurs between Highway 400 and Highway 427, where the highway has been built out to its maximum number of lanes. As a result, each new corridor alternative terminates at Highway 400 in order to address this most critical section of transportation deficiency in the area north and west of Toronto. The western termini of the Group #4 Alternatives vary by each alternative and represent significantly different points of network connection that are anticipated to provide different levels of congestion relief to the study area and serve different trucking activity and commuter travel patterns throughout the area.

2.4 Commercial Vehicle Demand Forecasting

Commercial vehicle demand was modeled using the commercial vehicle forecasts provided by the MTO based on the Commercial Vehicle Model. A general overview of the commercial vehicle (CV) module of the GGHM is presented below.

As with the passenger module, the CV model also underwent a major refinement in V2.2 to better reflect the spatial distribution of truck trips in the GGH area.

The CV model implemented within the GGHM can be described as a modified “Quick Response” 3-stage trip-based model. The three stages refer to trip generation, distribution and assignment of commercial vehicle trips by three truck types for the 12.5-hour daytime period, as well as the a.m. and p.m. peak hours.

Three classes of truck are modeled separately:

- Light Trucks - 4-tire commercial vehicles, including delivery and service vehicles
- Medium Trucks - Single unit trucks with 6 or more tires
- Heavy Trucks - Combination Trucks consisting of a power unit (truck or tractor) and one or more trailing units.

Various data sources have been used for the development of the CV model, including the following:

- MTO CVS Surveys & Counts from 2002 and 2006
- Region of Peel Commercial Travel Survey (2006-2007)
- GTA Cordon Counts for 2001 & 2006
- Statistics Canada population & employment data
- Info Canada Business Establishment Data (for major distribution centers)

For each truck class, the modeling approach is outlined in **Exhibit 5** below. The left column of this flow diagram refers to the data inputs that are used in each phase of the model; the right column refers to the modeling step.

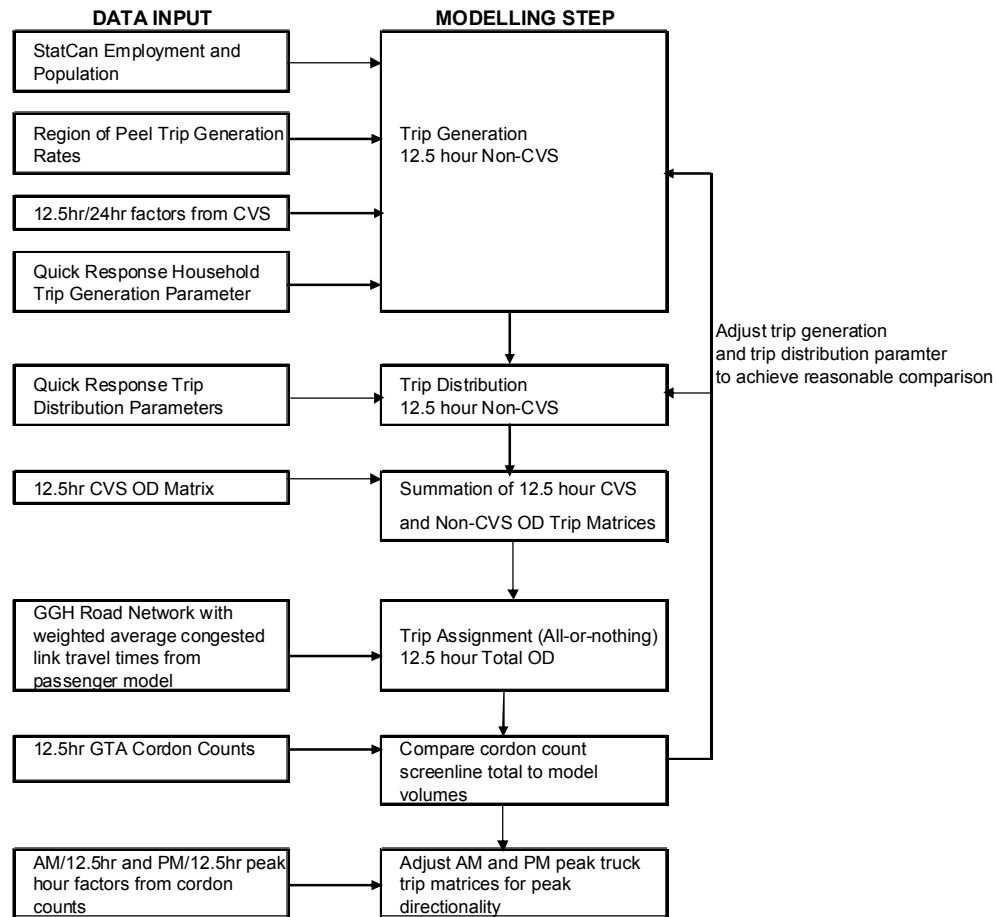
Trip Generation – Base 24-hour trip generation rates for business establishments are obtained from the Region of Peel Commercial Travel Survey, while trip generation rates for households are adopted from the FHWA Quick Response (QR) Method. Different adjustment factors are applied to better reflect the distribution of truck generations throughout the GGH. For example, adjustments were necessary to reflect the difference between Peel and the rest of GGH, given the nature of Peel being a freight hub, with a concentration of transportation-intensive manufacturing and warehousing establishments.

Trip Distribution – A series of gravity models are applied to distribute 12.5-hour non-CVS truck trips within the Greater Golden Horseshoe and these are combined with the CVS OD matrix obtained from the survey. The gravity model formulation recommended in the Quick Response Freight Manual is applied, with parameters specific to each of the three vehicle classes. For the 12.5 hour distribution, free-flow travel times are used as inputs to the gravity model. The gravity model parameters from the QR Freight Manual were adjusted to account for differences between the GGH and the U.S. metropolitan areas that provided the basis for the Freight Manual.

Trip Assignment – A 12.5-hour trip assignment is carried out using an all-or-nothing assignment in the EMME/2 traffic demand modeling software, using the same network as the passenger model. Peak hour assignments for the AM and PM periods are carried out using equilibrium link travel times obtained from the passenger model for the two peak hours, respectively. The peak hour commercial vehicle matrices are derived through daily-to-peak hour factors based on observed patterns from Cordon Count data.

The commercial vehicle and passenger vehicle demands are in the same TAZ system. Hence both were assigned to the transportation roadway network to estimate the total vehicular demand on the transportation system.

Exhibit 5: Overall Commercial Vehicle Modelling Inputs and Process



2.5 Modeling Group 1 and Group 2 Initiatives

Following the “Building Block” approach used in this study, the modeling for the Groups 3 and 4 alternatives have assumed that the implementation of Groups 1 and 2 initiatives would proceed. These include Transportation System Management (TSM) and Transportation Demand Management (TDM) measures aimed at improving the efficiency of existing infrastructure and reducing auto demand, respectively.

Group #1 – Optimize Existing Networks – builds upon the comprehensive strategies of the Metrolinx RTP, GO Transit 2020 Strategic Plan, MTO’s High Occupancy Vehicle Lane Network Plan and Carpool Lot Program, Transportation System Management (TSM) measures, Transportation Demand Management (TDM) initiatives and municipal transportation plans.

Group #2 – New / Expanded Non-Road Infrastructure – developed to address future problems and builds upon the transit, rail, marine and air service expansion initiatives, as envisioned by agencies, industry, Metrolinx and GO Transit.

The GGHM modeling setup already includes assumptions to capture the anticipated behavioural trends that are likely to occur in trip making independent of TDM policy measures introduced through the GTA West or NGTA studies.

The *Area Transportation System Problems and Opportunities Report* for the GTA West study applied additional post-GGH Model reductions to the auto demand to account for the TDM / TSM measures incorporated into the Groups 1 and 2 initiatives. These include:

- A global 4% reduction in auto demand to account for TDM and other transit initiatives
- A 10% reduction in long-distance truck demand to account for diversion to other travel modes, predominantly freight rail.

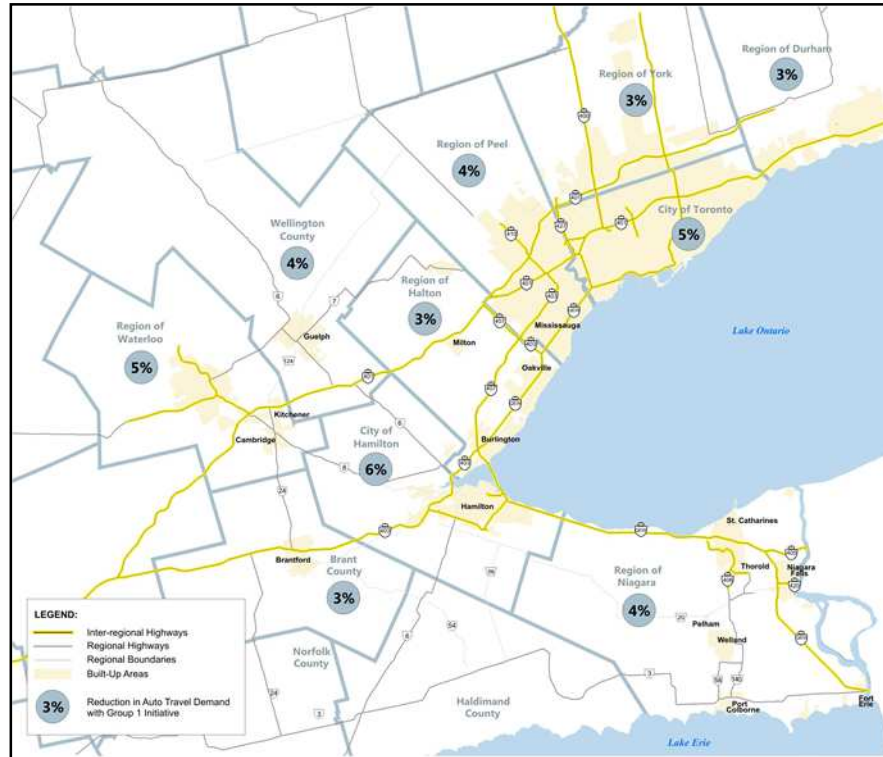
These adjustments were retained for the detailed evaluation of GTA West alternatives, although the global 4% reduction in auto demand was applied in a more targeted manner. Higher reductions were applied in urban areas where TDM and transit measures can have a larger impact on auto demands, and lower reductions were used in suburban or rural areas where opportunities are more limited. A trip reduction matrix was developed with higher trip reduction factors for trips internal to regions and for trips to larger urban centres such as Toronto and Hamilton. Lower trip reduction factors were used for long-distance trips between Regions, and in regions with lower congestion levels and potential for TDM. The inter-regional breakdown of the 4% adjustment to auto demand is presented in **Exhibit 6**.

Exhibit 6: 2031 Auto Demand Reduction under Groups 1 and 2 (%)

	Oshawa	Burlington	Oakville	Hamilton	St.Catharines	Brampton	Mississauga	Toronto	Cambridge	Kitchener	Waterloo	Guelph	Markham	Vaughan	other
Oshawa	3	3	3	5	2	2	2	5	1	1	1	3	1	1	1
Burlington	3	4	3	5	3	3	3	5	3	3	3	3	3	3	1
Oakville	3	3	4	5	3	3	3	5	3	3	3	3	3	3	1
Hamilton	5	5	5	6	5	5	5	5	5	5	5	5	5	5	1
St.Catharines	2	3	3	5	4	2	2	5	2	2	2	3	2	2	1
Brampton	2	3	3	5	2	4	2	5	2	2	2	3	2	2	1
Mississauga	2	3	3	5	2	2	4	5	2	2	2	3	2	2	1
Toronto	5	5	5	5	5	5	5	6	5	5	5	5	5	5	1
Cambridge	1	1	3	5	2	2	2	5	3	1	1	3	1	1	1
Kitchener	1	3	3	5	2	2	2	5	1	3	1	3	1	1	1
Waterloo	1	3	3	5	2	2	2	5	1	1	3	3	1	1	1
Guelph	3	3	3	5	3	3	3	5	3	3	3	4	3	3	1
Markham	1	3	3	5	2	2	2	5	1	1	1	3	3	1	1
Vaughan	1	3	3	5	2	2	2	5	1	1	1	3	1	3	1
other	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Exhibit 7 illustrates the distribution of the auto trip reduction assumptions used in the updated modeling work.

Exhibit 7: 2031 Auto Trip Reduction – Groups 1 and 2



Of the 4% reduction in auto demand:

- 2.5% of trips were assumed to shift from auto driver to transit;
- 1.0% of trips were assumed to shift from auto driver to auto passenger (carpooling); and
- 0.5% of trips no longer travel during peak periods (or at all)

The 10% reduction in long distance truck demand was applied to the 2031 heavy truck demand with a trip length of 500km or greater. These reductions were applied to the demand matrices produced by the Commercial Vehicle model and were implemented in the GGH model runs prior to the traffic assignment stage, to forecast resulting traffic volumes on the roadway network.

2.6 Traffic Assignment Methodology

MTO uses separate modeling procedures to forecast passenger and commercial vehicle demands. The GGHM models auto and transit passenger demands while the CV model forecasts truck demands. Currently these are not integrated. In the original GGH model, the roadway capacities are reduced to reflect the capacity that is available to autos, since trucks are not modeled explicitly.

Given the importance of goods movement in the study area, a modified approach to forecasting truck travel demands was used for the evaluation of alternatives in the GTA West study. With this approach, both the auto and commercial vehicle demand were assigned to the roadway network. The commercial

vehicle fleet is stratified into three classes – light, medium and heavy trucks. Light trucks are treated as equivalent to passenger cars in terms of their utilization of roadway capacity. Medium and heavy trucks are assumed to be equivalent to 1.75 and 2.5 passenger cars, respectively.

The medium and heavy truck demands were assigned to the road network using an all-or-nothing (AON) assignment reflecting the fact that trucks typically take the shortest and most direct route to their destination and are less likely to divert from freeway facilities to local roads in response to congestion. These modeled truck demands were used as a pre-load (or existing fixed volume) for the auto and light truck assignment.

As a result, the capacities in the GGH model for the auto assignment were adjusted upwards from their original total capacities to reflect passenger car equivalent (PCE) capacities by functional class of roadway as shown in **Exhibit 8**.

Exhibit 8: GGHM Original and Modified Roadway Link Capacities

Roadway Link Type	Original GGHM Roadway Link Capacity (pce/hr/lane)	Modified Total Roadway Link Capacity (pce/hr/lane)
Inter-regional Facility Mainline	1800	2200
Inter-regional Facility Ramp	1400	1700
Inter-regional Facility Mainline HOV Lane	1400	1700
Other Roadway Links	Varies by Road Class Less than 1300	Original Capacity + 100

The cost of using the 407 ETR was incorporated into the demand model through a toll charge attribute. The cost of tolls was assumed to increase at the rate of inflation between the current year and 2031.

3. ALTERNATIVES EVALUATION

3.1 Assessment of Commuter Travel Characteristics

The travel demand forecasting for both GTA West and NGTA studies was performed simultaneously using an integrated travel demand forecasting model and common transportation evaluation criteria. Given that the study areas share a boundary along the Highway 401 corridor, it was recognized that capacity improvements in one study area might affect travel demands and, more importantly, the routing of trips through the adjacent study area. Therefore, the modeling to support the evaluation process has assumed that “something” would be done to address the problems and opportunities in each study area.

The combined NGTA-GTA West GGH Model runs established the transit mode share component of travel and the regional self-sufficiency for each of the above scenarios. To understand the relationships between new auto capacity and the impact on transit use and self containment of trip making in the study area, a series of model runs were undertaken to test different combinations of scenarios. The scenarios tested include:

- Base Case – base for comparison of other scenarios and includes planned transit / road improvements described previously;
- GTA West 3-1 - includes base case improvements plus widening of existing Highways in the GTA West study area;

- NGTA 3-1 / GTA West 4-3 – base case improvements plus widening of existing Highways in the NGTA study area and a new corridor in the GTA West Study area between Highway 400 and Highway 401 in Milton;
- NGTA 4-3 / GTA West 4-3 – base case improvements plus a new corridor in the NGTA study area between Fort Erie and Highway 401 (west of Milton) combined with a new corridor in the GTA West Study area between Highway 400 and Highway 401 in Milton; and
- NGTA 3-1 / GTA West 4-4 - base case improvements plus widening of existing Highways in the NGTA study area and a new corridor in the GTA West Study area between Highway 400 and Highway 6 in Guelph

Exhibit 9 and 10 summarize the PM peak hour Transit Mode Shares and Self Containment (trips staying within the Region) for each of the municipalities in the GTA West Study area based on the results of the above noted GGH model Runs.

Exhibit 9: 2031 PM Peak Hour Transit Mode Share for Regional Trips

	Base Case	GTA West 3-1	NGTA 3-1 / GTA West 4-3	NGTA 4-3 / GTA West 4-3	NGTA 3-1 / GTA West 4-4
Toronto	36%	38%	38%	38%	38%
York	15%	16%	16%	16%	16%
Peel	16%	17%	17%	17%	17%
Halton	11%	12%	12%	12%	12%
Wellington	3%	5%	5%	5%	5%
Waterloo	6%	8%	8%	8%	8%
Hamilton	9%	12%	11%	11%	11%
Brant	3%	4%	4%	4%	4%

Exhibit 10: 2031 PM Peak Hour Regional Self-Containment

	Base Case	GTA West 3-1	NGTA 3-1 / GTA West 4-3	NGTA 4-3 / GTA West 4-3	NGTA 3-1 / GTA West 4-4
Toronto	69%	69%	69%	69%	69%
York	65%	65%	65%	65%	65%
Peel	70%	70%	69%	69%	69%
Halton	64%	64%	63%	63%	63%
Wellington	80%	80%	80%	80%	79%
Waterloo	91%	91%	91%	91%	91%
Hamilton	80%	80%	80%	80%	80%
Brant	88%	88%	88%	87%	88%

As summarized above, the PM peak hour transit mode shares generally increase slightly from the base case scenarios due to the TDM and TSM benefits of the Group 1 and Group 2 measures. Between the Group 3 and Group 4 road improvement alternatives there is very little difference between the transit mode shares, since each alternative was generally designed to provide sufficient road network capacity to accommodate future demands. The degree of self containment in trip making within Halton Region and Peel Region does reduce by approximately 1% with the introduction of the GTA West 4-3 new corridor. This represents a slight increase in long distance commuting as a result of the new corridor. With the GTA West 4-4 new corridor the same pattern is observed, with a 1% reduction in self containment (in Peel and Halton Regions) and no change to transit mode shares in the regions either. The extension of the new corridor all the way to Guelph does result in an additional 1% drop in municipal self containment of trips within Wellington County.

As a result of the above analysis, it was concluded that the introduction of new road capacity will have a modest impact on the future transit use and auto occupancies in the study area, but many of these impacts can be reduced and/or eliminated through the application of the Group 1 and Group 2 initiatives discussed previously in this report. The method of providing new road capacity (widening versus new corridor) does not appear to have a significant impact on the transit use or auto occupancies for the entire study area nor at the local municipality level, although the new corridor alternatives show a modest reduction in municipal self containment of trips for communities where the new corridor passes through.

Therefore, the roadway network modifications for different road network alternatives were modeled subsequently as separate traffic assignment runs in the EMME modeling software platform, rather than running them through the full GGH model.

For example, GTA West 4-2 is not expected to alter the trip distribution or transit use in the study area significantly from GTA West 4-3 since it only changes the location where the proposed new corridor would terminate at Highway 401 in Halton. Therefore the GTA West 4-3 travel demand matrix obtained from the GGH model was used along with the GTA West 4-2 network to simulate the network performance of this alternative. Since the GTA West 4-1, alternative only included a limited amount of new corridor combined with widening of existing highways, this scenario was modelled using the travel demand matrices derived from the GTA West 3-1 GGH model run.

The assessment of the GTA West 4-3 compared to GTA West 3-1 scenarios found that there was some minor change in the regional transit mode shares and the level of trip self containment between these two scenarios. A similar result was observed when the GTA West 4-4 alternative was run through the full GGH Model. As a result, the travel demand matrices obtained from the GTA West 4-3 GGH model run was used to test the network performance of the GTA West 4-4 and GTA West 4-5 new corridor scenarios to maintain consistency in the comparison of results.

3.2 Base Case Congestion

Each GTA West alternative was evaluated by comparing its performance against other GTA West alternatives and also against the Base Case; the Base Case was the benchmark for comparing the improvement alternatives. Hence, it was necessary to establish Base Case conditions for 2031 using the updated modeling approach adopted for the detailed evaluation of alternatives, including the use of the new model version, updates to land use, roadway network and approach to forecasting commercial goods movement demands. Note that levels of congestion are classified into three categories as shown below in **Exhibit 11**.

Exhibit 11: Description of Congestion Type, Level of Service (LOS) and Volume/Capacity (V/C) Ratio

Congestion Type	Approx. LOS	Approx. V/C	Description
Minor	LOS C or better	Less than 0.80	Non-recurring congestion*
Moderate	LOS D	0.80 to 0.90	Approaching Unstable conditions
Major	LOS E or F	0.90 and above	Unstable Conditions (Stop- and-Go)

* Congestion may result from non-recurring incidents such as inclement weather, accidents, road maintenance, etc.

Note that the lower the V/C ratio, the more capacity that is available and the better the traffic flows on the corridor. As the V/C ratio approaches 0.9 (meaning that the volume demand is about 90% of the available capacity) the speed deteriorates and the traffic flow becomes unstable and/or congested as the traffic volumes reach the link capacity. This is referred to as congested traffic conditions on the link.

Forecasts of peak hour congestion on the key inter-regional facilities in the study area for the Base Case conditions in 2031 are illustrated in the congestion plots shown in **Exhibits 12 and 13** for AM and PM peak hours, respectively.

Based on the updated Base Case model runs for the 2031 AM and PM peak hour periods the following key observations are noted:

- Virtually the entire stretch of Highway 401 is forecast to operate at LOS E or F by 2031 during both the AM and PM peak hours. The directional nature of the congestion that is observed on a regular basis today is expected to change over time, such that both directions of travel will experience congestion during each of the peak periods. This pattern is not so pronounced on other study area highways such as 407 ETR, Highway 400, Highway 410 and Highway 427, where the peak travel demand changes direction in each of peak periods.
- The stretch of 407 ETR between Highway 403 and Highway 401 is forecast to experience significant congestion in the peak direction in both the AM and PM peaks. The stretch between Highway 400 and Highway 410 will also begin to experience moderate to major congestion in both directions of travel during peak periods. Between Highway 410 and Highway 401, travel demands are expected to increase although this segment would only experience moderate congestion on certain sections during peak periods. This overall pattern, however, suggests that even with the tolls on 407 ETR and the full expansion of this facility to the approved 10 lane cross-section, there would be a significant increase in demand, and consequently increased congestion on 407ETR by 2031. This is a direct result of the significant increase in congestion on alternative corridors such as Highway 401.
- The North-South corridors in the study area – Highway 410, Highway 427 and Highway 400 are significantly congested in the peak direction of travel both in the morning and afternoon peak periods, even with planned improvements.

The travel demand forecasts for the Base Case 2031 conditions suggest that the transportation network would experience higher travel demands and more severe congestion during the PM peak than the AM peak period. Therefore, the evaluation of the GTA West alternatives in terms of travel demand modeling focused on the performance of the system during the PM peak period.

Exhibit 12: 2031 Base Case AM Peak Congestion Levels on Inter-Regional Facilities

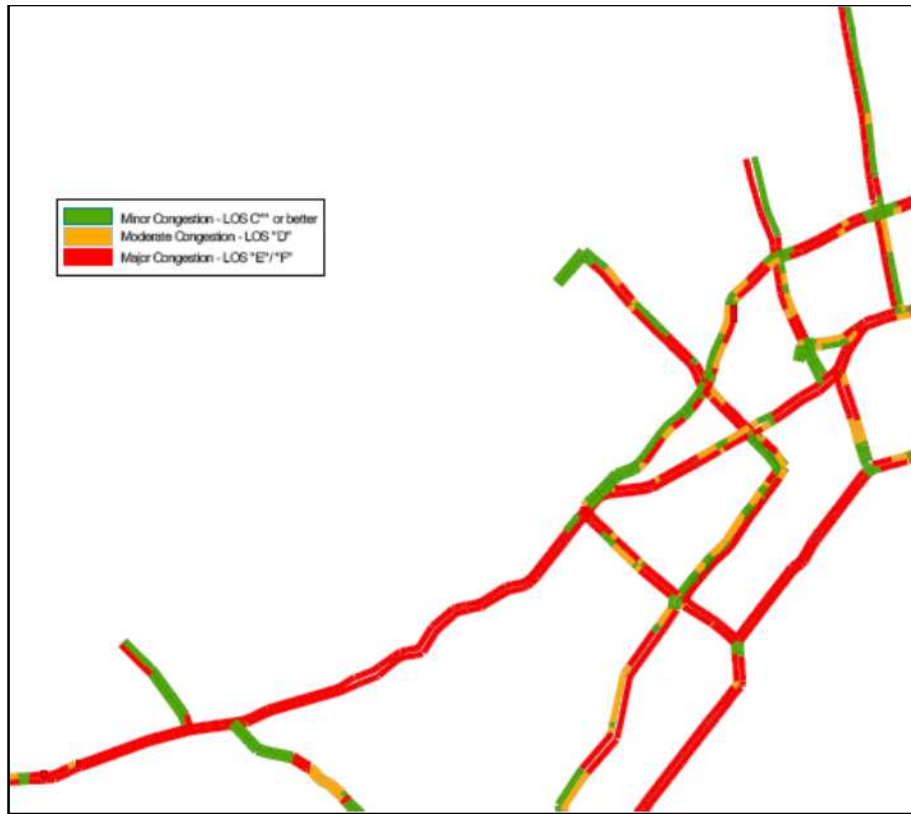
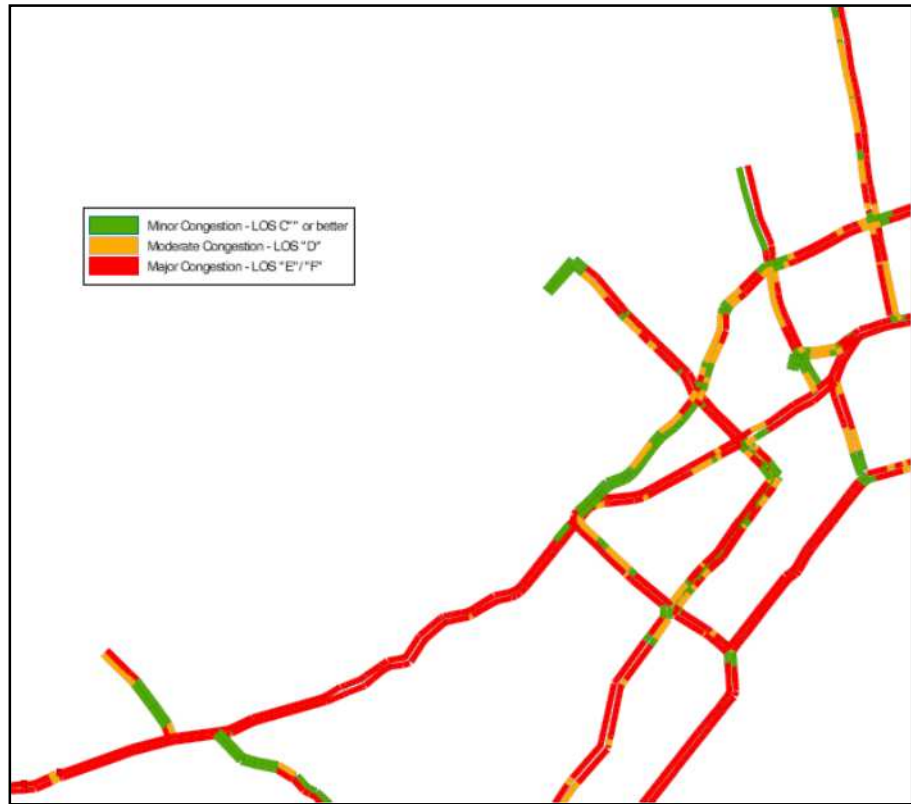


Exhibit 13: 2031 Base Case PM Peak Congestion Levels on Inter-Regional Facilities



In addition to plotting alternatives to assess congestion, the transportation network was analyzed for its capacity to accommodate travel demands at critical screenlines in 2031. The study team assessed roadway system capacity in the preliminary study area by comparing estimated traffic flows on selected corridors and at selected screenlines against available capacity. This is measured in units of Volume / Capacity ratio (V/C).

A screenline is a real or imaginary boundary that defines a broad corridor across which traffic flows, and may represent one or several road links. Each roadway link has limited capacity, which is its maximum ability to accommodate vehicular traffic. Screenlines are used to examine travel demands within a broader area to determine the ability of the overall network to accommodate travel demands. Some roadways crossing a screenline may be congested, but there may be available capacity on other under-utilized roads. This would suggest that improvements aimed at balancing the flow across the available roads would address the problem before looking at adding new capacity. When the majority of the roads crossing the screenline are operating at or close to capacity, this would tend to suggest the need for new capacity, either as new lanes or a new roadway.

The selection of screenlines in the GTA West preliminary study area for alternatives evaluation is presented in **Exhibit 14**. For each screenline, V/C ratios were computed for the peak direction only, which in the PM peak is westbound (WB) for the links under the north-south screenlines and northbound (NB) for the east-west screenlines. The screenline locations are as follows:

Screenline	Screenline Location
8002	East of Guelph – WB
8001	West of Milton (East of Eramosa Townline and Tremaine Road) – WB
4002	East of Winston Churchill Boulevard – WB
4001	East of Highway 10 (Huronario Street) – WB
3002	East of Highway 50 – WB
3001	West of Highway 400 – WB
4007	North of Queen St – WB

Exhibit 14: GTA West Preliminary Study Area Screenlines



Since one of the primary objectives of the GTA West study is to address inter-regional transportation needs, inter-regional facilities within each of these screenlines were examined for their performance separate from other roadways. As summarized below, on most screenlines the inter-regional facilities are forecast to perform worse in terms of V/C ratio compared to the overall screenline results with all roadways included. The two exceptions to this include the screenlines east of Guelph and east of Highway 50. At the east of Guelph screenline, Highway 7 (which is also a provincial highway but is considered as a regional facility for the purpose of this assessment) would operate with significant congestion along with Highway 401. At the east of Highway 50 screenline, 407 ETR is the only inter-regional facility. Since it is a tolled corridor, it will tend to operate at lower congestion levels than the other free facilities.

The study team also reviewed the impact of summer traffic on the transportation system. The draft *Area Transportation System Problems and Opportunities Report* established the factors to expand weekday peak hour traffic into Annual Average Daily Traffic (AADT) and Summer Average Daily Traffic (SADT) based on current observed patterns. These factors were used to estimate traffic flows during a typical summer peak hour. Given that the summer traffic count data were not available for local and regional facilities, the summer congestion levels were estimated only for inter-regional facilities. The screenline V/C ratios for the inter-regional facilities for a summer peak are tabulated in **Exhibit 15**. The influence of the summer demand pattern on inter-regional facilities increases the level of congestion forecast for 2031 with the east of Guelph screenline and west of Milton screenline reporting summer demands in excess of capacity by 13% to 20%, respectively.

Exhibit 15: 2031 Base Case Screenline Evaluation

Screenline	All Facilities – Weekday Peak	Inter-Regional Facilities - Weekday Peak	Inter-Regional Facilities - Summer Peak
East of Guelph WB	1.04	1.02	1.13
West of Milton (East of Eramosa Townline and Tremaine Road) WB	0.95	1.10	1.22
East of Winston Churchill Boulevard WB	0.75	0.79	0.87
East of Highway 10 (Hurontario Street) WB	0.82	0.97	1.06
East of Highway 50 WB	0.85	0.76	0.81
West of Highway 400 WB	0.98	1.02	1.07
North of Queen St (407 ETR) NB	1.02	1.14	1.26

XX - V/C ratio greater than 0.9 (LOS E or F)

Based on the deficiencies identified for the updated Base Case model run, it is clear that significant inter-regional transportation solutions are required, even with the updated land use and transportation network improvements incorporated into the model. This confirms the original assessment completed as part of the draft GTA West *Area Transportation System Problems and Opportunities Report* (July 2009).

The updated Base Case modeling results for each of the evaluation criteria and measures were compared to the results for the GTA West improvement alternatives. A summary of the evaluation finding is discussed in the sections below.

3.3 Detailed Screenline Assessment

One of the evaluation criteria for the GTA West alternatives was the performance of screenlines in terms of providing sufficient capacity for movement of people and goods. The transportation network was analyzed for its capacity to accommodate travel demands at critical screenlines in 2031. The study team assessed roadway system capacity in the preliminary study area by comparing estimated traffic flows on selected corridors and at selected screenlines against available capacity. This is measured in units of Volume / Capacity ratio (V/C).

The screenlines were assessed for capacity on all the roads and just the inter-regional facilities. Details of roadway volume demand and capacity for the screenlines are provided in **Exhibit 16**. **Exhibit 17** presents the results for the inter-regional facilities at the screenlines.

Exhibit 16: Detailed 2031 PM Peak Screenline Assessment of Base Case and GTA West Alternatives – All Facilities at the Screenline

Screenline	Street	Description	BASE				GTAW 3-1				GTAW 4-1				GTAW 4-2				GTAW 4-3				GTAW 4-4				GTAW 4-5			
			Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C
3001: West of Highway 400 - Westbound	Teston Rd	606W Teston Rd East of Highway 400	2	1,960	1,616	0.82	2	1,960	1,464	0.75	2	1,960	987	0.50	2	1,960	992	0.51	2	1,960	1,014	0.52	2	1,960	1,008	0.51	2	1,960	899	0.46
	GTAW Corridor	West of Hwy 400	0	0	0	0.00	0	0	0	0.00	3	6,600	5,916	0.90	3	6,600	5,868	0.89	3	6,600	5,875	0.89	3	6,600	5,967	0.90	3	6,600	5,964	0.90
	Major Mackenzie Dr	605W Major Mackenzie Dr East (YR 25) East of Highway 400	3	2,400	2,526	1.05	3	2,400	2,018	0.84	3	2,400	1,654	0.69	3	2,400	1,727	0.72	3	2,400	1,732	0.72	3	2,400	1,665	0.69	3	2,400	1,795	0.75
	Rutherford Rd	604W Rutherford Rd (YR 73) East of Highway 400	3	2,940	2,662	0.91	3	2,940	3,003	1.02	3	2,940	2,962	1.01	3	2,940	2,962	1.01	3	2,940	2,969	1.01	3	2,940	2,990	1.02	3	2,940	2,974	1.01
	Langstaff Rd	603W Langstaff Rd (YR 72) East of Highway 400	2	1,600	1,558	0.97	2	1,600	1,405	0.88	2	1,600	1,361	0.85	2	1,600	1,347	0.84	2	1,600	1,346	0.84	2	1,600	1,373	0.86	2	1,600	1,381	0.86
	Highway 7	602W Highway 7 (YR 7) East of Highway 400	3	3,270	3,271	1.00	3	3,270	3,239	0.99	3	3,270	3,085	0.94	3	3,270	3,094	0.95	3	3,270	3,096	0.95	3	3,270	3,107	0.95	3	3,270	3,182	0.97
	Highway 407	601W Highway 407 East of Highway 400	5	11,000	11,189	1.02	8	17,600	13,085	0.74	5	11,000	9,749	0.89	5	11,000	9,827	0.89	5	11,000	9,820	0.89	5	11,000	9,821	0.89	5	11,000	8,349	0.76
	Steeles Ave	330W Steeles Ave at Newmarket Subdivision (Tor East of Keele)	2	1,960	1,870	0.95	2	1,960	1,774	0.91	2	1,960	1,772	0.90	2	1,960	1,762	0.90	2	1,960	1,760	0.90	2	1,960	1,769	0.90	2	1,960	1,641	0.84
TOTALS			20	25,130	24,693	0.98	23	31,730	25,988	0.82	23	31,730	27,485	0.87	23	31,730	27,579	0.87	23	31,730	27,612	0.87	23	31,730	27,701	0.87	23	31,730	26,185	0.83
3002: East of Highway 50 - Westbound	Nashville Rd	306W Nashville Rd (YR 49) East of Highway 50 (YR 24)	1	800	758	0.95	1	800	748	0.93	1	800	770	0.96	1	800	780	0.98	1	800	813	1.02	1	800	818	1.02	1	800	822	1.03
	GTAW Corridor	East of Hwy 50	0	0	0	0.00	0	0	0	0.00	2	4,400	4,591	1.04	2	4,400	4,793	1.09	2	4,400	5,078	1.15	2	4,400	5,066	1.15	2	4,400	5,514	1.25
	Major Mackenzie Dr	305W Major Mackenzie Dr (YR 25) East of Highway 50 (YR 24)	3	2,280	2,681	1.18	3	2,280	2,602	1.14	3	2,280	2,012	0.88	3	2,280	2,046	0.90	3	2,280	2,135	0.94	3	2,280	2,146	0.94	3	2,280	2,110	0.93
	Rutherford Rd	304W Rutherford Rd (YR 73) East of Highway 50 (YR 24)	3	2,610	2,899	1.11	3	2,610	2,853	1.09	3	2,610	2,269	0.87	3	2,610	2,300	0.88	3	2,610	2,380	0.91	3	2,610	2,385	0.91	3	2,610	2,609	1.00
	Langstaff Rd	303W Langstaff Rd (YR 72) East of Highway 50 (YR 24)	2	1,520	1,494	0.98	2	1,520	1,411	0.93	2	1,520	1,143	0.75	2	1,520	1,144	0.75	2	1,520	1,197	0.79	2	1,520	1,231	0.81	2	1,520	1,103	0.73
	Fogal Road	315W Fogal Road East of Highway 50	2	1,740	1,323	0.76	2	1,740	1,246	0.72	2	1,740	1,087	0.62	2	1,740	1,097	0.63	2	1,740	1,121	0.64	2	1,740	1,135	0.65	2	1,740	870	0.50
	Hwy 7	302W Highway 7 (YR 7) East of Highway 50 (YR 24)	3	3,600	3,404	0.95	3	3,600	3,208	0.89	3	3,600	2,953	0.82	3	3,600	2,924	0.81	3	3,600	2,989	0.83	3	3,600	3,027	0.84	3	3,600	3,384	0.94
	Hwy 407	301W Highway 407 East of Highway 50 (YR 24)	5	11,000	8,374	0.76	7	15,400	9,967	0.65	5	11,000	7,038	0.64	5	11,000	7,407	0.67	5	11,000	7,259	0.66	5	11,000	7,029	0.64	5	11,000	5,340	0.49
Steeles Ave	134W Steeles Ave West of Highway 50	2	1,800	599	0.33	2	1,800	386	0.21	2	1,800	434	0.24	2	1,800	435	0.24	2	1,800	416	0.23	2	1,800	413	0.23	2	1,800	335	0.19	
TOTALS			21	25,350	21,533	0.85	23	29,750	22,421	0.75	23	29,750	22,299	0.75	23	29,750	23,926	0.77	23	29,750	23,388	0.79	23	29,750	23,250	0.78	23	29,750	22,087	0.74
4001: East of Highway 10 (Huronario Street) - Westbound	GTAW Corridor	East of Hwy 10	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	2	4,400	3,836	0.87	2	4,400	3,982	0.90	2	4,400	4,248	0.97	2	4,400	4,568	1.04
	Mayfield Rd	69W Mayfield Rd East of Huronario St (WB)	3	2,400	1,717	0.72	3	2,400	1,552	0.65	3	2,400	1,615	0.67	3	2,400	1,318	0.55	3	2,400	1,314	0.55	3	2,400	1,509	0.63	3	2,400	1,238	0.52
	Wanless/Conservation Rd	East of Huronario Street	2	1,520	966	0.64	2	1,520	921	0.61	2	1,520	855	0.56	2	1,520	833	0.55	2	1,520	874	0.57	2	1,520	944	0.62	2	1,520	716	0.47
	Sandwood Parkway E	293W Sandalwood Parkway East of Huronario St (WB)	3	2,610	1,680	0.64	3	2,610	1,505	0.58	3	2,610	1,513	0.58	3	2,610	1,327	0.51	3	2,610	1,381	0.53	3	2,610	1,424	0.55	3	2,610	1,326	0.51
	Bovaird Dr E	188W Bovaird Dr (Highway 7) East of Huronario St (WB)	3	3,270	3,035	0.93	3	3,270	2,897	0.89	3	3,270	2,945	0.90	3	3,270	2,787	0.85	3	3,270	2,829	0.87	3	3,270	2,896	0.89	3	3,270	2,973	0.91
	Williams Parkway E	292W Williams Parkway East of Huronario St (WB)	3	2,610	2,313	0.89	3	2,610	2,167	0.83	3	2,610	2,153	0.82	3	2,610	2,008	0.77	3	2,610	2,070	0.79	3	2,610	2,103	0.81	3	2,610	1,995	0.76
	Vodden Street	291W Vodden Ave East of Huronario St (WB)	2	1,740	1,288	0.74	2	1,740	1,162	0.67	2	1,740	1,204	0.69	2	1,740	1,112	0.64	2	1,740	1,138	0.65	2	1,740	1,167	0.67	2	1,740	1,049	0.60
	Church St	East of Huronario St	2	1,000	610	0.61	2	1,000	562	0.56	2	1,000	570	0.57	2	1,000	549	0.55	2	1,000	528	0.53	2	1,000	558	0.56	2	1,000	502	0.50
	Queen St Hwy 6	67W Queen St (Reg Rd 107) East of Huronario St (WB)	2	1,740	1,256	0.72	2	1,740	1,229	0.71	2	1,740	1,280	0.74	2	1,740	1,262	0.73	2	1,740	1,247	0.72	2	1,740	1,246	0.72	2	1,740	1,216	0.70
	Clarence St	290W Clarence St East of Huronario St (WB)	1	870	727	0.84	1	870	691	0.79	1	870	696	0.80	1	870	683	0.79	1	870	685	0.79	1	870	687	0.79	1	870	651	0.75
	Nanwood Drive	East of Huronario St	1	500	221	0.44	1	500	210	0.42	1	500	205	0.41	1	500	204	0.41	1	500	210	0.42	1	500	212	0.42	1	500	200	0.40
	Bartley Bull Parkway	East of Huronario St	1	500	356	0.71	1	500	324	0.65	1	500	300	0.60	1	500	300	0.60	1	500	308	0.62	1	500	326	0.65	1	500	302	0.60
	Steeles Ave	66W Steeles Ave East of Huronario St (WB)	3	2,940	2,904	0.99	3	2,940	2,704	0.92	3	2,940	2,804	0.95	3	2,940	2,717	0.92	3	2,940	2,712	0.92	3	2,940	2,738	0.93	3	2,940	2,721	0.93
	County Court Boulevard North	East of Huronario Street	2	1,000	215	0.21	2	1,000	166	0.17	2	1,000	156	0.16	2	1,000	112	0.11	2	1,000	134	0.13	2	1,000	165	0.17	2	1,000	55	0.06
	County Court Boulevard South	East of Huronario Street	2	1,740	220	0.13	2	1,740	216	0.12	2	1,740	225	0.13	2	1,740	267	0.15	2	1,740	249	0.14	2	1,740	216	0.12	2	1,740	323	0.19
	Hwy 407	409W Highway 407 East of Highway 10 (WB)	5	11,000	10,466	0.95	6	13,200	11,098	0.84	5	11,000	9,992	0.91	5	11,000	9,404	0.85	5	11,000	9,310	0.85	5	11,000	9,501	0.86	5	11,000	7,092	0.64
	Derry Rd West	31W Derry Rd East of Huronario (WB)	3	3,270	2,839	0.87	3	3,270	2,864	0.88	3	3,270	2,889	0.88	3	3,270	2,853	0.87	3	3,270	2,864	0.88	3	3,270	2,873	0.88	3	3,270	2,689	0.82
	Courtney Park Dr	30W Courtney Park Dr East of Huronario (WB)	3	2,610	808	0.31	3	2,610	832	0.32	3	2,610	878	0.34	3	2,610	914	0.35	3	2,610	848	0.32	3	2,610	800	0.31	3	2,610	753	0.29
Hwy 401	143W Highway 401 East of Huronario St (WB)	6	13,200	13,005	0.99	6	13,200	11,677	0.88	6	13,200	11,908	0.90	6	13,200	11,788	0.89	6	13,200	11,683										

Exhibit 17: Detailed 2031 PM Peak Screenline Assessment of Base Case and GTA West Alternatives – Inter-Regional Facilities at the Screenline

Screenline	Street	Description	BASE				GTAW 3-1				GTAW 4-1				GTAW 4-2				GTAW 4-3				GTAW 4-4				GTAW 4-5			
			Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C	Lanes	Link Capacity	Volume	V/C
3001: West of Highway 400 - Westbound	GTAW Corridor	West of Hwy 400	0	0	0	0.00	0	0	0	0.00	3	6,600	5,916	0.90	3	6,600	5,868	0.89	3	6,600	5,875	0.89	3	6,600	5,967	0.90	3	6,600	5,964	0.90
	Highway 407	601W Highway 407 East of Highway 400	5	11,000	11,189	1.02	8	17,600	13,085	0.74	5	11,000	9,749	0.89	5	11,000	9,827	0.89	5	11,000	9,820	0.89	5	11,000	9,821	0.89	5	11,000	8,349	0.76
TOTALS			5	11,000	11,189	1.02	8	17,600	13,085	0.74	8	17,600	15,665	0.89	8	17,600	15,695	0.89	8	17,600	15,695	0.89	23	31,730	27,701	0.87	8	17,600	14,313	0.81
3002: East of Highway 50 - Westbound	GTAW Corridor	East of Hwy 50	0	0	0	0.00	0	0	0	0.00	2	4,400	4,591	1.04	2	4,400	4,793	1.09	2	4,400	5,078	1.15	2	4,400	5,066	1.15	2	4,400	5,514	1.25
	Hwy 407	301W Highway 407 East of Highway 50 (YR 24)	5	11,000	8,374	0.76	7	15,400	9,967	0.65	5	11,000	7,038	0.64	5	11,000	7,407	0.67	5	11,000	7,259	0.66	5	11,000	7,029	0.64	5	11,000	5,340	0.49
TOTALS			5	11,000	8,374	0.76	7	15,400	9,967	0.65	7	15,400	11,629	0.76	7	15,400	12,200	0.79	7	15,400	12,338	0.80	23	29,750	23,250	0.78	7	15,400	10,854	0.70
4001: East of Highway 10 (Huronario Street) - Westbound	GTAW Corridor	East of Hwy 10	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	2	4,400	3,836	0.87	2	4,400	3,982	0.90	2	4,400	4,248	0.97	2	4,400	4,568	1.04
	Hwy 407	409W Highway 407 East of Highway 10 (WB)	5	11,000	10,466	0.95	6	13,200	11,098	0.84	5	11,000	9,992	0.91	5	11,000	9,404	0.85	5	11,000	9,310	0.85	5	11,000	9,501	0.86	5	11,000	7,092	0.64
	Hwy 401	143W Highway 401 East of Huronario St (WB)	6	13,200	13,005	0.99	6	13,200	11,677	0.88	6	13,200	11,908	0.90	6	13,200	11,788	0.89	6	13,200	11,683	0.89	6	13,200	11,572	0.88	6	13,200	14,606	1.11
	Hwy 401 HOV	East of Huronario St	0	0	0	0.00	1	1,700	1,555	0.91	1	1,700	1,544	0.91	1	1,700	1,495	0.88	1	1,700	1,479	0.87	1	1,700	1,446	0.85	1	1,700	1,411	0.83
TOTALS			11	24,200	23,471	0.97	13	28,100	24,330	0.87	12	25,900	23,444	0.91	14	30,300	26,523	0.88	14	30,300	26,453	0.87	14	30,300	26,767	0.88	14	30,300	27,677	0.91
4002: East of Winstonchurchill Blvd - Westbound	GTAW Corridor	East of Winston Churchill Boulevard	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	2	4,400	3,788	0.86	2	4,400	3,918	0.89	2	4,400	3,628	0.82	2	4,400	4,052	0.92
	New Road in 2031	East of Winston Churchill Boulevard	1	800	644	0.81	1	800	575	0.72	1	800	555	0.69	1	800	538	0.67	1	800	536	0.67	1	800	573	0.72	1	800	471	0.59
	New Road in 2031	East of Winston Churchill Boulevard	2	1,600	417	0.26	2	1,600	322	0.20	2	1,600	293	0.18	2	1,600	471	0.29	2	1,600	279	0.17	2	1,600	283	0.18	2	1,600	180	0.11
	Highway 407	411W Highway 407 West of Winston Churchill Blvd (WB)	5	11,000	6,588	0.60	6	13,200	8,372	0.63	5	11,000	8,064	0.73	5	11,000	6,846	0.62	5	11,000	7,143	0.65	5	11,000	7,537	0.69	5	11,000	5,940	0.54
	Hwy 401	East of Winston Churchill Boulevard	4	8,800	9,135	1.04	4	8,800	8,781	1.00	4	8,800	8,752	0.99	4	8,800	9,134	1.04	4	8,800	8,562	0.97	4	8,800	8,380	0.95	4	8,800	11,008	1.25
Hwy 401 HOV	East of Winston Churchill Boulevard	0	0	0	0.00	1	1,700	1,718	1.01	1	1,700	1,772	1.04	1	1,700	1,820	1.07	1	1,700	1,678	0.99	1	1,700	1,630	0.96	1	1,700	1,526	0.90	
TOTALS			12	22,200	16,785	0.76	14	26,100	19,768	0.76	13	23,900	19,436	0.81	15	28,300	22,596	0.80	15	28,300	22,116	0.78	15	28,300	22,030	0.78	15	28,300	23,177	0.82
8001: East of Erin/Eramosa Townline and Tremaine Road - Westbound	GTAW Corridor	West of Milton	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	2	4,400	3,800	0.86	2	4,400	3,166	0.72	2	4,400	3,200	0.73
	Highway 401	3194W Highway 401 West of Dublin Line	3	6,600	7,262	1.10	5	11,000	10,643	0.97	5	11,000	10,566	0.96	5	11,000	10,598	0.96	5	11,000	9,511	0.86	4	8,800	8,592	0.98	4	8,800	10,352	1.18
TOTALS			3	6,600	7,262	1.10	5	11,000	10,643	0.97	5	11,000	10,566	0.96	5	11,000	10,598	0.96	7	15,400	13,310	0.86	6	13,200	11,758	0.89	6	13,200	13,551	1.03
8002: East of Guelph - Westbound	GTAW Corridor	East of Guelph	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	2	4,400	3,410	0.78	2	4,400	3,073	0.70
	Highway 401	3175W Highway 401 East of 1st Line	3	6,600	6,709	1.02	5	11,000	8,967	0.82	5	11,000	8,878	0.81	5	11,000	8,926	0.81	5	11,000	9,239	0.84	4	8,800	7,161	0.81	4	8,800	8,095	0.92
TOTALS			3	6,600	6,709	1.02	5	11,000	8,967	0.82	5	11,000	8,878	0.81	5	11,000	8,926	0.81	5	11,000	9,239	0.84	6	13,200	10,571	0.80	6	13,200	11,168	0.85
4007: North of Queen St - Northbound	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

3.4 Summer Congestion

One of the deficiencies identified in the *Area Transportation System Problems and Opportunities Report* (July 2009) for the Base Case scenario was the performance of the transportation network during weekend and summer peak travel periods. The inter-regional facilities were found to operate at significantly higher levels of congestion during peak periods, which results in significant delays to tourist travel to and through the GTA West study area. Based on the factors established in the *Area Transportation System Problems and Opportunities Report* (July 2009), forecasts of summer peak travel demands on the key inter-regional facilities in the study area were estimated. **Exhibit 18** shows the screenline V/C ratios for summer peak conditions.

Exhibit 18: 2031 Summer Peak Hour Screenline Evaluation– Inter-Regional Facilities

Screenline	GTA West Base	GTA West 3-1	GTA West 4-1	GTA West 4-2	GTA West 4-3	GTA West 4-4	GTA West 4-5
East of Guelph WB	1.13	0.91	0.90	0.90	0.93	0.89	0.94
West of Milton (East of Eramosa Townline and Tremaine Road) WB	1.22	1.07	1.07	1.07	0.96	0.99	1.14
East of Winston Churchill Boulevard WB	0.87	0.87	0.95	0.92	0.90	0.90	0.96
East of Highway 10 (Hurontario Street) WB	1.06	0.95	0.99	0.96	0.96	0.97	1.01
East of Highway 50 WB	0.81	0.69	0.82	0.86	0.87	0.85	0.77
West of Highway 400 WB	1.07	0.78	0.94	0.94	0.94	0.95	0.86
North of Queen St NB	1.26	1.27	1.27	1.24	1.26	1.29	1.33

XX - V/C ratio greater than 0.9 (LOS E or F)

In most cases, the GTA West alternatives provide some level of relief for summer weekend peak traffic congestion, but a number of the screenlines are still forecast to operate at or just over capacity during the summer peak periods. The screenlines to the west of Milton perform better with Alternatives 4-3 and 4-4, while the screenline within Brampton and Vaughan tend to perform best with Alternative 3-1, due to the extensive widening of 407 ETR which provides additional inter-regional system capacity.

On the East of Winston Churchill and East of Highway 50 screenlines, the screenline performance of inter-regional facilities is worse with the GTA West alternatives compared to the Base Case. While this may seem counter-intuitive, the GTA West alternatives, by providing a new inter-regional facility, would attract traffic away from local and regional facilities resulting in the higher usage of inter-regional corridors.

3.5 Commercial Vehicle Traffic to and from Simcoe County

One of the key issues for truck movements in the study area is the degree of congestion in the Highway 400 / Highway 401 interchange area. For truck movements to and from Simcoe County (and points north along Highway 400 and Highway 11), this congestion represents significant amount of delay added to

these trips. The cost of truck tolls on 407ETR make this route less attractive to trucks, although this is expected to change over time as congestion levels continue to grow. As a result there are a number of truck trips that utilize the local and county road network to the north of the GTA West study area to travel between Simcoe County and the Highway 401 corridor to the west of the GTA. This pattern was also identified in the Problems and Opportunities Report and was raised by a number of industry and local stakeholders.

The benefits of a new GTA West corridor in addressing this problem are illustrated in the **Exhibit 19 and 20**. **Exhibit 19** illustrates the future anticipated flow of truck trips to and from Simcoe County for the Base Case scenario.

Exhibit 19: 2031 Base Case PM Peak Hour Distribution of Truck Traffic to and from Simcoe County

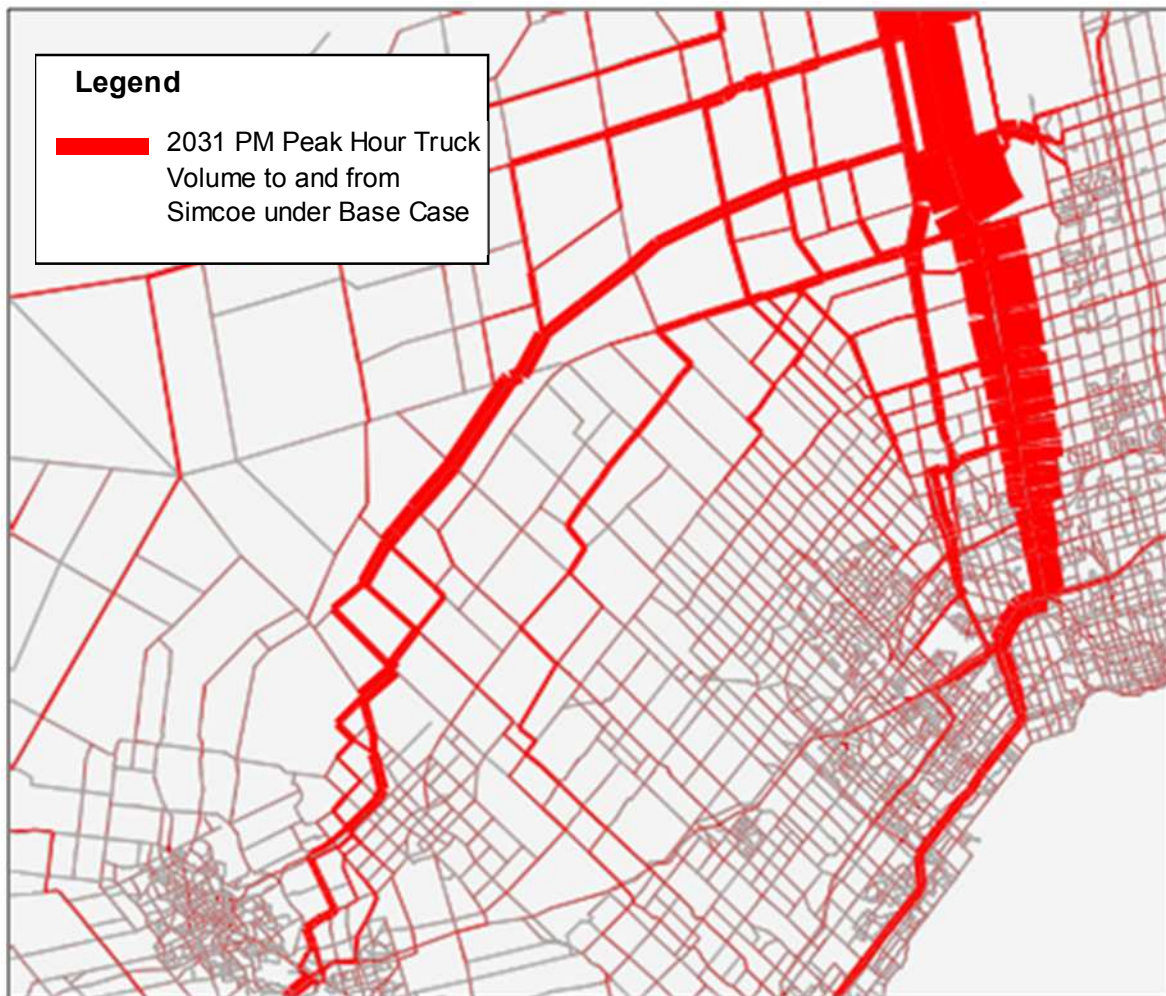


Exhibit 20 illustrates the anticipated routes used by truck trips with the GTA West 4-3 corridor in place. This alternative was chosen to demonstrate the importance or benefit of providing a direct connection between Highway 401 and Highway 400 via a new GTA West corridor. In the two exhibits, the coloured road links represent the routes used by the truck trips to and from Simcoe County. The width of the band represents the relative volume of trucks using these roads to get to or from Simcoe County.

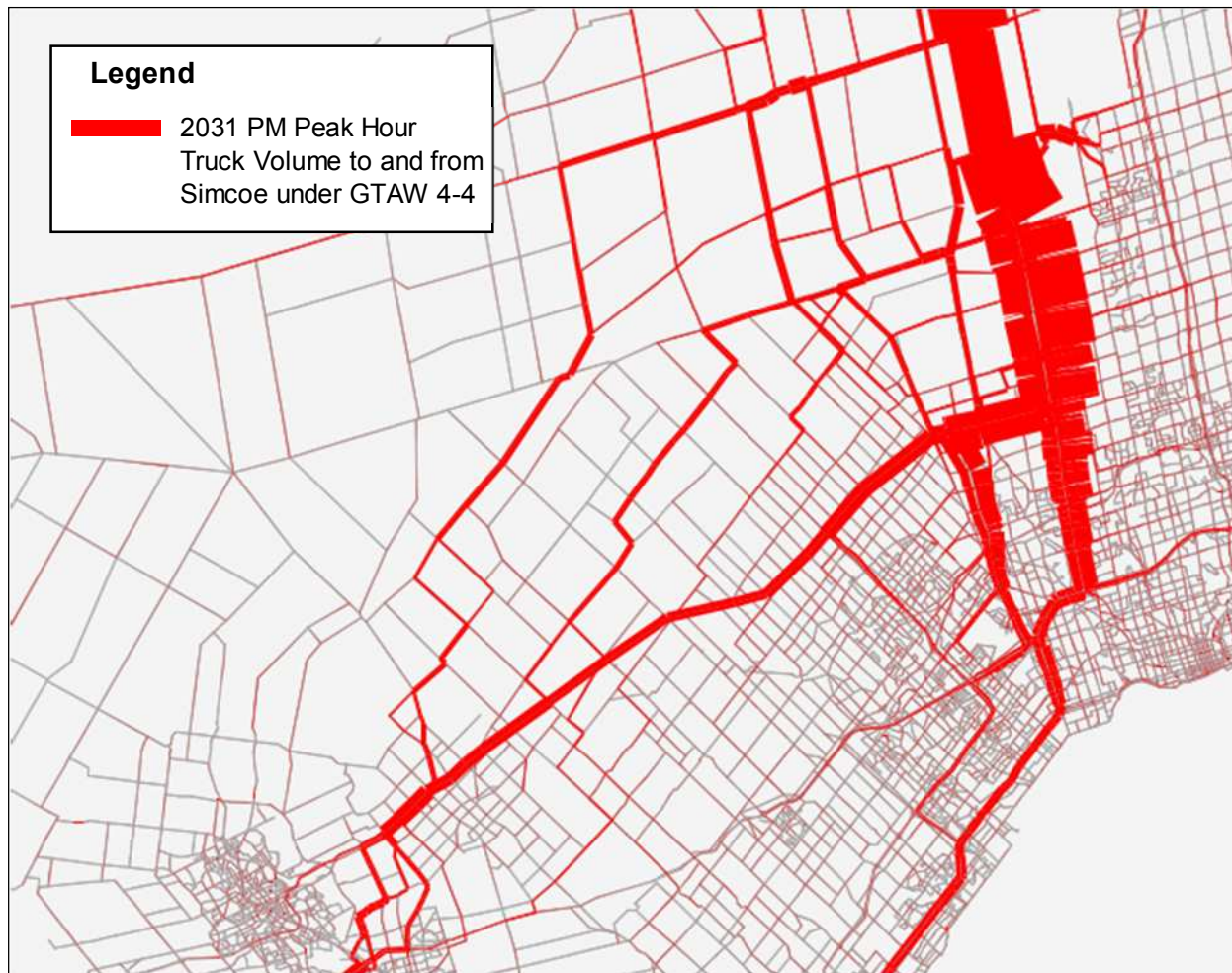
Exhibit 20: 2031 GTA West 4-3 PM Peak Hour Distribution of Truck Traffic to and from Simcoe County



Based on the results of these two model runs it is clear that the GTA West 4-3 corridor would support truck traffic demands to/from Simcoe County and points to the north. As a result, the number of commercial vehicle trips taking these northern routes reduces by about 25% compared to the Base Case; or the equivalent of about 100 trucks per hour in the PM peak hour. A similar level of diversion would also be anticipated for the GTA West 4-2.

For the GTA West 4-4 and 4-5, which provide a new corridor connection to Highway 6 in the Guelph area, the truck traffic using the northern routes is forecast to be about 46% lower than the base case, amounting to a reduction of about 200 trucks in the PM peak hour. **Exhibit 21** illustrates the anticipated routes used by truck trips with the GTA West 4-4 corridor in place.

Exhibit 21: 2031 GTA West 4-4 PM Peak Hour Distribution of Truck Traffic to and from Simcoe County



3.6 Modal Integration & Linking Population and Growth Centres

Since movement of people is a critical objective of the GTA West study, the study team evaluated the alternatives for their potential to improve modal integration, balance and choice for movement of people between activity centers.

One of the measures used under this evaluation criterion was the potential to increase the attractiveness/ effectiveness of existing, new and improved transit services. In addition, the ability to support alternative modes for travel and to support active transportation use in the study area are also key considerations.

Under Alternative 3-1, higher-order inter-regional transit services are limited to existing/ widened inter-regional freeways. Though Alternative 3-1 has the potential to improve operations and thus effectiveness of inter-regional transit on existing corridors, it has only minor potential to improve linkages between inter-regional and local transit with improved service integration and new opportunities for station locations and service connections. Alternative 3-1 also results in the highest use of local roads for inter-regional trips impacting safety / security for active transportation.

Alternative 4-1 is slightly better than Alternative 3-1 with its ability to provide new higher order transit services and connections on the proposed corridor, but the short length of the corridor limits the opportunities for inter-regional transit and linkages between inter-regional and local transit. Alternative 4-1 also results in high use of local roads for inter-regional trips impacting safety / security for active transportation users.

Alternatives 4-2 and 4-3 create the potential for new higher order inter-regional transit on the new corridor over approximately half of the study area. They improve bus operational performance with improved road network operations and potential for bus rapid transit (BRT) on new corridor. Both of these alternatives result in the lowest use of local roads for inter-regional trips, thus improving safety / security for active transportation users. The introduction of new corridors can create a barrier affect to movement by active modes across a new facility although this can be mitigated by providing sidewalks / bike lanes on new crossing structures. Alternative 4-2 and 4-3 align such that they link the areas with high population and employment growth forecasted by 2031. These alternatives improve accessibility between Urban Growth Centres and the GTA with a new corridor between Highways 400 and 401 at Milton.

Alternatives 4-4 and 4-5 offer the potential to introduce new higher order inter-regional transit on the new corridor over the entire study area. Both alternatives improve accessibility between Urban Growth Centres and the GTA with a new corridor between Highway 400 and Highway 6 at Guelph. Similar to Alternatives 4-2 and 4-3, Alternatives 4-4 and 4-5 result in the lowest use of local roads for inter-regional trips, thus improving safety / security for active transportation users. While Alternative 4-4 provides transit opportunities on the new corridor across the northern portion of the study area, Alternative 4-5 provides transit opportunities on the new corridor over the study area, with potential linkages to the NGTA corridor.

In addition to potential for new modal linkages and transit services, the alternatives were evaluated for their ability to improve travel times between urban growth centers over the Base Case. Travel time is a measure of the ability to move people faster and better between activity centers. Exhibit 22 shows the percent reduction in PM peak hour travel times for auto and road-based transit between Urban Growth Centers.

Exhibit 22: Change in Travel Times Between Urban Growth Centres

Alternative	Percent Reduction in 2031 PM Peak Hour Travel Times
GTA West 3-1	19.2%
GTA West 4-1	19.5%
GTA West 4-2	19.1%
GTA West 4-3	19.6%
GTA West 4-4	20.5%
GTA West 4-5	20.0%

The results indicate that Alternative 4-4 provides the most improvement to travel times between urban growth centers with 21% reduction in travel times over the Base Case although the improvement to travel times under the other alternatives ranges from 19% to 20% over the Base Case, which are very similar to Alternative 4-4.

4. SENSITIVITY ANALYSIS

4.1 Dedicated Truck Facility

Currently, Highway 401 experiences significant truck volumes during the day and even throughout the evening off-peak periods. These demands are forecast to grow significantly by 2031 as described in the *GTA West Area Transportation System Problems and Opportunities Report* (July 2009). Since one of the key objectives for the GTA West study is to improve goods movement in the region, the study team also considered the feasibility of a new GTA West corridor operating as a dedicated truck only facility. In addition to linking manufacturing and distribution related employment areas with a dedicated facility, this option would permit longer distance truck trips to avoid congested road segments during peak periods. If enough truck traffic could be diverted from existing highway facilities, this could also reduce congestion and provide travel time savings benefits to automobile and transit travel using these corridors during peak periods.

A modified traffic assignment procedure was used to forecast demand for the dedicated truck facility scenario. Under the other alternative scenarios the trucks were assigned using an All-or-Nothing (AON) assignment (please refer to Section 1.2.6). One of the main benefits of the dedicated truck facility (other than directly linking manufacturing and distribution related employment areas) is for trucks to have a route to by-pass congested road segments during peak periods – even if it is a little longer route. The AON assignment does not replicate this behaviour very well – since the truck routing under the AON assignment does not take into account the congested travel times of the various routes. Therefore, a multi-class traffic assignment procedure was used, where passenger auto and truck demands were assigned to the network simultaneously. Autos are restricted from using the dedicated truck facility and trucks can use this facility if it saves them time on their trip (including the downstream congestion they might face where the truck way ends at Highway 400). Separate travel time penalties are used on 407 to reflect the cost / value of time for trucks compared to autos. This new assignment technique was used to account for the travel time savings some trucks may experience by using the dedicated truck facility.

An integrated GTA West and NGTA network was used for this test to examine the feasibility of truck-only corridors in both study areas simultaneously. The network combination of the GTA West Alternative 4-3 and NGTA Alternative 4-3, which both connect to Highway 401 in the Milton area, was chosen for this test since this option was considered to provide the most integrated goods movement corridor. In addition to traversing through the majority of the two study areas, these two alternatives provide connectivity between Highways 400 and 401 and south to the border crossings in Niagara, making this an attractive route for long-distance truck trips to and from the US. The study team also reviewed the GTA West Alternative 4-3 as a truck only facility without the NGTA corridor connection.

The dedicated truck facility scenario was tested using the trip distribution patterns from the GTA West 3-1 GGH model run, as the new truck-only facility would not change the trip distribution patterns for commuter traffic. The existing highways were assumed to have the same number of lanes as under GTA West Alternative 4-3 with mixed traffic. In the results discussed below, “truck only facility” refers to both NGTA and GTA West corridors as dedicated truck facilities, unless specified as a GTA West dedicated truck corridor.

Exhibit 23 summarizes the 2031 PM peak hour truck volume demands and passenger car equivalencies using the dedicated truck facility in the GTA West study area. Forecasts suggest that the truck demands would be equivalent to two freeway lanes of capacity in each direction. Truck traffic using the facility could

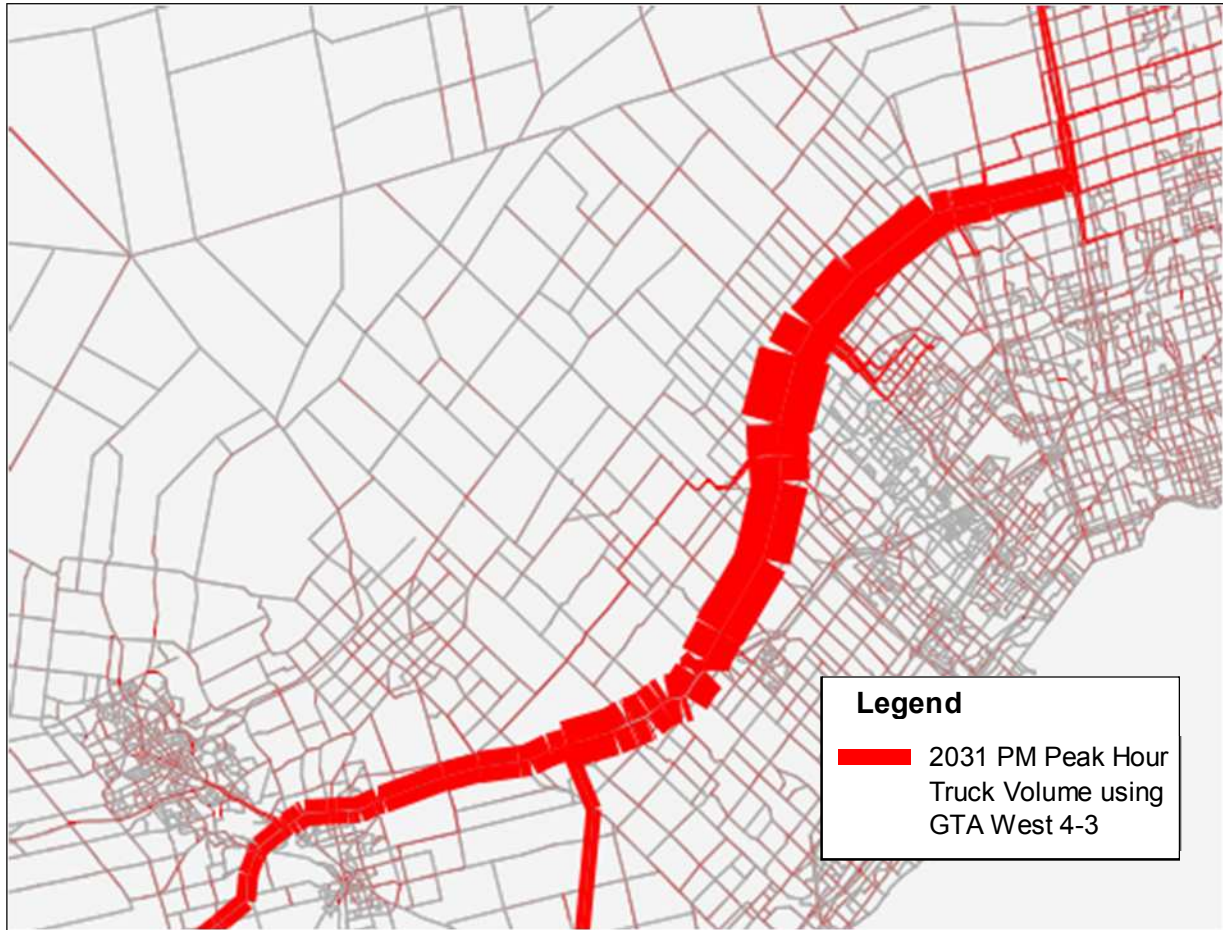
potentially be higher in the off peak hours based on an average truck traffic profile over the course of a day, although the extent of congestion on competing routes may be lower during these periods.

Exhibit 23: 2031 PM Peak Hour Truck Volumes between Highway 401 and Highway 400

GTAW Corridor Segment	PM Peak Hour Truck Volume (passenger car equivalents)	
	Eastbound	Westbound
Highway 401 (W. of Milton) to HP BATS Corridor	1,660 (3,320)	1,580 (3,160)
HP BATS Corridor at Highway 401 / 407 ETR to Highway 410	1,765 (3,530)	1,985 (3,970)
Highway 410 to Highway 427	1,700 (3,400)	1,875 (3,750)
Highway 427 to Highway 400	2,215 (4,430)	1,690 (3,380)

Exhibit 24 illustrates the routing of truck trips forecast to use the new corridor just west of Highway 410, based on an assignment run for the 2031 PM Peak Hour and **Exhibit 25** summarizes the origins and destinations of the truck demand using the facility. In the westbound direction, the forecasted truck demand is 1,985 trucks on the new corridor, just west of Highway 410. Of these, about 700 would come from Highway 400 (35%) with 390 trucks entering from the south and 310 trucks entering from the north.

Exhibit 24: Routing of PM Peak Hour Truck Demand using the GTA West truck-only facility (West of Highway 410)



Most of the trucks entering from the south on Highway 400 originate in the industrial areas in Vaughan (i.e. intermodal yards in the Highway 7 / Keele Street area) rather than Highway 401; which only contributes about 30 trucks (1.5%). A number of trucks also access the new corridor from Airport Road, Highway 427, and Highway 410, serving the industrial areas to the north of the 407 ETR. The remaining 375 trucks enter the new corridor at various local road interchanges.

Exhibit 25: 2031 PM Peak Hour Origins and Destinations of Trucks using the GTA West

Truck Trips New Corridor West of Highway 410	Westbound	Eastbound
From / To Highway 410	390 (20%)	200 (11%)
From / To Airport Road	200 (10%)	100 (6%)
From / To Highway 427	320 (16%)	130 (7%)
From / To Highway 400	700 (35%)	795 (45%)
From / To local roads	375 (19%)	540 (31%)
Trucks on New Corridor	1,985	1,765

In the eastbound direction, about 1,765 trucks would use the new corridor, with 795 continuing west to Highway 400 (45%). Of these, 440 proceed south along Highway 400 and 350 exit to the north on Highway 400. Only 77 trucks (4%) use Highway 400 to rejoin Highway 401. Highway 410, Airport Road and Highway 427 each attract over 100 truck trips, with the remaining 540 trucks exiting at various other local interchanges. The destinations of these truck trips are to the industrial areas in Brampton / Vaughan.

Since heavy trucks can have a significant impact on capacity when running in mixed traffic, a comparison of the screenline volume to capacity ratios was undertaken for the mixed traffic and truck only scenarios. Screenline evaluation results are presented in **Exhibit 26**, and show that the option of providing a truck only facility on the GTA West corridor will provide sufficient screenline capacity to accommodate the projected demands at a similar or better level than the scenario with a mixed use facility.

The dedicated truck facility frees up capacity on existing inter-regional facilities by diverting considerable truck demand. Since one truck is equivalent to more than one passenger car, even a smaller volume of trucks using the truck only facility (compared to a mixed traffic facility) could result in comparable congestion relief. Truck traffic diversion plots, illustrated in **Exhibit 27** below, show that most of the truck traffic is diverted from inter-regional facilities such as Highways 401, 407 ETR, 403 and parts of Highways 403 and 400.

Exhibit 26: 2031 PM Peak Hour Screenline Evaluation for GTA West 4-3 Alternative Scenarios

Screenline	GTA West 4-3 (Mixed Traffic)		GTA West 4-3 and NGTA 4-3 (dedicated truck facility)		GTA West 4-3 (dedicated truck facility)	
	Lanes on GTA West Corridor	Screenline V/C	Lanes on GTA West Corridor	Screenline V/C	Lanes on GTA West Corridor	Screenline V/C
East of Guelph	-	0.84	-	0.88	-	0.82
West of Milton	4	0.86	4	0.73	4	0.71
East of Winston Churchill Blvd	4	0.75	4	0.74	4	0.73
East of Highway 10	4	0.76	4	0.76	4	0.76
East of Highway 50	4	0.79	4	0.78	4	0.78
West of Highway 400	6	0.87	6	0.82	6	0.82

The demands on the truck only facility suggest that the section between Highway 427 and Highway 400 may not require six lanes as would be required under GTA West Alternative 4-3 with mixed traffic. With GTA West Alternative 4-3 as a mixed traffic or dedicated truck facility, the section of Highway 401 between 407 ETR and Milton would operate over capacity with similar V/C ratios. With the mixed use facility there is flexibility to widen the new corridor to six lanes to provide additional capacity to relieve the over capacity situation on Highway 401. In the truckway scenario, a widening might attract a few additional trucks from Highway 401, but this would not necessarily provide sufficient auto capacity on Highway 401, and may necessitate the need for additional widening to 12 lanes, resulting in the need to protect for a core-collector system through Milton.

Exhibit 27: 2031 PM Peak Hour Truck traffic diversion from the existing facilities to the GTA West truck only corridor

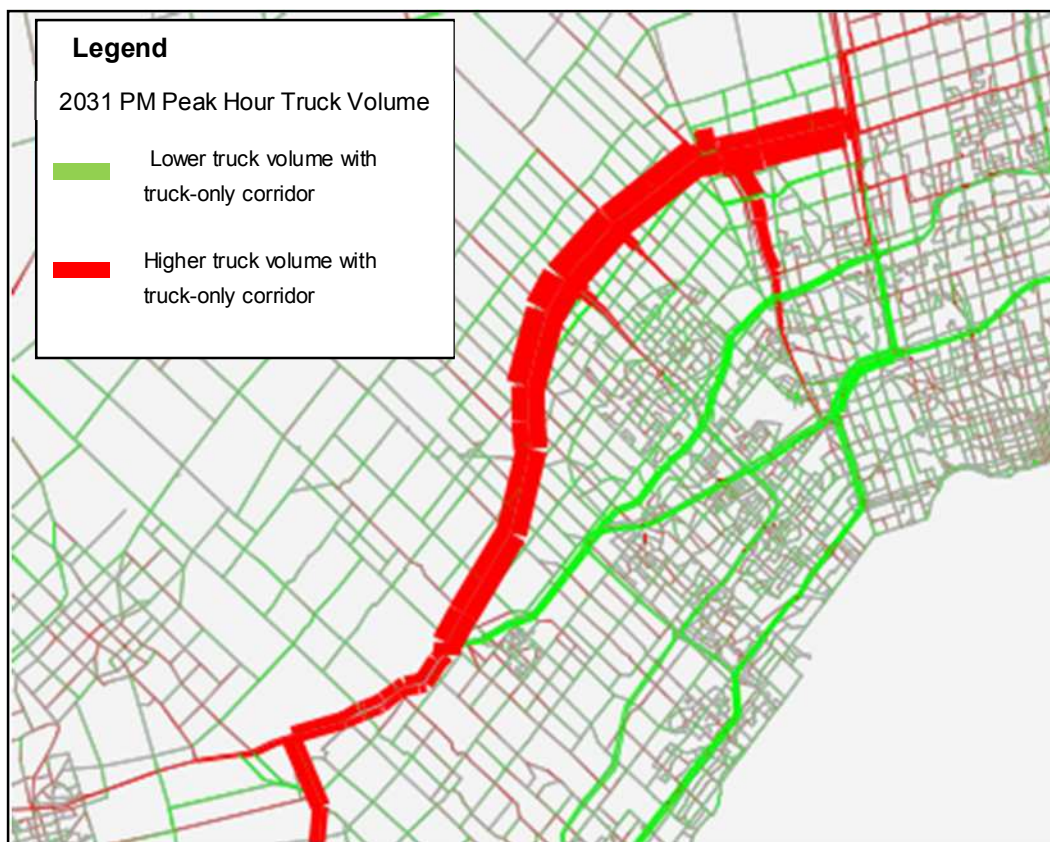


Exhibit 28 shows the performance of the GTA West truck-only facility with respect to the people and goods movements criteria.

With the truckway alternatives, the share of the auto and truck travel operating at LOS D or better on the inter-regional road network is improved compared to the Base Case and compared to Alternative 4-3 operating as a mixed use facility. This results in a noticeable delay savings for truck and auto traffic using all inter-regional facilities. One drawback of the truck only facility is that some auto traffic would be diverted to local road network, most of it within the northern portions of Brampton and Vaughan, and to the north of the new corridor.

Exhibit 28: 2031 PM Peak Hour GTA West 4-3 with NGTA 4-3 Alternative Evaluation - People and Goods Movement

Criteria	Base Case	GTA West 4-3	GTA West 4-3 and NGTA 4-3 as truck-only facilities	GTA West 4-3 as truck-only facility
% of Inter-regional roadway auto network better than LOS D (auto veh-km)	22%	32%	38%	38%
% of local roadway auto network better than LOS D (auto veh-km)	54%	70%	67%	68%
Auto delay on inter-regional roadway network (auto veh-hr)	24,266	21,001 (3,265)	18,109 (6,157)	17,845 (6,421)
Auto delay on local roadway network (auto veh-hr)	41,737	23,523 (18,214)	25,666 (16,070)	25,695 (16,042)
% of Inter-regional auto travel using local roads	61%	47%	52%	47%
% of Inter-regional roadway truck network better than LOS D (truck-km)	13%	30%	47%	53%
Truck delay on inter-regional roadway network (truck-hr)	5,857	3,075 (2,782)	2,668 (3,189)	2,329 (3,528)
% of Inter-regional truck travel using local roads	30%	25%	22%	22%

(XXX): Reduction from the Base Case

Based on the results of the sensitivity test, there appears to be a number of benefits and only a few drawbacks that may accrue if the GTA West new corridor was to be operated as a truck only facility. Before a definitive conclusion on the viability of this alternative can be reached, additional work would need to be completed to better understand the benefits, the design and operational issues that may need to be addressed and the local implications and potential mitigation measures that could be implemented. As such, the study team believes that the truck only facility should be carried forward as a viable solution as part of the transportation development strategy.

4.2 Connection to the NGTA Corridor

Since the GTA West and NGTA studies are being conducted simultaneously, it is desirable for the two studies to be coordinated in terms of the assessment of various and the development of recommended alternatives. To a large degree, traffic patterns between the two study areas are different and distinct as were the problems and opportunities that were highlighted in previous reports; however, it is also recognized that longer distance trips may benefit from a connection between the two facilities.

To assist in understanding how a road connection between the two corridors would influence the network performance, the study team tested one of the GTA West alternatives modelled in combination with one of

the NGTA alternatives. Since both NGTA 4-3 and GTA West 4-3 alternatives both connect to Highway 401 in the Milton area, the combination of these two alternatives was tested to determine the degree of interaction between the two study alternatives.

Exhibit 29 illustrates the routing of 2031 PM peak hour trips forecast to use the section of the NGTA 4-3 connection, just south of Highway 401. The results indicate that 40% of the traffic demand from the NGTA connection would use the GTA West corridor, equivalent to half a freeway lane in each direction in the PM peak hour. The remaining trips would use Highway 401 or other local / regional facilities.

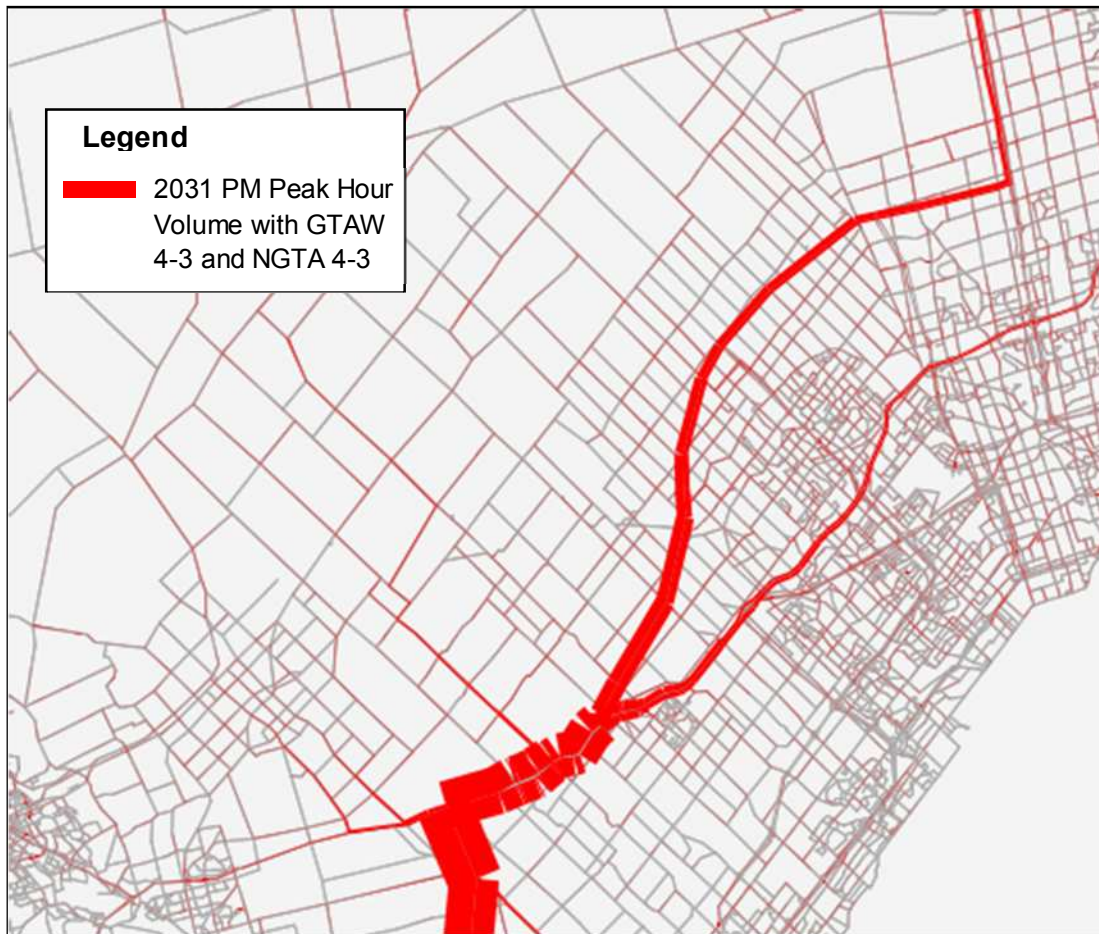


Exhibit 29: 2031 PM Peak Hour – With NGTA Connection to Highway 401

Exhibit 30 summarizes the comparison of screenline performance measures for the GTA West 4-3 compared to a combined GTA West 4-3 and NGTA 4-3.

Exhibit 30: 2031 PM Peak Hour Screenline Evaluation With and Without Connection to NGTA Corridor

Screenline	All Facilities		Inter-Regional Facilities		Summer Peak – Inter-Regional Facilities	
	GTA West 4-3	GTA West 4-3 with NGTA 4-3	GTA West 4-3	GTA West 4-3 with NGTA 4-3	GTA West 4-3	GTA West 4-3 with NGTA 4-3
East of Guelph WB	0.84	0.93	0.84	0.95	0.93	1.05
West of Milton (East of Eramosa Townline and Tremaine Road) WB	0.76	0.79	0.86	0.89	0.96	0.99
East of Winston Churchill Boulevard WB	0.75	0.75	0.82	0.82	0.90	0.91
East of Highway 10 (Hurontario Street) WB	0.76	0.76	0.87	0.88	0.96	0.97
East of Highway 50 WB	0.79	0.79	0.80	0.80	0.87	0.87
West of Highway 400 WB	0.87	0.88	0.89	0.90	0.94	0.95
North of Queen St NB	0.95	0.95	1.14	1.14	1.26	1.26

XX - V/C ratio greater than 0.9 (LOS E or F)

The above results suggest that the introduction of NGTA 4-3 alternative would worsen the screenline east of Guelph from moderate to major congestion levels. This can be attributed to higher traffic volumes and greater congestion on Highway 401. The screenline west of Regional Road 25 in Milton would also experience slightly higher congestion. The screenlines east of the Highway 401 / 407 ETR interchange would not experience any difference due to the NGTA 4-3 alternative. The analysis suggests that capacity impact of an NGTA connection to Highway 401 would be concentrated around the Milton area.

Exhibit 31 summarizes the comparison of people and goods movement under GTA West 4-3 compared to a combined GTA West 4-3 and NGTA 4-3. In terms of people and goods movement measures, the combination of GTA West 4-3 and NGTA 4-3 makes very little difference in terms of the network evaluation statistics within the GTA West study area. In some categories, such as % of inter-regional road network operating at LOS D, and total delays, the combined alternative would perform marginally worse than GTA West 4-3 combined with NGTA 3-1. This is due to the additional travel demand on Highway 401 from the NGTA corridor connection as the difference to the local network is insignificant.

Exhibit 31: 2031 PM Peak Hour People & Goods Movement Evaluation – With and Without NGTA Connection

Criteria	Base Case	GTA West 4-3	GTA West 4-3 with NGTA 4-3
% of Inter-regional roadway auto network better than LOS D (auto veh-km)	22%	32%	30%
% of local roadway auto network better than LOS D (auto veh-km)	54%	70%	70%
Auto delay on inter-regional roadway network (auto veh-hr)	24,266	21,001 (3,265)	22,190 (2,075)
Auto delay on local roadway network (auto veh-hr)	41,737	23,523 (18,214)	23,867 (17,870)
% of Inter-regional auto travel using local roads	61%	47%	47%
% of Inter-regional roadway truck network better than LOS D (truck-km)	13%	30%	27%
Truck delay on inter-regional roadway network (truck-hr)	5,857	3,075 (2,782)	3,397 (2,460)
% of Inter-regional truck travel using local roads	30%	25%	25%

(XXX): Reduction from the Base Case

4.3 Guelph to Cambridge Improvement Needs

As noted in the *GTA West Area Transportation System Problems and Opportunities Report* (July 2009), in 1998 MTO transferred jurisdiction for a 64 kilometre section of Highway 24, between Highway 401 in Cambridge and Highway 9, to the County of Wellington, Region of Waterloo, and Region of Peel, respectively. For the 11 kilometre section of former Highway 24 between the City of Cambridge and the City of Guelph, now referred to as County Road 24 and County Road 124 (County Road 24 / County Road 124), MTO completed an Environmental Study Report in 1996 that concluded that there was justification for this section of road to be widened to a four lane facility.

The County of Wellington completed a *Role and Function Study* for this facility in 2007 and concluded that this section of road functions as an integral part of a significantly longer economic corridor that serves as a by-pass for the congested GTA highway system for travel between Highway 401 west of Waterloo Region and locations to the north of the GTA.

The *Area Transportation System Problems and Opportunities Report* (July 2009) reviewed current (2007) volumes on this section of County Road 24 / County Road 124 and observed that the current two-lane roadway is operating at capacity during typical PM peak periods with peak directional volumes exceeding 1,000 vehicles per hour on the section between Maple Grove Road and Wellington County Road 32.

Preliminary forecasts for 2031 (using an assumed truck percentage of 10%) concluded that growth in travel demand in this corridor would continue, with PM peak hour conditions reaching LOS E-F for the entire two-lane section of this facility. On the existing four-lane section, between Highway 401 and Maple Grove Road, the 2031 forecasts indicate a LOS C condition during peak hours.

Updated forecasts were developed for this section of County Road 24 / County Road 124 as part of the updated modeling work completed for the GTA West study. **Exhibits 32 and 33** show the origins and destinations of auto trips using the segment of County Road 124 just north of Wellington Road 32 under Base Case and Alternative 4-3, respectively. This is the segment with the maximum band width. The width is proportional to the number of auto vehicles on the road segment. As shown, the usage of County Road 124 for longer distance trips is reduced with the introduction of the GTA West corridor. A similar pattern is forecast for the truck traffic. **Exhibits 34 and 35** show the origins and destinations of truck trips using the same segment of County Road 124. The band width is proportional to the number of truck vehicles on the road segment, but the scale is different from the plots for auto traffic.

Based on forecasts of future travel demands with the GTA West Alternative 4-3 in place, approximately 50% of the trips forecast to use this section of County Road 124 are traveling between the cities of Cambridge and Guelph. Most of the remaining trips are between Guelph and other destinations within Waterloo Region. The number of trips using County Road 124 for longer distance travel is inconsequential.

Exhibit 32: 2031 PM Peak Hour Origin-Destination Patterns of CR 24 / 124 Auto Traffic - Base Case

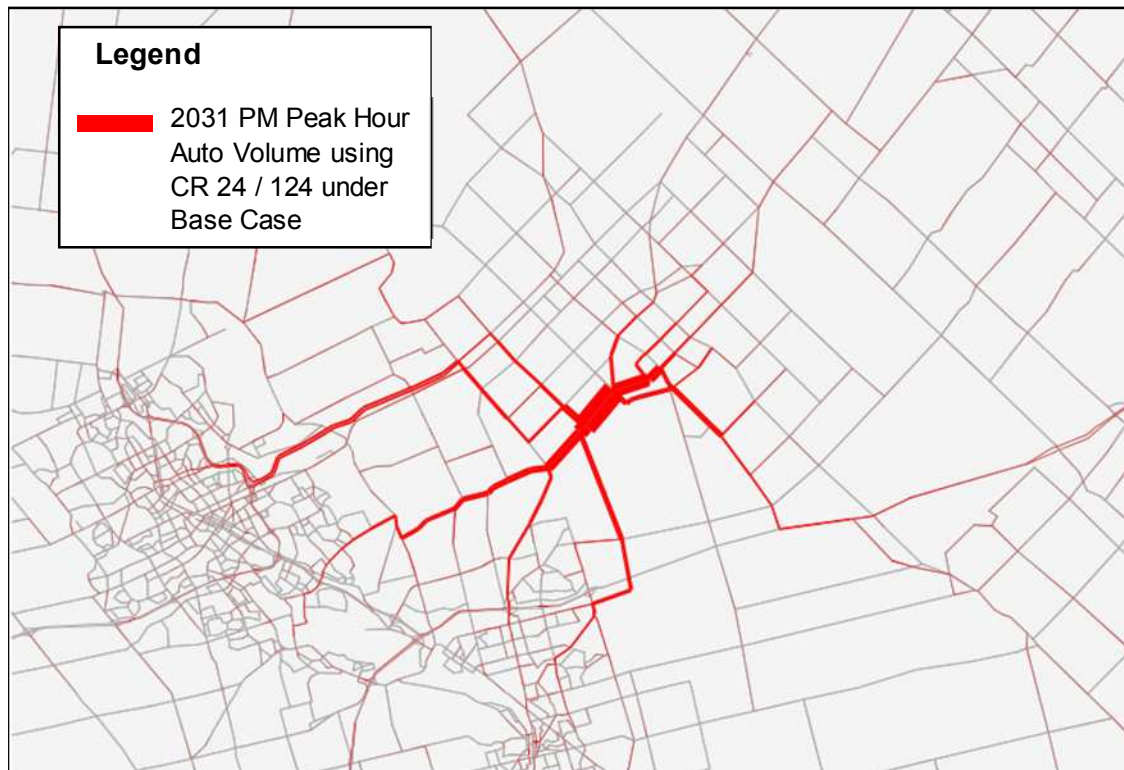


Exhibit 33: 2031 PM Peak Hour Origin-Destination Patterns of County Road 24 / 124 Auto Traffic - GTA West 4-3

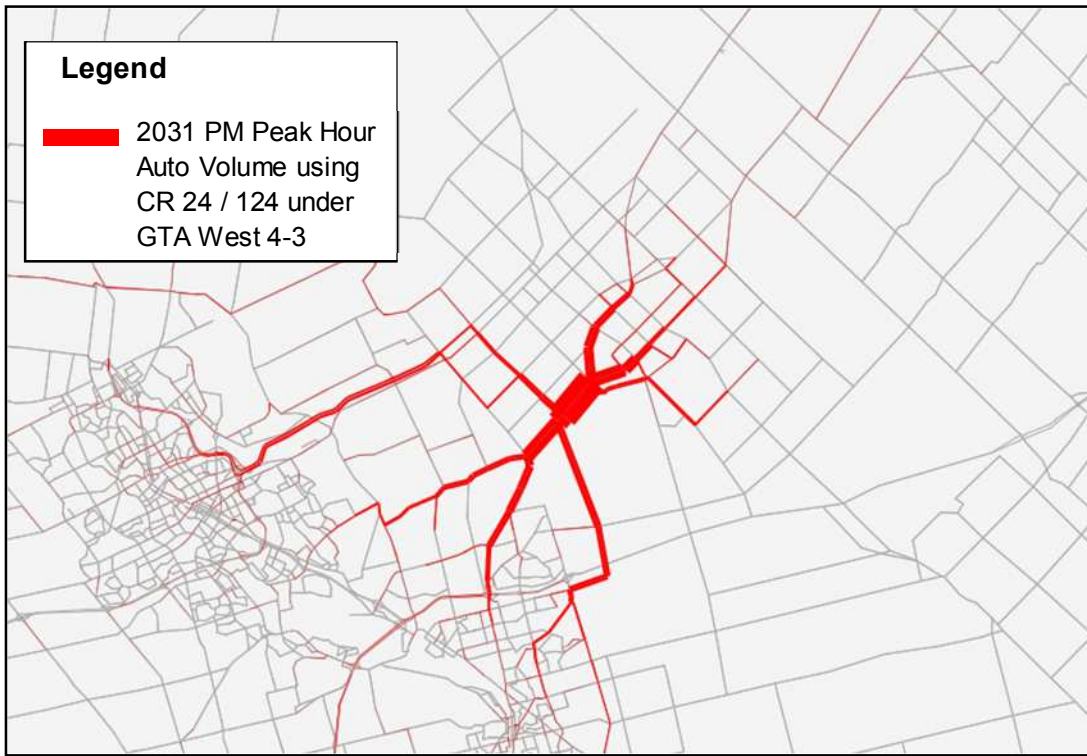


Exhibit 34: 2031 PM Peak Hour Origin-Destination Patterns of County Road 24 / 124 Future Truck Traffic Volumes under Base Case

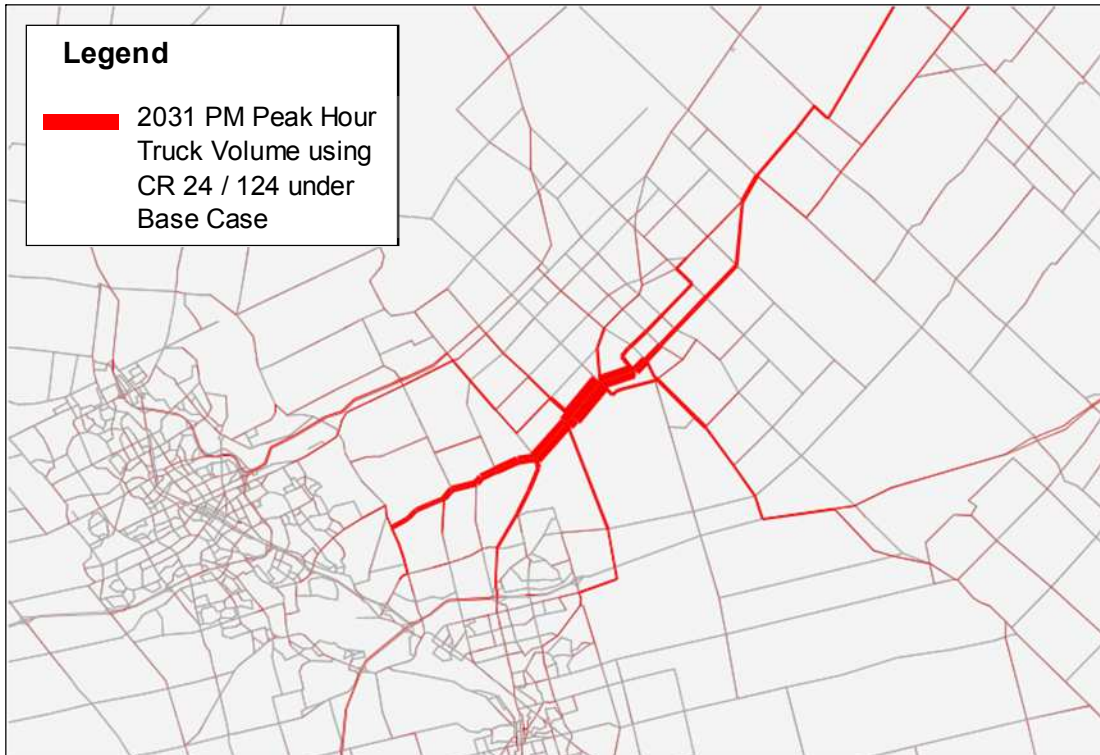
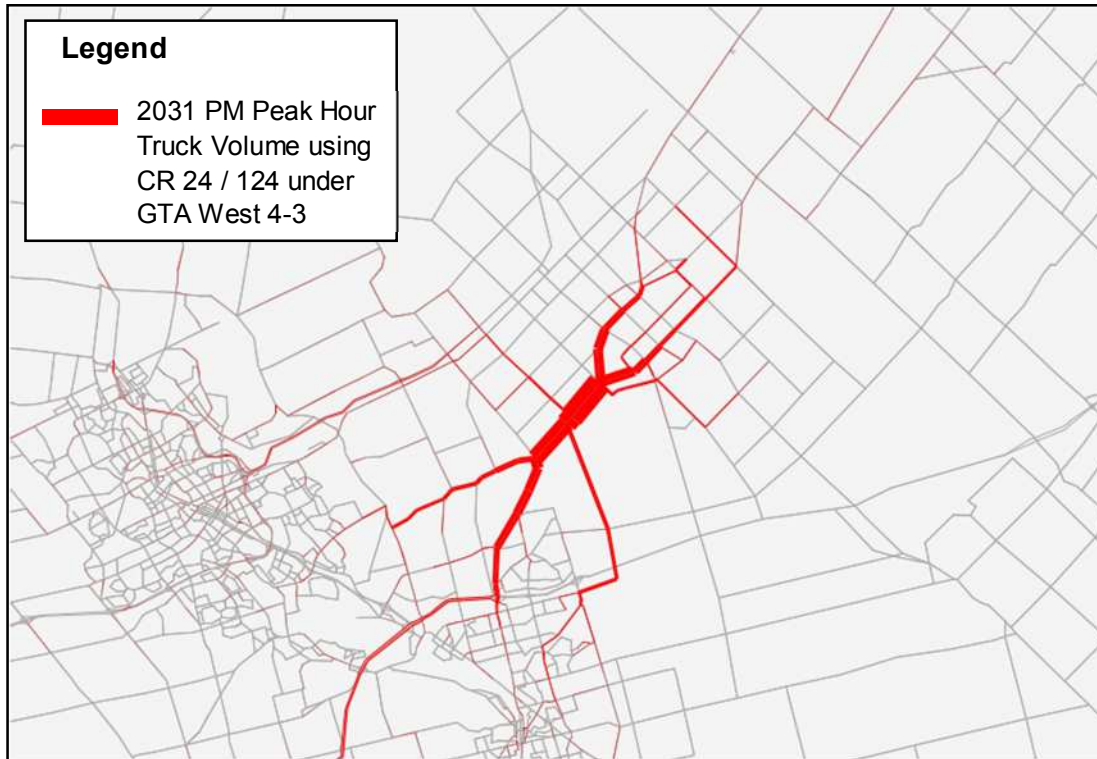


Exhibit 35: 2031 PM Peak Hour Origin-Destination Patterns of County Road 24 / 124 Future Truck Traffic Volumes under GTA West 4-3



In addition to assessing the travel patterns of trips using County Road 24 / 124, the corridor was studied for traffic operational performance.

Exhibit 36 summarizes the future 2031 PM Peak hour traffic volumes and Level of Service on County Road 24/124 for the Base Case scenario. **Exhibit 37** summarizes the results with the GTA West Alternative 4-3 in place. The ‘HCS-2000 Two Lane Capacity Analysis Process’ was applied to assess LOS for the two-lane highway segments and the ‘HCS- 2000 Multilane Capacity Analysis Process’ was used to assess LOS for the four-lane segment. As indicated by the tables, Alternative 4-3 improves the 4-lane section south of Maple Grove Road from LOS C under Base Case to LOS B.

Exhibit 36: 2031 PM Peak Hour County Road 24/124 Traffic Volume Forecasts and Level of Service - Base Case

County Road 24 / 124 Traffic Count Locations	2031 PM Peak Hour Forecasts (veh)			Capacity (veh/hr)	Level of Service & V/C Ratio
	Northbound	Southbound	Total		
North of Wellington Road 32	866	827	1,693	2000	E
Wellington Road 32 to Township Road 1	1,230	1,244	2,474	2000	E
Township Road 1 to Maple Grove Road	1,703	1,171	2,874	2000	F
Highway 401 to Maple Grove Road	1,296	1,292	2,588	3600	C

Exhibit 37: 2031 PM Peak Hour County Road 24/124 Future Traffic Volume Forecasts and Level of Service - GTA West 4-3

County Road 24 / 124 Traffic Count Locations	2031 PM Peak Hour Forecasts (veh)			Capacity (veh/hr)	Level of Service & V/C Ratio
	Northbound	Southbound	Total		
North of Wellington Road 32	852	725	1,577	2000	E
Wellington Road 32 to Township Road 1	1,181	1,134	2,315	2000	E
Township Road 1 to Maple Grove Road	1,683	1,177	2,859	2000	F
Highway 401 to Maple Grove Road	1,237	1,228	2,465	3600	B

The analysis of forecast travel patterns for County Road 24 / County Road 124 suggest that although traffic demands are expected to continue to grow on the County Road 24 / County Road 124 corridor, much of this growth is related to continued growth in population and employment within the Region of Waterloo and County of Wellington. Updated forecasts developed for this study suggest that the introduction of GTA West 4-3 will help to reduce long distance traffic using the County Road 24 / County Road 124 corridor as a by-pass around the GTA.

4.4 GTA West Corridor Connection to Highway 410

This section documents the analysis conducted to assess the traffic conditions with and without the GTA West corridor interchange at Highway 410 to recommend the preferred option as part of the GTA West corridor alternative.

Under all of the Group 4 alternatives evaluated as part of the GTA West Study, an interchange is assumed for the GTA West corridor at Highway 410. A sensitivity analysis was undertaken to assess the option of using the existing section of Highway 410 between Mayfield Road and Highway 10 as an indirect route for the Highway 410 traffic to access the GTA West corridor.

In this context, a high level analysis was conducted to check the adequacy of the Highway 410 – Highway 10 connection without the GTA West corridor interchange at Highway 410 in place for the 2031 PM peak hour conditions. Three scenarios were defined for the purpose of this analysis:

- Scenario 1
 - No GTA West interchange at Highway 410
 - 4 lanes on Highway 410 between Mayfield Road and Highway 10
 - 8 lanes on Highway 410 south of Mayfield Road
 - 6 lanes on Highway 10 between Mayfield Road and GTA West corridor
- Scenario 2
 - No GTA West interchange at Highway 410
 - 8 lanes on Highway 410 between Mayfield Road and Highway 10
 - 8 lanes on Highway 410 south of Mayfield Road
 - 6 lanes on Highway 10 between Mayfield Road and Highway 410
 - 8 lanes on Highway 10 between Highway 410 and GTA West corridor

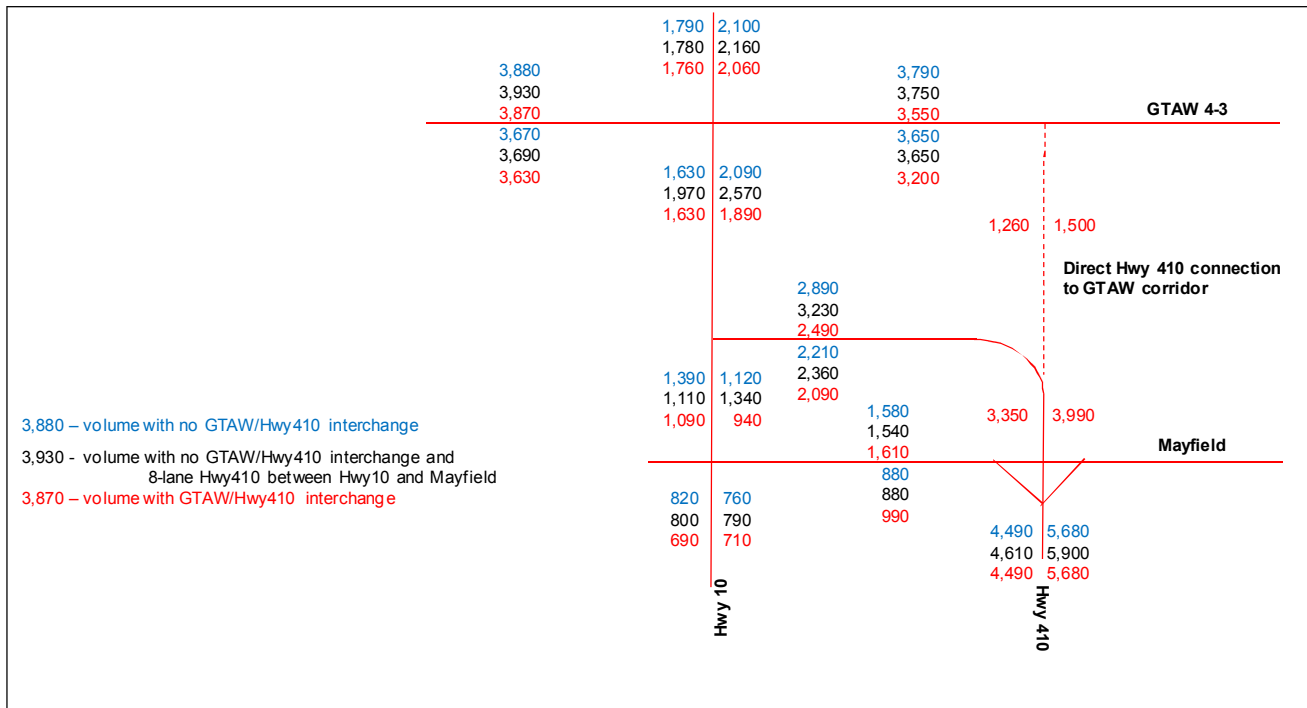
- Scenario 3
 - GTA West interchange at Highway 410
 - 4 lanes on Highway 410 between Mayfield Road and Highway 10
 - 8 lanes on Highway 410 south of Mayfield Road
 - 6 lanes on Highway 10 between Mayfield Road and GTA West corridor
 - South-oriented moves at the Highway 410 interchange at old 410 connection (north of Mayfield Road)

The analysis includes an assessment of the following:

- Roadway Link volume-capacity (V/C) ratios
- Roadway traffic volumes on Highway 410, Highway 10, GTA West corridor and Mayfield Road
- Traffic distribution with and without the GTA West-Highway410 interchange
- Network performance indicators – auto and truck delays

The roadway link traffic volumes on Highway 410, Highway 10, Mayfield Road and GTA West corridor with and without the interchange (assuming GTA West 4-3) are shown in **Exhibit 38**.

Exhibit 38: 2031 PM Peak Hour Traffic Volumes with and without GTA West 4-3 interchange at Highway 410

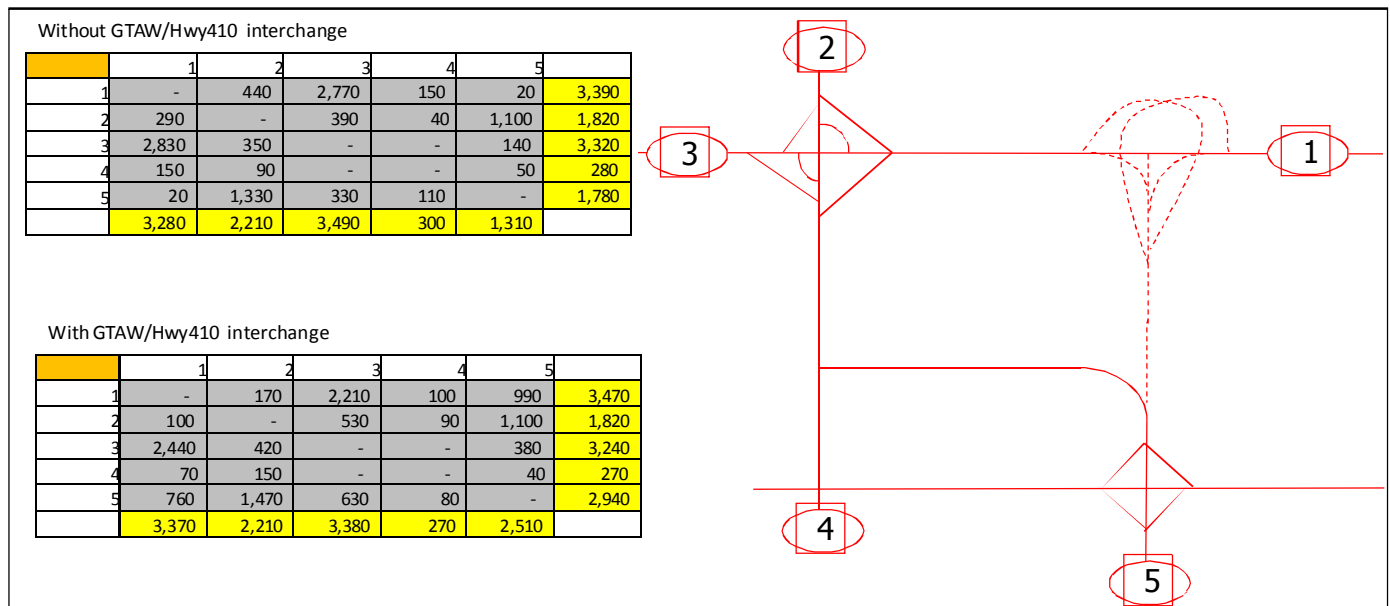


The traffic volumes suggest that a few segments experience different volumes with and without the interchange– the section of Highway 10 between Highway 410 and GTA West corridor would experience higher volumes without the interchange in place. However, the traffic arriving on Highway 410, Highway 10 and the GTA West corridor at the ends of this defined roadway network are not very different with and without the GTA West interchange at Highway 410. This would mean that the origin and destination

patterns for the traffic shown in the figure are different. Also, the demand for a specific origin-destination pair that cannot use the GTA West direct connection at Highway 410 would be forced to use other less direct routes.

Exhibit 39 shows the traffic movement between origin-destination nodes defined for this roadway network. The traffic volumes shown are in vehicles per hour for the 2031 PM peak hour.

Exhibit 39: 2031 PM Peak Hour Traffic movement between defined origin-destination nodes



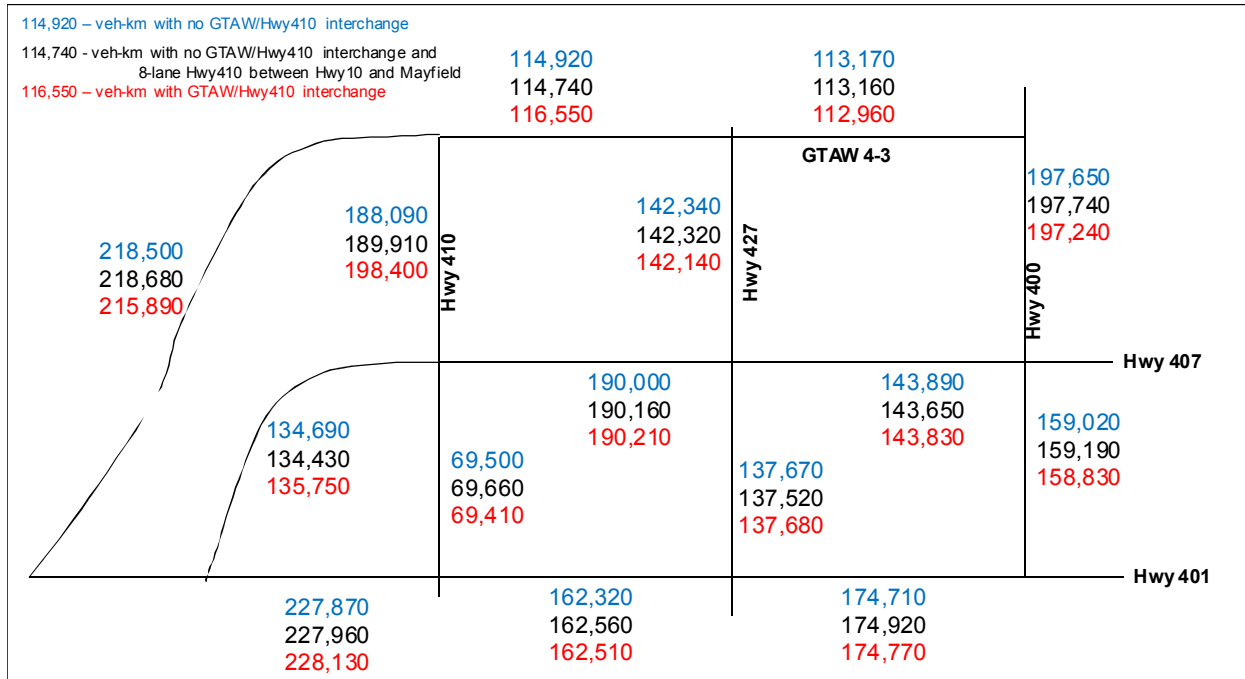
The traffic distribution between the defined nodes suggests that

- With no direct connection between GTA West corridor and Highway 410, there is no traffic between nodes 1 and 5, which is a critical inter-regional movement from GTA to the west. There are only 20 trips from 1 to 5 and vice-versa, while the traffic volumes are 990 and 760 vehicles per hour with the interchange in place. This would mean that there is significant inter-regional demand for the connection, and in its absence, the inter-regional traffic is diverted to local roads.
- The traffic arriving at node 5 is significantly lower without the interchange. This would mean that traffic that would have used the interchange is forced to use other parallel facilities (such as Highway 427) that are forecast to be close to capacity. With the connection in place, those facilities would be relieved of that traffic.
- The Highway 10 traffic south of Mayfield Road intending to use the GTA West corridor (between nodes 4 and 1) would instead stay on Highway 10, thus unable to use the proposed inter-regional facility.

Preliminary review of the constructability of the interchange at Mayfield Road / Highway 410 suggests that the ramp from Mayfield Road to the northbound GTA West 4-3 connection may not be feasible. The traffic analysis showed that the potential demand for this particular movement is only 150 vehicles in the PM peak hour.

The possibility of diversion of inter-regional traffic to other facilities in the absence of the direct connection between Highway 410 and the GTA West corridor was explored by reviewing the total amount of vehicular travel on a defined inter-regional roadway network grid within the GTA West study area. **Exhibit 40** shows the vehicle-kilometers of travel on the various segments of inter-regional facilities for 2031 PM peak hour.

Exhibit 40: 2031 PM Peak Hour Vehicle-kilometers of Travel on Inter-Regional Facilities

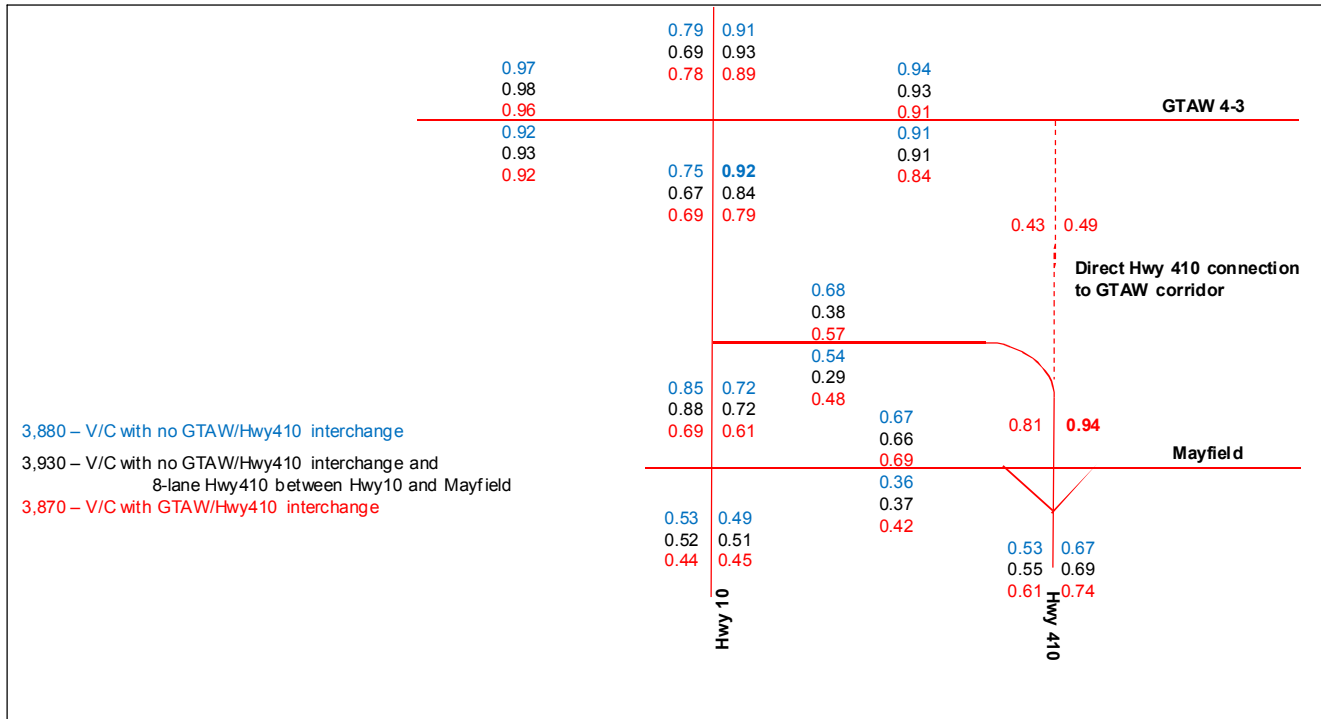


The vehicle-kilometres of travel on other north-south facilities does not change significantly when the connection to GTA West is not provided. In the absence of the GTA West interchange at Highway 410, traffic is continuing on the GTA West corridor and diverting to the local roads network to reach their destination instead.

To further assess traffic distribution and volumes under the three scenarios defined above, the resulting congestion on the roadway segments was reviewed by estimating the volume-capacity (V/C ratios). The roadway link V/C ratios on Highway 410, Highway 10, Mayfield Road and GTA West corridor with and without the interchange under GTA West 4-3 are shown in **Exhibit 41**. In summary,

- With no interchange on the GTA West corridor at Highway 410, the section of Highway 10 between Highway 410 and GTA West corridor operates at LOS E and is close to capacity. With limited ability to widen the arterial segment to 8 lanes, this level of congestion cannot be mitigated.
- With the interchange at Highway 410/GTA West corridor, the section of Highway 410 just north of Mayfield Road operates at LOS E and may require additional widening.
- The GTA West corridor east of the Highway 410 interchange is close to capacity. There might be a need for more than 4 lanes in this section.

Exhibit 41: 2031 PM peak Hour Roadway Segment V/C ratios with and without GTA West 4-3 interchange at Highway 410



In addition to roadway link V/C ratios and traffic volumes, network-wide performance measures were estimated for each of the different scenarios. Delays on local facilities are slightly higher without the GTA West-Highway 410 interchange due to diversion of longer-distance traffic to local facilities. The delays on inter-regional facilities are marginally higher with the interchange in place. On balance, there is not a significant difference in roadway link operations between the scenarios.

Considering the above analysis, it is recommended that the GTA West interchange at Highway 410 be included as part of the GTA West corridor alternative for improved inter-regional access and relief to local roadway facilities.

APPENDIX A

LOCAL AND REGIONAL ROAD NETWORK ASSUMPTIONS RTP AND GTA West BASE CASE SCENARIOS

APPENDIX A.1: Halton Region Updates to GGH Model

Road/Arterial/Highway	Link Description	RTP	GTA West Base
		# of Lanes	# of Lanes
Oakville			
NORTH/SOUTH			
Meadow Ridge Drive	Burnhamthorpe Road to Dundas Street	0	2
Trafalgar Road	White Oaks Road to White Oaks Road	4	6
Sixth Line	Burnhamthorpe Road to Dundas Street	2	4
Oak Park Boulevard	Dundas Street to Trafalgar Road	2	4
Neyagawa Boulevard	407 ETR to Burnhamthorpe Road	2	4
Kerr Street	North Service Road to Wyecroft Road	2	4
Dorval Drive	Wyecroft Road to Speers Road	4	6
4th Line	Lower Baseline Road to Burnhamthorpe Road	2	0
4th Line	Lower Baseline Road to 407 ETR	0	2
3rd Line	New Burnhamthorpe Road to Dundas Street	0	4
3rd Line	Dundas Street to QEW	2	4
EAST/WEST			
New Connector	Neyagawa Boulevard to Meadow Ridge Drive	0	2
Upper Middle Road	Trafalgar Road to Grand Boulevard	6	4
Old Abbey Lane	Nottingham Gate to Dorval Drive	2	4
North Service Road	3rd Line to Kerr Street	2	4
Wyecroft Road	Burloak Drive to Bronte Road	0	4
Wyecroft Road	Bronte Road to Dorval Drive	2	4
Speers Road	Bronte Road to 3rd Line	2	4
Speers Road	Chartwell Road to Ford Drive	2	4
Speers Road	Ford Drive to Winston Churchill Boulevard	0	4
Rebecca Street	Forsythe Street to Trafalgar Road	4	6
Burlington			
NORTH/SOUTH			
Brant Street	Tyandaga Park Drive to QEW	6	4
King Road	Mountain Brow Road to QEW	0	2
Waterdown Road	Mountain Brow Road to QEW	2	4
Waterdown Road	QEW to Plains Road	2	4
Snake Road	Main Street to QEW	0	2
EAST/WEST			
Mountain Brow Road	Flanders Drive to King Road	0	2
Mainway	Heritage Road to Burloak Road	2	4
Fairview Street	Brant Street to Guelph Line	6	4
Lakeshore Road	Maple Avenue to Martha Street	2	4

Road/Arterial/Highway	Link Description	RTP # of Lanes	GTA West Base # of Lanes
Milton			
NORTH/SOUTH			
8th Line	Derry Road to Britannia Road	3	2
James Snow Parkway	Main Street to Derry Road	0	4
4th Line	Main Street to Derry Road	4	0
4th Line	Derry Road to Britannia Road	4	2
Esquesing Line	North of James Snow Parkway to Steeles Avenue	4	2
Thompson Road	Derry Road to Britannia Road	4	2
Wilson Drive	Steeles Avenue to Woodward Avenue	2	4
New Tremaine Road	Tremaine Road to Steeles Avenue	0	4
Tremaine Road	Steeles Avenue to Main Street	2	4
Tremaine Road	Re-Alignment from Steeles Avenue to Main Street	4	0
EAST/WEST			
Highway 401	Guelph Line to Regional Road 25	8	10
Highway 401	Regional Road 25 to Trafalgar Road	8	8 GPL + 2 HOV
Highway 401	Trafalgar Road to 407 ETR	12	8 GPL + 2 HOV
Steeles Avenue	Tremaine Road to Bronte Street	4	2
Main Street	Bronte Street to Bell Street	4	2
Main Street	Millside Drive to Ontario Street	4	2
Louis St Laurent Avenue	Tremaine Road to James Snow Parkway	0	2
Halton Hills			
NORTH/SOUTH			
10th Line	22nd Sideroad to 17th Sideroad	2	4
Highway 7/Trafalgar Road	27th Sideroad to Main Street/Highway 7	2	4
4th Line	10th Sideroad to 5 Sideroad	4	2
Regional Road 25	North of 5 Sideroad to 5 Sideroad	4	2
EAST/WEST			
Highway 7/27th Sideroad	Wallace Street to Trafalgar Road	2	4
Highway 7	Trafalgar Road to Wildwood Road	2	4
Highway 7/Guelph Street	Main Street to Winston Churchill Boulevard	2	4
Sargent Road	Main Street to Mountainview Road	2	0

Note: Updates based on Halton 2007 Development Charge Study

APPENDIX A.2: Durham Region Updates to GGH Model

Road/Arterial/Highway	Link Description	RTP	GTA West Base
		# of Lanes	# of Lanes
Pickering			
NORTH/SOUTH			
Whites Road	Highway 7 to Whitevale Road	0	4
Whites Road/26 Sideline	Whitevale Road to Taunton Road	2	4
22 Sideline Extension	Highway 7 to Taunton Road	0	4
New Extension	Taunton Road to Rossland Road	0	4
Liverpool Road	Finch Avenue to Highway 2/Kingston Road	4	6
New Brock Road Alignment	7th Concession Road to 407 ETR	2	4
Westney Road	7th Concession Road to Taunton Road	2	4
Salem Road	7th Concession Road to Taunton Road	2	4
EAST/WEST			
407 ETR	York-Durham Townline to Brock Road	6	10
407 ETR	Whites Road/407 ETR Interchange	0	2
407 ETR	New 22 Sideline/407 ETR Interchange	0	2
407 ETR East Ext	Brock Road to Lakeridge Road	4	8
Highway 7	Paddock Road to Salem Road	2	4
6th Concession Road	Paddock Road to Highway 7	4	2
Taunton Road	York-Durham Townline to Church Street	6	4
Rossland Road	Valley Farm Road to Church Street	2	4
Highway 2/Kingston Road	Altona Road to Brock Street	6	4
Ajax			
NORTH/SOUTH			
Salem Road	Taunton Road to Rossland Road	2	4
Salem Road	North of Taunton Road to Highway 2	0	4
Salem Road	Chambers Drive to Highway 401	0	4
EAST/WEST			
Taunton Road	Church Street to Lakeridge Road	6	4
Rossland Road	Church Street to Lakeridge Road	2	4
Highway 2/Kingston Road	Westney Road to Audley Road	6	4
Highway 401	Highway 401/Harwood Avenue	2	0
Highway 401	New Highway 401/Salem Road Interchange	0	2
Whitby			
NORTH/SOUTH			
Lakeridge Road	7th Concession Road to Taunton Road	4	6
West Durham Link	407 ETR East Extension to Highway 401	4	6
Baldwin Street	Winchester Road to North Street	2	4

Road/Arterial/Highway	Link Description	RTP # of Lanes	GTA West Base # of Lanes
EAST/WEST			
407 ETR East Ext	Lakeridge Road to Thornton Road	4	8
Winchester Road	Baldwin Street to Thornton Road	2	4
Taunton Road	Lakeridge Road to Baldwin Street	6	4
Oshawa			
NORTH/SOUTH			
Simcoe Street	Columbus Road to Winchester Road	2	4
Harmony Road	Columbus Road to Conlin Road	2	4
Townline Road	Taunton Road to Pebblestone Road	2	4
EAST/WEST			
407 ETR East Ext	Thornton Road to Simcoe Street	4	8
407 ETR East Ext	Simcoe Street to Enfield Road	4	6
Winchester Road	Thornton Road to Ritson Road	2	4
Conlin Road	Thornton Road to Harmony Road	2	4
Rossland Road	Harmony Road to Townline Road	2	4
Clarington			
NORTH/SOUTH			
Enfield Road	6th Concession Road to Taunton Road	2	4
Trulls Road	Pebblestone Road to Devondale Street	2	4
EAST/WEST			
407 ETR East Ext	Enfield Road to East Durham Link	4	6
New Bloor Street	Bruntsfield Street to Prestonvale Road	0	4
Bloor Street	Prestonvale Road to Courtice Road	2	4
Highway 2/King Street	Scugog Street to Townline Road	2	4

Note: Updates based on 407 ETR East Extension Transportation Model and Region of Durham Development Charge Study

APPENDIX A.3: Peel Region Updates to GGH Model

Road/Arterial/Highway	Link Description	RTP # of Lanes	GTA West Base # of Lanes
Caledon			
NORTH/SOUTH			
Hurontario Street	Highway 9 to Charleston Sideroad	4	6
Hurontario Street	Olde Baseline Road to Highwood Road	4	6
Kennedy Road	Old School Road to Mayfield Road	2	4
Coleraine Drive	King Street to Mayfield Road	2	4
Albion-Vaughan Road	King Street to Mayfield Road	2	4
EAST/WEST			
Highway 9	Airport Road to The Gore Road	2	4
Brampton			
NORTH/SOUTH			
Winston Churchill Road	10th Sideroad to Steeles Avenue	6	4
HPBATS	Embleton Road to Steeles Avenue	4	8
HPBATS	Steeles Avenue to Meadowpine Boulevard	0	8
HPBATS	New HPBATS/ 407 ETR Interchange	0	2
Heritage Road	Embleton Road to 407 ETR	2	4
Mississauga Road	Sandalwood Parkway Extension to Steeles Avenue	4	6
Churchville Road	Creditview Road to Creditview Road	2	4
Hurontario Street	Nanwood Drive to Steeles Avenue	4	6
Kennedy Road	Conservation Drive to Bovaird Drive	6	4
Kennedy Road	Williams Parkway to Vodden Street	6	4
Kennedy Road	Steeles Avenue to Derry Road	6	4
Highway 410	Bovaird Drive to Clark Boulevard	6	8
Bramalea Road	Bovaird Drive to Queen Street	4	6
Goreway Drive	Exchange Drive to Queen Street	2	6
Goreway Drive	Queen Street to Intermodal Drive	4	6
The Gore Road	Courtside Drive to Castlemore Road	4	6
The Gore Road	Queen Street to Highway 50	6	4
Highway 50	Queen Street to 407 ETR	6	4
EAST/WEST			
Mayfield Road	Highway 10/Hurontario Street to Valleyview Road	4	6
Mayfield Road	Dixie Road to Humber Station Road	4	6
Conservation Drive	Hurontario Street to Kennedy Road	2	4
Sandalwood Parkway	Winston Churchill Boulevard to Mississauga Road	0	4
Bovaird Drive	Winston Churchill Boulevard to Heritage Road	6	4
Bovaird Drive	Airport Road to Highway 50	2	6
Williams Parkway	Jordan Boulevard to Torbram Road	6	4
Embleton Road	Heritage Road to Mississauga Road	4	2

Road/Arterial/Highway	Link Description	RTP # of Lanes	GTA West Base # of Lanes
Queen Street	Mississauga Road to McLaughlin Road	6	4
Queen Street	Kennedy Road to Hansen Road	4	6
Clark Avenue	Rutherford Road to Dixie Road	4	6
Steeles Avenue	Finch Avenue to Albion Road	6	4
Mississauga			
NORTH/SOUTH			
Ridgeway Drive	Angel Pass Drive to Unity Drive	2	4
Winston Churchill Boulevard	Dalehurst Drive to Derry Road	4	6
Winston Churchill Boulevard	Erin Centre Boulevard to Dundas Street	6	4
Winston Churchill Boulevard	Kingsway Drive to Royal Windsor Drive	6	4
Winston Churchill Boulevard	Royal Windsor Drive to Lakeshore Road	4	2
Southdown Road	Royal Windsor Drive to Lakeshore Road	4	2
Mavis Road	407 ETR to Highway 401	4	6
Mavis Road	Britannia Road to Eglinton Avenue	8	6
McLaughlin Road	Courtney Park Drive to Cantay Road	2	4
McLaughlin Road	Britannia Road to Briston Road	2	6
Hurontario Street	Queensway to QEW	6	4
Cawthra Road	Queensway to Lakeshore Road	4	6
EAST/WEST			
Derry Road	9th Line to 10th Line	6	4
Courtneypark Drive	Hurontario Street to Highway 410	4	6
Britannia Road	Erin Mills Parkway to Creditview Road	6	4
Eglinton Road	Winston Churchill Boulevard to Erin Mills Parkway	4	6
Eglinton Road	Highway 403 to Spectrum Way	6	4
Dundas Street	Hurontario Street to Cawthra Road	4	6
Lakeshore Road	Winston Churchill Road to Southdown Road	4	2

Note: Updates based on Peel Long Term Transportation Plan (2005) and Peel Capital Plan (2009)

APPENDIX A.4: York Region Updates to GGH Model

Road/Arterial/Highway	Link Description	RTP # of Lanes	GTA West Base # of Lanes
Markham			
NORTH/SOUTH			
Markham Road	407 ETR to Steeles Ave	6	4
McCowan Road	Stouffville Road to Major Mackenzie Drive	2	4
Kennedy Road	16th Avenue to Highway 7	6	4
Kennedy Road	407 ETR to Steeles Ave	6	4
Warden Avenue	Stouffville Road to Major Mackenzie Drive	2	4
Woodbine Avenue	Stouffville Road to South of 19th Avenue	2	4
Woodbine Avenue	South of 19th Avenue to Elgin Mills Road	4	2
Woodbine Avenue	Major Mackenzie Road to Highway 7	6	4
Leslie Street/Don Mills Road	Highway 7 to Steeles Avenue	6	4
Bayview Avenue	Highway 7 to Steeles Avenue	6	4
EAST/WEST			
19th Avenue	Leslie Street to Markham By-Pass Extension	2	4
Elgin Mills Road	Leslie Street to Woodbine Avenue	2	4
Markham By-Pass Ext	19th Avenue to Major Mackenzie Drive	0	4
Major Mackenzie Road	Leslie Street to Woodbine Avenue	6	4
Major Mackenzie Road	William Berczy Boulevard to McCowan Road	2	4
16th Avenue	McCowan Road to West of Reesor Road	6	4
Highway 7	Markham By-Pass to York-Durham Townline	4	2
407 ETR	Highway 404 to York-Durham Townline	8	10
14th Avenue	Markham Road to Box Grove By-Pass	2	4
Steeles Avenue	Reesor Road to Eleventh Line	3	4
Vaughan			
NORTH/SOUTH			
Hilda Avenue	Clark Avenue to Steeles Avenue	2	4
Atkinson Avenue	Bathurst Street to Clark Avenue	2	4
New Westminster Drive	Bathurst Street to Steeles Avenue	2	4
Dufferin Street	King-Vaughan Road to Teston Road	2	4
Dufferin Street	Major Mackenzie Road to Steeles Avenue	6	4
Keele Street	Major Mackenzie Road to Rutherford Road	6	4
Jane Street	Kirby Road to Teston Road	2	4
Jane Street	Major Mackenzie Drive to Steeles Avenue	6	4
Weston Road	Kirby Road to Teston Road	2	4
Weston Road	Major Mackenzie Drive to Steeles Avenue	6	4
Pine Valley Road	Major Mackenzie Road to Rutherford Road	4	2
Regional Road 27	King-Vaughan Road to N of Major Mackenzie Road	2	4
Highway 427	New E/W Arterial to Major Mackenzie Road	0	4

Road/Arterial/Highway	Link Description	RTP # of Lanes	GTA West Base # of Lanes
Highway 427	New Highway 427/Nashville Road Interchange	0	2
Highway 427	Rutherford Road to Highway 7	4	6
Huntington Road	King-Vaughan Road to Langstaff Road	4	2
EAST/WEST			
New E/W Arterial	Albion Vaughan Road to Highway 400	0	4
King-Vaughan Road	Highway 400 to Bathurst Street	2	4
Teston Road	Jane Street to Keele Street	2	4
Teston Road Ext	Keele Street to Dufferin Street	0	4
Major Mackenzie Road	Highway 50 to Highway 400	4	6
Major Mackenzie Road	Highway 400 to Melville Avenue	6	4
Rutherford Road	Highway 50 to Highway 400	4	6
Langstaff Road	Highway 50 to Huntington Road	6	4
Fogal Road	Highway 50 to Huntington Road	2	4
Whitchurch-Stouffville			
NORTH/SOUTH			
Warden Avenue	Bloomington Road to Stouffville Road	2	4
Woodbine Avenue	Bloomington Road to Stouffville Road	2	4
EAST/WEST			
Bloomington Road	Highway 404 to York-Durham Townline	2	4
Main Street	Regional Road 48 to 9th Line	2	4
Richmond Hill			
NORTH/SOUTH			
Leslie Street	Major Mackenzie Road to Highway 7	6	4
Bayview Avenue	19th Avenue to Highway 7	6	4
Bathurst Street	Elgin Mills Road to Major Mackenzie Road	4	6
EAST/WEST			
Elgin Mills Road	Bathurst Street to Yonge Street	2	4
19th Avenue	Bayview Avenue to Leslie Street	2	4
Major Mackenzie Road	Yonge Street to Leslie Street	6	4
16th Avenue	Bathurst Street to Leslie Street	6	4
16th Avenue	Leslie Street to Highway 404	4	6
Aurora			
EAST/WEST			
Regional Road 26	Bayview Avenue to Woodbine Avenue	2	4

Road/Arterial/Highway	Link Description	RTP # of Lanes	GTA West Base # of Lanes
Newmarket			
NORTH/SOUTH			
Leslie Street	Davis Street to Gotham Street	2	4
Yonge Street	Green Lane to Mulock Drive	6	4
King			
NORTH/SOUTH			
Keele Street	15th Sideroad to King Road	2	4
Regional Road 27	King Road to King-Vaughan Road	2	4
EAST/WEST			
Bridge Street	Canal Road to Bathurst Road	2	4
Highway 9	Weston Road to Highway 400	3	2
Highway 9	Highway 400 to Bathurst Street	5	4
East Gwillimbury			
NORTH/SOUTH			
Woodbine Avenue	Ravenshoe Road to Green Lane	4	2
Leslie Street	Colonel Waying Boulevard to Green Lane	2	4
2nd Concession Road	Doane Road to Green Lane	2	4
Yonge Street	Holland Landing Road to Holland Landing Road	4	2
EAST/WEST			
Queensville Sideroad	Leslie Street to Woodbine Avenue	2	4
Georgina			
NORTH/SOUTH			
Highway 404	Ravenshoe Road to Pollock Road	0	4
Highway 404	New Highway 404/Glenwoods Avenue Interchange	-	-
Highway 404	New Highway 404/Pollock Road Interchange	-	-
EAST/WEST			
Baseline Road	7th Concession Road to Dalton Road	2	4
Highway 404	Pollock Road to Highway 48/Pefferlaw Road	0	4
Highway 404	New Highway 404/Highway 48 Interchange	-	-
Glenwoods Avenue	The Queensway to Woodbine Avenue	4	2
Glenwoods Avenue	Woodbine Avenue to Highway 404	0	4
Glenwoods Avenue	Woodbine Avenue to Highway 404	0	2

Note: Updates based on York Region Transportation Model

APPENDIX A.5: Wellington County/City of Guelph Region Updates to GGH Model

Road/Arterial/Highway	Link Description	RTP # of Lanes	GTA West Base # of Lanes
Guelph			
NORTH/SOUTH			
Watson Road	Eastview Drive to York Road	2	4
Victoria Road	Clair Road to Maltby Road	0	2
Gordon Street	Clair Road to Maltby Road	2	4
Highway 6 Ext	New Highway 7 to Woodlawn Road	0	4
Elmira Road	Speedvale Avenue to Paisley Road	0	2
EAST/WEST			
York Road	Victoria Road to East of Watson Road	2	4
Stone Road	Gordon Street to Watson Road	2	4
Laird Road	Downey Road to Highway 6	0	4
Maltby Road	Highway 6 to Victoria Street	0	2
Rest of Wellington			
NORTH/SOUTH			
Wellington Road 7	Eighth Line to Highway 6	2	4
Highway 6 North Ext	Wellington Road 7 to New Highway 7	0	4
Wellington Road 46	Maltby Road to Wellington Road 34	2	4
Highway 6 South By-Pass	Highway 401 to Campbellville Road	0	4
EAST/WEST			
Maltby Road	Victoria Road to Watson Road	0	2
Highway 401	Cambridge Townline Road to Brock Road	6	10
Highway 401	Highway 6 to Guelph Line	8	10

Note: Updates based on Guelph-Wellington Transportation Study

APPENDIX A.6: City of Hamilton Updates to GGH Model

Road/Arterial/Highway	Link Description	RTP # of Lanes	GTA West Base # of Lanes
Hamilton Region			
NORTH/SOUTH			
Green Road	South Service Road to King Street	0	2
Grays Road	North Service Road to South Service Road	0	2
Millen Road	North Service Road to South Service Road	0	2
Glover Road	North Service Road to South Service Road	0	2
Winona Road	North Service Road to South Service Road	0	2
EAST/WEST			
Parkside Drive	Churchill Road to new N/S road	2	4
Dundas Street	New N/S road to Hamilton Boundary	4	6
Mountain Brow Road	Waterdown Road to new N/S road	2	4
Governor's Road	Creighton Drive to Davidson Boulevard	2	4
North Service Road	Centennial Parkway to Grays Road	0	2
North Service Road	Grays Road to Green Road	0	4
North Service Road	Green Road to Casablanca Boulevard	0	2
Arvin Avenue	Winona Road to Fifty Road	0	2

Note: Updates based on comments from City of Hamilton

APPENDIX A.7: Niagara Region Updates to GGH Model

Road/Arterial/Highway	Link Description	RTP # of Lanes	GTA West Base # of Lanes
Niagara Region			
NORTH/SOUTH			
Stanley Ave	Roberts St to Valley Way	2	4
Stanley Ave	Dunn St to Main St	2	4
EAST/WEST			
Woodlawn Rd	Rice Rd to Niagara St	2	4
4th Louth Ave	First St Louis St to Marindale Rd	2	4

Note: Updates based on the Niagara Transportation Master Plan