

To: Adrian Smith, City of Brampton Date: June 23, 2004
From: Jim Gough / Serdar Oncel Job No.: 16-02083-03-T06
Subject: Recent enhancement of EMME/2 CC:
Model Calibration

This memo summarizes the fine-tuning of calibration of the EMME/2 model used in the Brampton Transportation and Transit Master Plan (TTMP) study.

1. BACKGROUND

The initial model was provided by the Region of Peel. An updating process was carried out in order to simulate the actual road network within Brampton, in terms of checking capacities and volume-delay functions, road connections, zonal connections (to ensure they reflect actual local roads where they exist or are planned) and speeds. The land use data used in the model was also updated to reflect current City of Brampton projections. Following the first round of model results, an extra step was taken to refine the model calibration, working collaboratively with the Region and Peter Dalton.

Link volumes obtained from Brampton's EMME/2 model have been compared to the Simplified GTA Model's results as a check. The rationale behind this comparison was to provide a sense of the differences on the screenline basis, given that the two models have been calibrated separately.

The details of the process were provided below. The memo dated November 24, 2003 is attached to provide additional background information.

2. COMPARISON OF MODELS

The differences between the Brampton and Simplified GTA models are based on some factors that should be considered when comparing the results obtained from the two sources:

1. Trip rates
2. Modal split
3. Trip distribution
4. Peak hour and auto occupancy factor
5. Trip assignment

Significant differences between the projections of two models were aggregated at the Brampton/Mississauga boundary.

3. CALIBRATION RESULTS

Following modelling discussion sessions with the Region and the City of Mississauga, Mississauga's analysis had been very helpful in pointing out areas of the forecasts that needed to be checked, such as trip rates, peak hour factors and self-containment percentages. Of particular importance were the peak



hour auto volumes crossing the Brampton/Mississauga boundary. The Peel model was projecting boundary crossings that appeared high in 2011 relative to 2001 values.

The Peel model forecasts were adjusted by modifying not only the model parameters to reflect 2001 TTS trip rates and peaking characteristics (preliminary findings available at that time [November 2003]), but also changing the trip distribution beta factors to account for how people react to growing congestion and travel shorter distances on the average.

The cooperative work with the Region and Peter Dalton ensured that the respective model inputs and outputs were as close and consistent as possible.

Attached to this memo is a comparison between the results of the two models; the spreadsheet and graph included with the memo show how the models simulate the traffic across the Brampton/Mississauga Boundary.

4. CONCLUSION

The forecasts in the table were considered sufficiently accurate to serve as the basis of the TTMP road plans. It is noted that, based on Peter Dalton's experience the new projections are largely consistent with forecasts in Mississauga, Halton and York produced at the same time.

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Date: November 24, 2003

DRAFT

From: Jim Gough

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Subject: **TRAVEL DEMAND
FORECASTING MODEL REVIEW
BRAMPTON TRANSPORTATION
AND TRANSIT MASTER PLAN**

CC: Bob Sasaki, City of Mississauga
Andy Kwan, City of Mississauga
Murray McLeod, Region of Peel
Nadeem Siddiqui, Region of Peel
Peter Dalton

This memo documents the review of the results of the two travel demand forecasting models employed to this point in the Brampton Transportation and Transit Master Plan Study. This review has been undertaken because of concerns raised by staff of the cities of Brampton and Mississauga with respect to the magnitude of the difference on certain screenlines.

The memo references the two models as follows: the 'TTMP model' is the model derived from the Peel model, and the 'GTA model' is Peter Dalton's Simplified GTA model.

The memo includes the following components:

- Summary of updates to the TTMP model results following the meetings with staff
- Comparisons between the results of the current analysis and those of previous projects cited by the City of Mississauga staff
- Comparison and discussion of differences between the GTA and TTMP models
- Conclusions in terms of proposed direction for closure

1. ANALYSIS UPDATE FOLLOWING MEETINGS OF OCTOBER/NOVEMBER, 2003

It is important to understand the analysis updates completed following the meetings with the City and other agencies in the October/November period. These have decreased the differences between the two models.



The road network requirements have been comprehensively reviewed, in light of the comments received from Brampton staff and the Technical Advisory Committee representatives. Updates have included the following adjustments:

- a. The volume adjustments for trucks and buses have been revised to eliminate the change to passenger car equivalents. This has resulted in a lowering of the volume-to-capacity ratios. This adjustment has been made for all horizons (including 2001).

Why this has been done: It is considered more logical to leave volumes in vehicle units, because this is consistent with the capacity values employed. Capacities are not adjusted to represent pcu's (this would be difficult to do with certainty), and thus volumes should similarly not be adjusted.

- b. Opportunities to defer certain improvements created by the addition of parallel road expansions have been considered. For example, the model results show that Winston Churchill Boulevard theoretically requires improvement. However, development of Bramwest Parkway affords the opportunity to eliminate or defer the Winston Churchill improvement, by virtue of the capacity it can provide.

Why this has been done: To avoid over-supply of road network capacity, and minimize road network costs.

- c. The road network improvements needed for the Transit Priority (i.e. HOV/RBL) Network have been reflected in the assessment. Volume-to-capacity ratios on the screenlines, reflecting these initiatives, have been recalculated. The results are shown in **Figure 1**. These results are based on the TTMP model. They reflect the programmed improvements (shown in **Figure 2**) and the additional improvements needed (shown in **Figure 3**). **It should be noted that the additional improvements required shown in Figure 3 have been reduced relative to the versions previously shown at the meetings.**

2. COMPARISONS WITH RESULTS OF PREVIOUS PROJECTS

Table 1 summarizes the comparison of volume/capacity ratios derived from the GTA and TTMP models to those derived from two other completed projects: the York/Peel Boundary Area Transportation Study (BATS), and the West-Central Peel Transportation Study (WCPTS). These two projects were suggested by City of Mississauga staff.

Key points with respect to the data are as follows:

- In compiling the data, it was noted that the capacities are different in most cases. We have compensated for these differences by using the same capacities in calculating the v/c ratios
- In cases where the results did not include a percentage for truck traffic, a percentage value was added



- The number of road included in the screenlines varied between the four models. It is not possible to adjust for this difference within the models. The "Comments" column documents the differences.
- These first three points show that this cannot be an exact comparison. It is by necessity approximate
- It should also be noted that the north-south screenline is fairly short for the BATS analysis (i.e. Airport Road and east). These results should not be taken as representing the entire Brampton/Mississauga screenline

The comparison of results has focussed on columns H, I, M and N in the table. These are the comparisons which utilize consistent capacities, so they are the most comparable. These columns are percentage differences between screenline results, as follows:

- Column H is the percentage difference between the TTMP model and the BATS or WCPTS study, assuming no adjustment for the degree of self-containment within Brampton
- Column I is the percentage difference between the TTMP model and the BATS or WCPTS study, taking into account a very crude adjustment for the degree of self-containment within Brampton (summarized in the notes of the table)
- Column N is the percentage difference between the GTA model and the BATS or WCPTS study, assuming no adjustment for the degree of self-containment within Brampton

(The issue of self-containment is discussed further in Section 3 below.)

2.1 Comparison with the BATS Results

- Column N compared to Column H or I shows that the GTA and TTMP results are not significantly different on most screenlines, for horizon 2001. In fact, the TTMP model results more closely resemble those of the BATS analysis than does the GTA model
- For 2031, the results are consistent for the Highway 407 (Mississauga boundary) screenline, but they diverge north of Queen Street. The pattern north of Queen is that relative to the BATS results, the TTMP under-predicts demand east-west to/from York Region, and over-predicts north/south. Note that this is relative. The same pattern is visible in the GTA results, but not to the same degree. This may affect road network requirement listings north of Queen, but not at the Mississauga boundary. East/west, this suggests that additional road improvements could be seen as required, but two factors mitigate against such a recommendation. The first is the horizon - 30 years out. The second is the goal to put transit first, in order to balance roads and transit.
- The approximation of self-containment (column I) does not move the TTMP results closer to the BATS results
- Some of the differences on specific screenline sections are significant. However, the results on the entire 'West of Highway 50' screenline are very close. Also, the north-south sections are very short, and not entirely consistent in terms of roads included or location



2.2 Comparison with the WCPTS Results

- Column N compared to Column H or I shows that the GTA and TTMP results are not significantly different on most of the screenlines, for horizon 2001. In fact, the TTMP model results more closely resemble those of the WCPTS analysis
- For 2031, the TTMP results are also closer to the WCPTS than the GTA results are
- The approximation of increased self-containment does bring the TTMP results closer to the WCPTS results
- The difference between TTMP/GTA and WCPTS future results are not as large as those between the TTMP/GTA and BATS results.

2.3 Summary re: Accuracy

The models are calibrated to within $\pm 10\%$ accuracy on a screenline basis. The differences in Table 1 between the v/c ratios of the various models should not be construed as representing the accuracy of one model over another, because these are for the most part simply segments of screenlines.

It is also important to note that the differences may not be as great as first thought, when the error terms are considered. If the WCPTS results are 10% high and the TTMP results are 10% low, that alone is a difference of 20%. The true test of the results is how they are reviewed by the analyst, and how they are applied.

3. DISCUSSION: DIFFERENCES BETWEEN GTA AND TTMP MODELS

Figure 4 shows the 2001 modelled volume/capacity ratios, for both the GTA and TTMP models. For this base year, there is a mix in terms of which produces higher v/c ratios, in both the peak and off-peak directions.

Figure 5 shows the 2011 modelled volume/capacity ratios, for both the GTA and TTMP models. For this year, the TTMP model generally produces higher v/c ratios in the peak and off-peak directions.

For both Figures 4 and 5, the City and Regional programmed road improvements have been included. The effect of the HOV/RBL transit priority network has not been reflected.

Background points regarding the two models are as follows:

- The TTMP model distribution is gravity-based, which allocates trips based on a theoretical cost relationship between pairs of zones; the GTA model is based on a modified Fratar process, which builds on observed patterns
- The GTA model permits adjustment to reflect increased self-containment within the City. It has also been adjusted in terms of labour participation rates and other trip parameters, which

TABLE 1. SCREENLINE COMPARISONS WITH OTHER STUDIES

Boundary Area Transportation Study, iTRANS

				A	B	C	D	E	F	G	H	I	J	K	L	M	N		
				iTRANS			TTMP Model			v (Bram) / c (iTRANS)	DIFF (C - G) (%)	DIFF (C - G) (%) (note 1)	Simplified GTA Model			v (GTA) / c (iTRANS)	DIFF (C - M) (%)	Comments	
Screenline Location	Direction	From	To	Volume	Capacity	v/c	Volume	Capacity	v/c				Volume	Capacity	v/c				
2001 AM																			
North of Highway 407 (North of Steeles for MMM)	SB	Airport Rd.	McVean Dr. (Gorewood Dr.)	3569	4300	0.83	3745	5100	0.73	0.87	-4%	5%	3313	4100	0.81	0.77	6%	TTMP Model does not have Gorewood Dr.	
North of Queen St. E.	SB	Airport Rd.	The Gore Rd.	3864	5600	0.69	4898	5600	0.87	0.87	-18%	-27%	6001	5000	1.20	1.07	-38%		
North of Castlemore Rd. (Bovaird Dr.)	SB	Airport Rd.	Clarkway Dr.	2760	4000	0.69	3960	4300	0.92	0.99	-30%	-40%	4767	5200	0.92	1.19	-50%		
South of Mayfield Rd.	SB	Airport Rd.	Coleraine Dr.	2352	4800	0.49	1621	5900	0.27	0.34	15%	19%	4033	5200	0.78	0.84	-35%		
West of Highway 50	EB	Steeles Ave. E.	Queen St. E. (Hwy. 7)	4050	5000	0.81	4269	4100	1.04	0.85	-4%	4%	4747	7000	0.68	0.95	-14%	Highway 407 Volumes are not included in this comparison.	
	EB	Ebenezer Rd.	Mayfield Rd.	1360	4000	0.34	557	2300	0.24	0.14	20%	21%	2206	4400	0.50	0.55	-21%		
	EB	OVERALL for West of Highway 50		5410	9000	0.60	4827	6400	0.75	0.54	6%	12%	6953	11400	0.61	0.77	-17%		
2031 AM																			
North of Highway 407 (North of Steeles for MMM)	SB	Airport Rd.	McVean Dr.	5712	4800	1.19	6068	5100	1.19	1.26	-7%	5%	4740	4800	0.99	0.99	20%		
North of Queen St. E.	SB	Airport Rd.	The Gore Rd.	10560	8000	1.32	14611	9150	1.60	1.83	-51%	-69%	10117	6100	1.66	1.26	6%		
North of Castlemore Rd. (Bovaird Dr.)	SB	Airport Rd.	Clarkway Dr.	6916	7600	0.91	10309	9650	1.07	1.36	-45%	-58%	8372	6100	1.37	1.10	-19%		
South of Mayfield Rd.	SB	Airport Rd.	Coleraine Dr.	4524	7800	0.58	6966	8900	0.78	0.89	-31%	-22%	5487	6800	0.81	0.70	-12%		
West of Highway 50	EB	Steeles Ave. E.	Queen St. E. (Hwy. 7)	6552	6300	1.04	5513	5100	1.08	0.88	16%	25%	7294	7000	1.04	1.16	-12%	Highway 407 Volumes are not included in this comparison.	
	EB	Ebenezer Rd.	Mayfield Rd.	7912	9200	0.86	3725	5250	0.71	0.40	46%	50%	5167	5500	0.94	0.56	30%		
	EB	OVERALL for West of Highway 50		14464	15500	0.93	9238	10350	0.89	0.60	34%	40%	12461	12500	1.00	0.80	13%		

West-Central Peel Transportation Study 2002

				Region of Peel (Alt 2)			TTMP Model			v (TTMP) / c (Peel)	DIFF (C - G) (%)	DIFF (C - G) (%) (note 1)	Simplified GTA Model			v (GTA) / c (iTRANS)	DIFF (C - M) (%)	Comments	
Screenline Location	Direction	From	To	Volume	Capacity	v/c	Volume	Capacity	v/c			Volume	Capacity	v/c					
2011AM																			
Brampton/Mississauga Boundary	SB	Winston Churchill Blvd.	Tomken Rd.	25000	25600	0.98	28470	24667	1.15	1.11	-14%	-2%	18597	19000	0.98	0.73	25%	GTA does not have Financial Dr, but it includes Creditview Rd. instead.	
	NB	Winston Churchill Blvd.	Tomken Rd.	15487	25400	0.61	16302	26467	0.62	0.64	-3%	3%	10072	19000	0.53	0.40	21%	Same as above.	
South of Mayfield Rd.	SB	Winston Churchill Blvd.	Highway 410	4677	9700	0.48	8923	14900	0.60	0.92	-44%	-35%	4234	10000	0.42	0.44	5%	GTA does not have Highway 410 extension.	
	NB	Winston Churchill Blvd.	Highway 410	1961	9500	0.21	3900	14900	0.26	0.41	-20%	-16%	2849	10000	0.28	0.30	-9%	Same as above.	
Brampton/Halton Boundary	EB	Queen St. (Embleton Rd.)	Mayfield Rd.	2820	3500	0.81	3410	4800	0.71	0.97	-17%	-7%	2183	3400	0.64	0.62	18%		
	WB	Queen St. (Embleton Rd.)	Mayfield Rd.	2376	3500	0.68	2050	4800	0.43	0.59	9%	15%	1443	3400	0.42	0.41	27%		
East of Highway 410	EB	Glidden Rd.	Mayfield Rd.	16535	18200	0.91	14662	15633	0.94	0.81	10%	2%	12302	12800	0.96	0.68	23%	GTA does not have Sandalwood Parkway.	
	WB	Glidden Rd.	Mayfield Rd.	15565	18300	0.85	10788	15633	0.69	0.59	26%	20%	8330	12800	0.65	0.46	40%	Same as above.	
2021AM																			
Brampton/Mississauga Boundary	SB	Winston Churchill Blvd.	Tomken Rd.	29570	31000	0.95	28268	24450	1.16	0.91	4%	13%	21649	19000	1.14	0.70	26%	GTA does not have Financial Dr, but it includes Creditview Rd. instead.	
	NB	Winston Churchill Blvd.	Tomken Rd.	17274	30700	0.56	14793	26250	0.56	0.48	8%	13%	10586	19000	0.56	0.34	22%	Same as above.	
South of Mayfield Rd.	SB	Winston Churchill Blvd.	Highway 410	8562	16500	0.52	11206	15800	0.71	0.68	-16%	-9%	5804	10000	0.58	0.35	17%	GTA does not have Highway 410 extension.	
	NB	Winston Churchill Blvd.	Highway 410	3874	16000	0.24	4646	15800	0.29	0.29	-5%	-2%	3246	10000	0.32	0.20	4%	Same as above.	
Brampton/Halton Boundary	EB	Queen St. (Embleton Rd.)	Mayfield Rd.	3334	5200	0.64	2592	6050	0.43	0.50	14%	19%	2332	3400	0.69	0.45	19%		
	WB	Queen St. (Embleton Rd.)	Mayfield Rd.	2739	5200	0.53	2989	6050	0.49	0.57	-5%	1%	1795	3400	0.53	0.35	18%		
East of Highway 410 *	EB	Glidden Rd.	Mayfield Rd.	21638	18200	1.19	17024	15450	1.10	0.94	25%	16%	13243	12800	1.03	0.73	46%	GTA does not have Sandalwood Parkway.	
	WB	Glidden Rd.	Mayfield Rd.	18494	18300	1.01	13393	15450	0.87	0.73	28%	21%	9494	12800	0.74	0.52	49%	Same as above.	

Assumed Truck % for West-Central Peel Transportation Study = 15%

* Corrections made by MMM (the capacity is equal to 2011's).

NOTES:

1. For the highlighted (yellow) cells in this column, the TTMP model values crossing municipal boundaries were reduced by 10% to approximately replicate the effect of increased self-containment, in recognition that the model is likely under-representing self-containment
2. For the blue cells, the TTMP value was increased by 10%, to represent more trips staying in Brampton. It is recognized that this is simplistic, but is intended to provide an impression of the effect of increased self-containment



have not been updated in the TTMP model. The level of self-containment cannot be directed^{by} adjusted in the TTMP model

- Capacities are consistent between the two models. In any case, it is likely that the differences in capacity play a fairly small role in defining trip assignments on such a congested network. The demands have been adjusted for the screenline calculations to reflect trucks and buses in an appropriate way. That should be sufficient to address the capacity issues raised by staff
- The GTA model contains a higher level of trips per population or employment for Brampton than the TTMP model. The relationship is fairly constant over the four study horizons. The TTMP model typically projects 5% trips/pop of Brampton, whereas the GTA projects 8.75%. On the employment side, the TTMP model projects 11% trips/emp, while the GTA model projects 20%. The fact that the GTA model has higher activity rates within Brampton, yet lower v/c values, shows the impact of the distribution in the model

Another check of the basic model results is the ratio of additional trips projected by the models relative to the projected increase in development, over the study horizons. Table 2 summarizes this type of comparison, using the projected Brampton population and employment increases, the additional trips in the two models within Brampton and the additional trips in the models as a whole. The "% of total change" columns show that the Brampton population, employment and trips within Brampton all follow a consistent pattern from year to year. The percentage change in the GTA model total trips (last row) also follows this pattern. Only the 'total trips in TTMP model' row does not follow the pattern. A disproportionately high growth in number of trips occurs during the 01 to 11 timeframe for the TTMP model.

TABLE 2. COMPARISON OF GROWTH IN DEVELOPMENT TO GROWTH IN TRIPS

	Change from year to year			Total	% of total change		
	01-11	11-21	21-31		01-11	11-21	21-31
Brampton Population				353,007	42%	34%	24%
	149,256	119,299	84,452				
Brampton Employment				147,644	42%	35%	23%
	61,914	51,112	34,618				
Trips within Brampton							
TTMP Model				13,047	43%	40%	17%
	5,639	5,211	2,197				
GTA Model				33,495	44%	24%	32%
	14,865	8,006	10,624				
Total trips in model							
TTMP Model				250,642	62%	22%	16%
	155,022	56,030	39,590				
GTA Model				333,664	44%	26%	30%
	145,857	86,283	101,524				

It can be concluded that the TTMP model appears to over-predict trips at the 2011 horizon. Combined with the lower level of self-containment inherent in the TTMP model, it is likely that



the 2011 road network deficiencies are overstated to some degree. However, this should not be interpreted as a reason to abandon the TTMP model. The application and interpretation of the model is addressed in the following section.

4. CONCLUSIONS: PROPOSED DIRECTION FOR CLOSURE

The analysis summarized in this memo has shown the following:

- a. The road network requirements have been comprehensively reviewed, in light of the comments received from Brampton staff and the Technical Advisory Committee representatives. The volume adjustments for trucks and buses have been revised to eliminate the change to passenger car equivalents. This has resulted in a lowering of the volume-to-capacity ratios for all horizons;
- b. Comparisons with the BATS and WCPTS results are not exact, due to differences in methodology and networks. However, the comparisons show that there are differences at the horizons of 2021 and 2031:
 - The comparison with WCPTS does not suggest that the TTMP model results are significantly inaccurate
 - The comparison with BATS suggests a greater level of concern, but not at the Mississauga boundary. The results north of Queen Street in the eastern section of Brampton suggest that caution should be exercised in defining the needed improvements, so as not to oversupply capacity;
- c. The comparison of the TTMP and GTA models suggest that the TTMP model is overpredicting deficiencies for 2011;
- d. Thus the main focus is on 2011. As noted above, the true test of the results is how they are reviewed by the analyst, and how they are applied. In this case, it is helpful to review the effect of the improvements proposed in addition to the programmed changes.

At the Mississauga boundary, the screenline v/c before applying the additional improvements is 1.33 based on the TTMP model, or 0.98 based on the GTA model. The v/c ratio after applying the additional improvements (including the transit priority network) is projected to be 1.18. That is a reduction of 0.15 below the 1.33 value. Most of the improvements proposed are in the developing west end, or adjacent to Highway 410. This is seen as logical, given the areas of growth in the City. These have been recommended on the basis of network needs and specific link v/c ratios. **The program of additional improvements does not result in a v/c ratio of less than 1.0** - it is recognized that the program of improvements will not address all of the deficiencies at this horizon. This is in keeping with the TTMP goal of providing balance between road and transit - road capacity should not be oversupplied.

Another way to look at the difference in v/c ratio on this screenline is in terms of the reduction of 0.15 between the unimproved and improved networks. If the GTA model values were accepted as correct, the unimproved v/c ratio of 0.98 (effectively capacity, an undesirable situation) would reduce to 0.84 - a Level of Service of 'D', which is an accepted

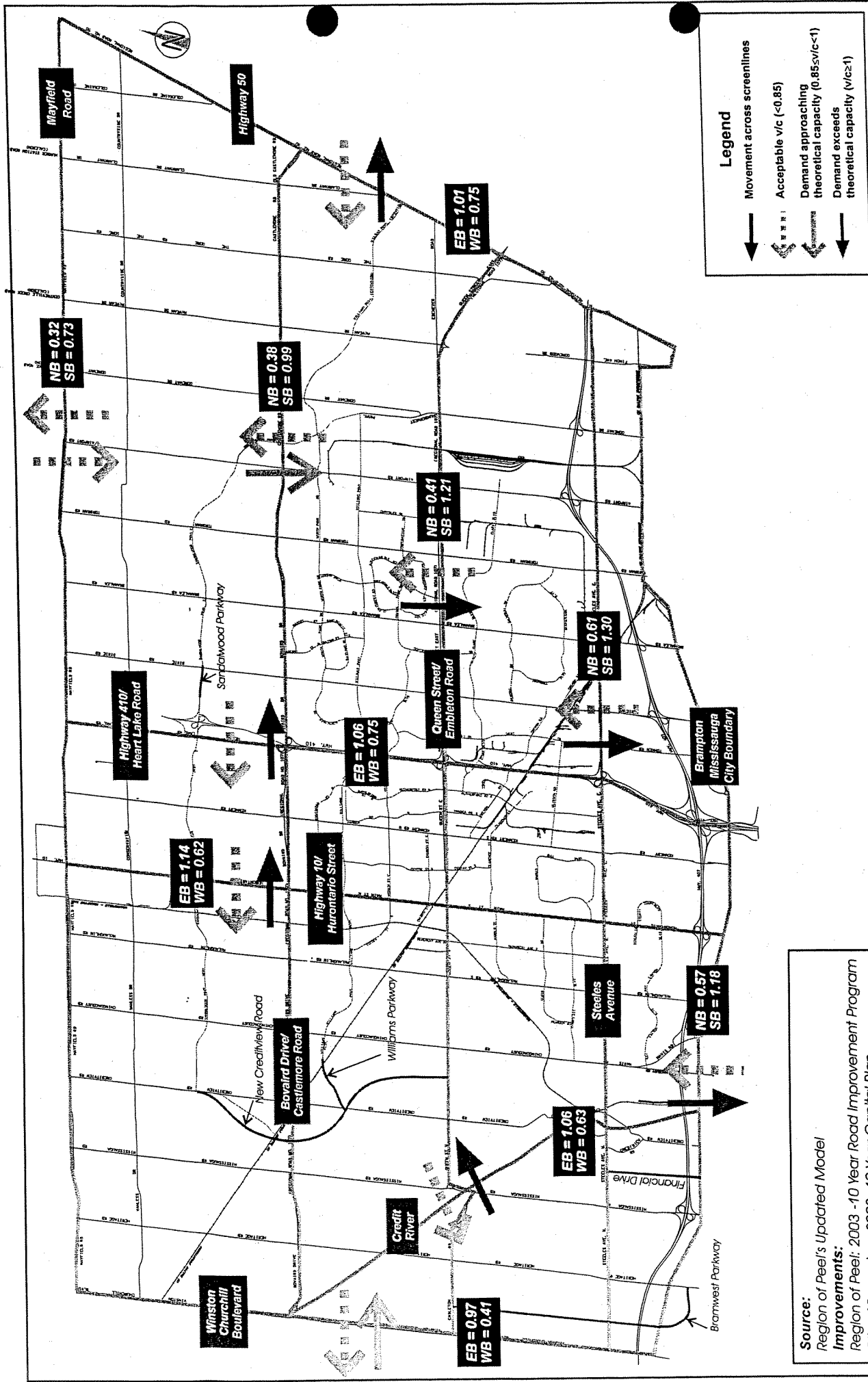


objective. Thus the proposed program of improvements does not represent an oversupply of capacity.

The proposed direction for closure is to continue using the TTMP model, recognizing its shortcomings. This should be accomplished by a joint review of the link improvements by City staff, MMM and the other interested members of the Technical Advisory Committee.

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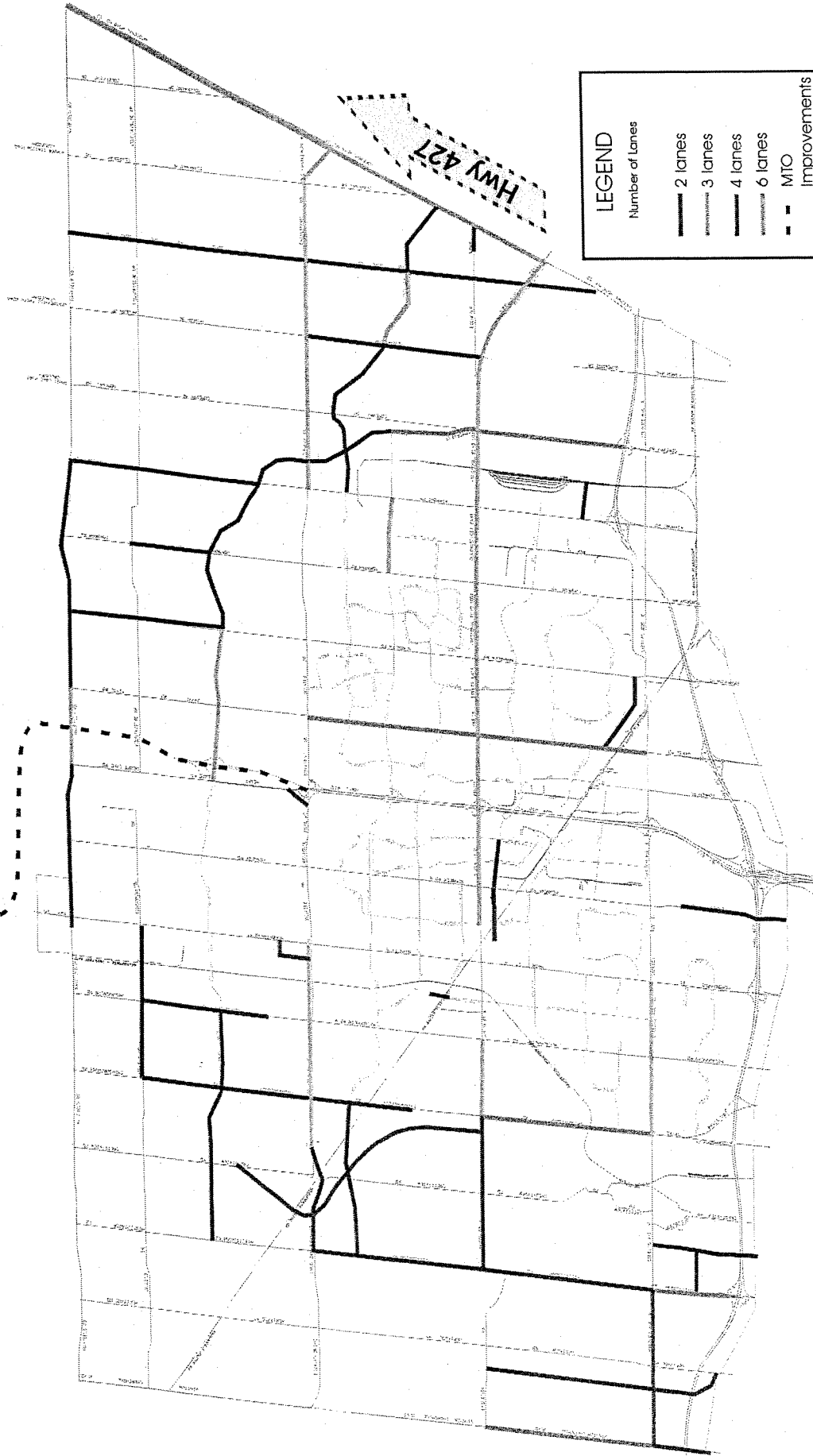
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**Figure 1: Screenline Volume to Capacity Ratios
2011 Improved Network (A.M. Peak Hour)
including HOV Lanes Adjustment**

Source:
Region of Peel's Updated Model
Improvements:
Region of Peel: 2003 - 10 Year Road Improvement Program
City of Brampton: 2003 - 10 Year Capital Plan





LEGEND

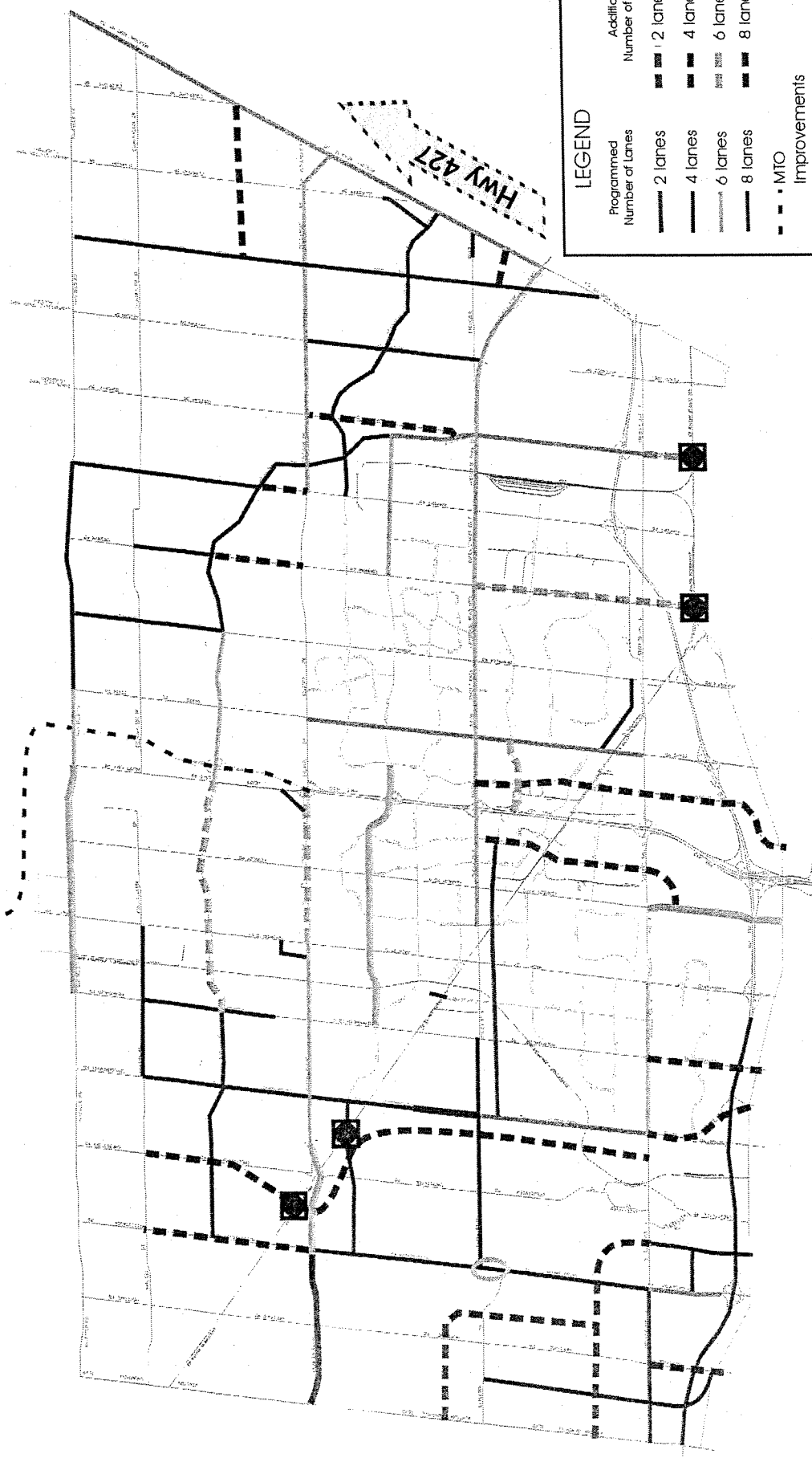
Number of Lanes

- 2 lanes
- - - 3 lanes
- 4 lanes
- - - 6 lanes
- - - MTO Improvements

10-Year plan (2002-2012)

Figure 2: Programmed Road Improvements (City and Region 10-Year Capital Works Programs)



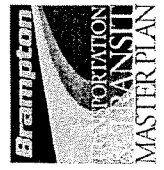


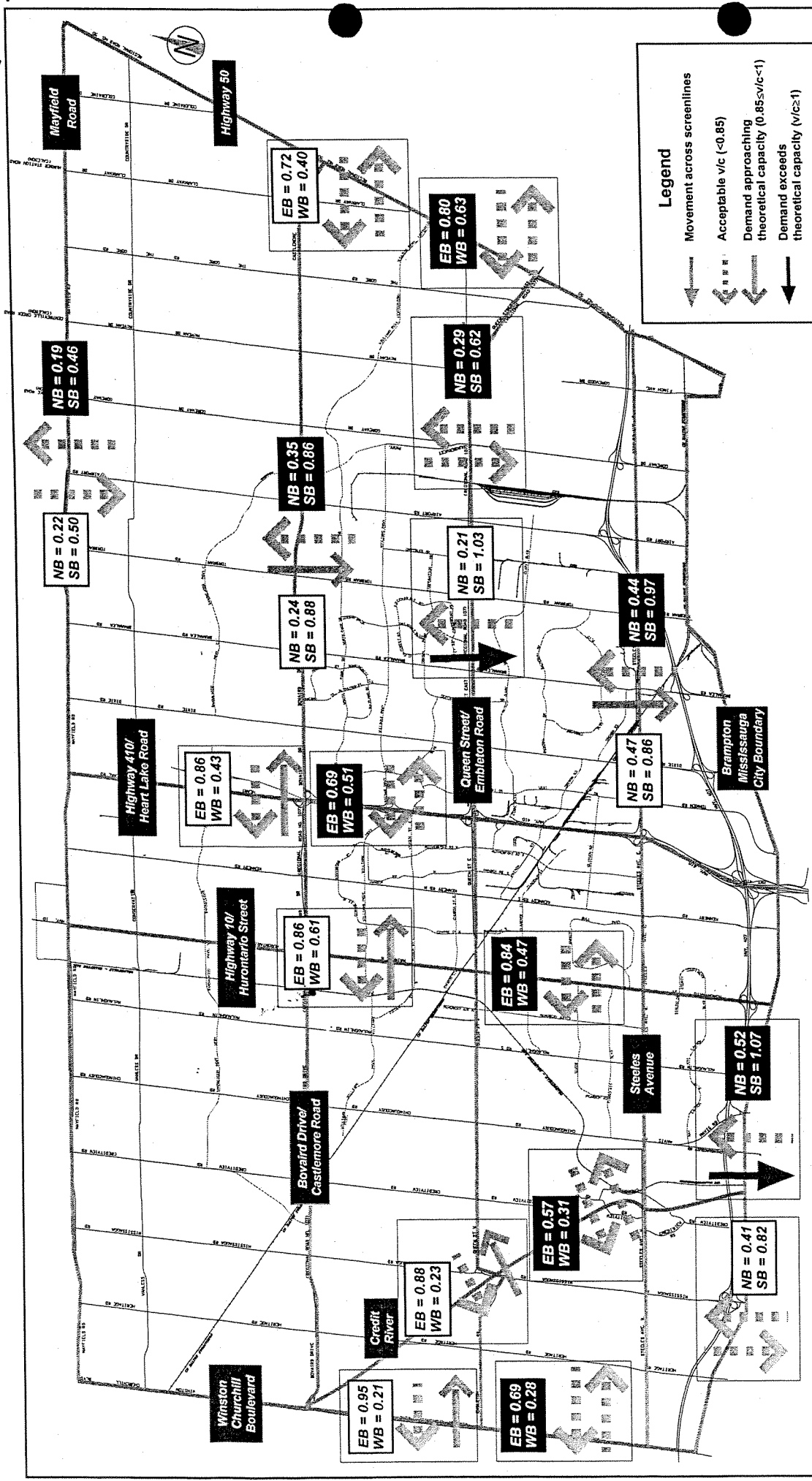
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Programmed Number of Lanes		Addition Number of Lanes	
—	2 lanes	▨	2 lanes
—	4 lanes	▨	4 lanes
—	6 lanes	▨	6 lanes
—	8 lanes	▨	8 lanes
- - -	MTO Improvements	■	Grade Separation Needed
○	Intersection Improvement		

2011 Network w/ additional improvements

Figure 3: 2011 Recommended Road Network Improvements





Source:
GTA Simplified Model
TTMP Model
Improvements:
Region of Peel: 2003 -10 Year Road Improvement Program
City of Brampton: 2003 -10 Year Capital Plan

Note: A small number of additional roads were included in the TTMP Model Screenline values.

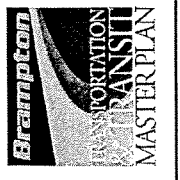
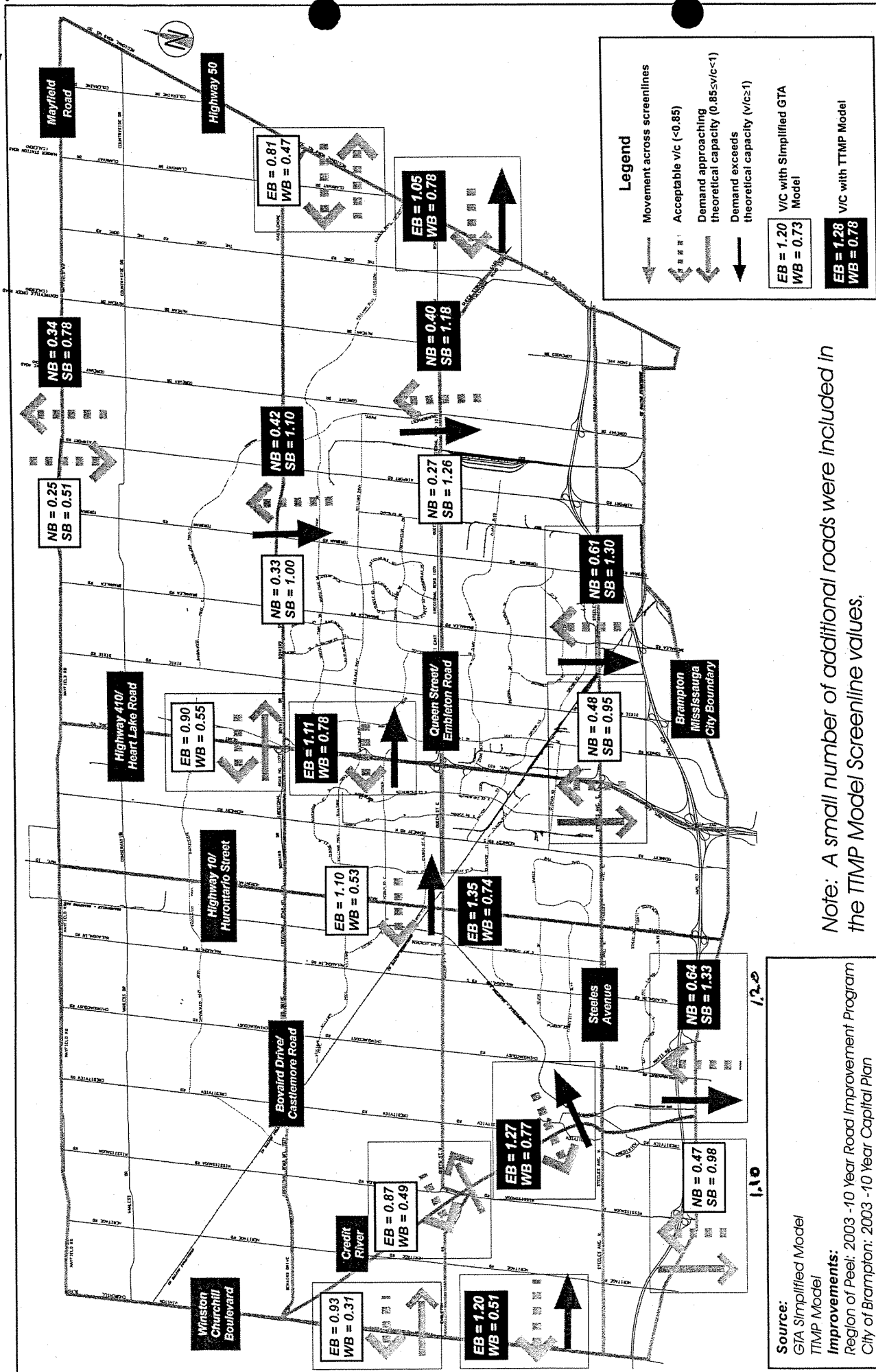


Figure 4: Screenlines Comparison 2001 Network (A.M. Peak Hour) Volume to Capacity Ratios (TTMP vs GTA Model)



Note: A small number of additional roads were included in the TMP Model Screenline values.

Source: GTA Simplified Model
 TTMP Model
 Improvements: Region of Peel: 2003 -10 Year Road Improvement Program
 City of Brampton: 2003 -10 Year Capital Plan

Figure 5: Screenlines Comparison 2011 Network (A.M. Peak Hour) Volume to Capacity Ratios (TTMP vs GTA Model)

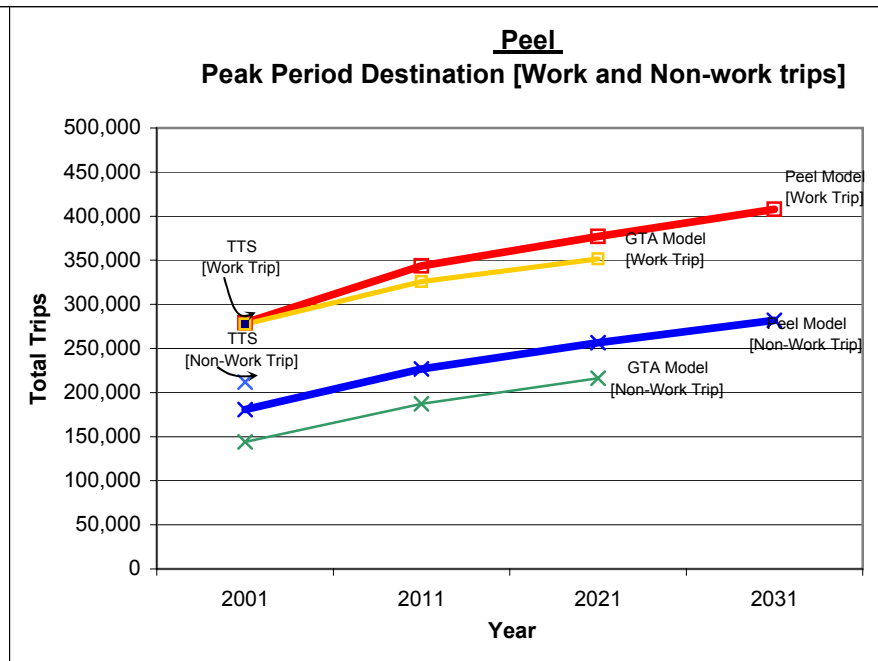
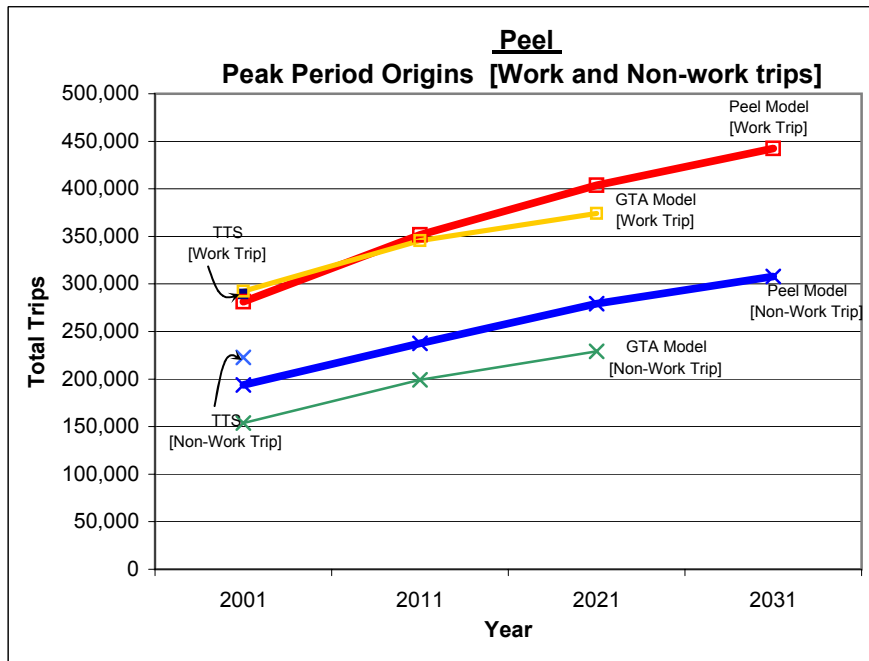
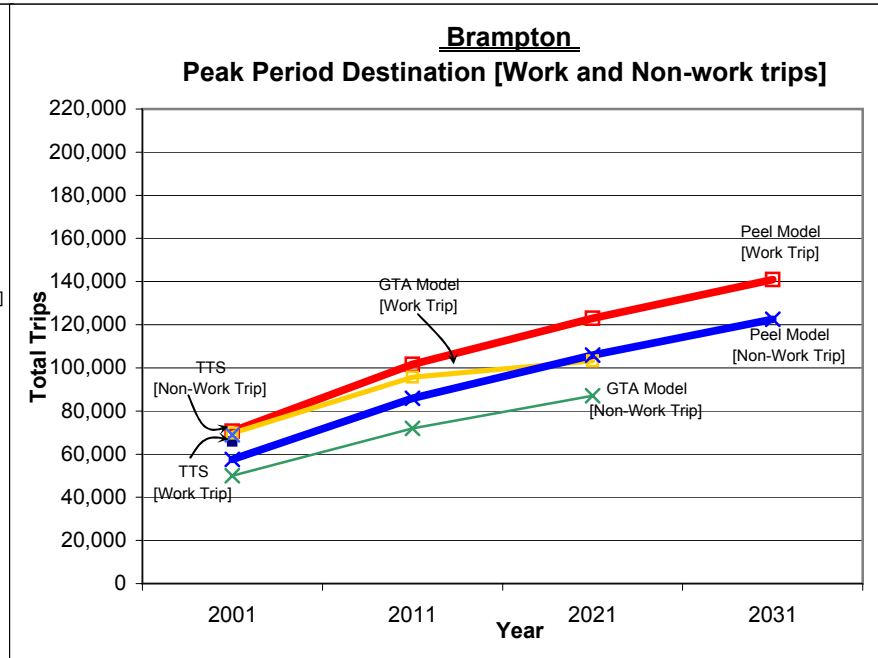
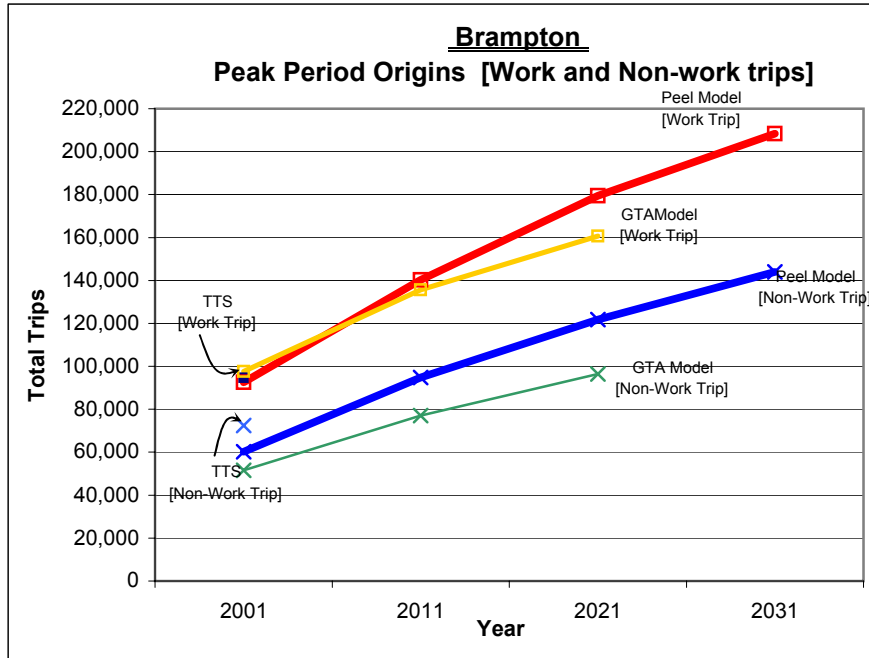


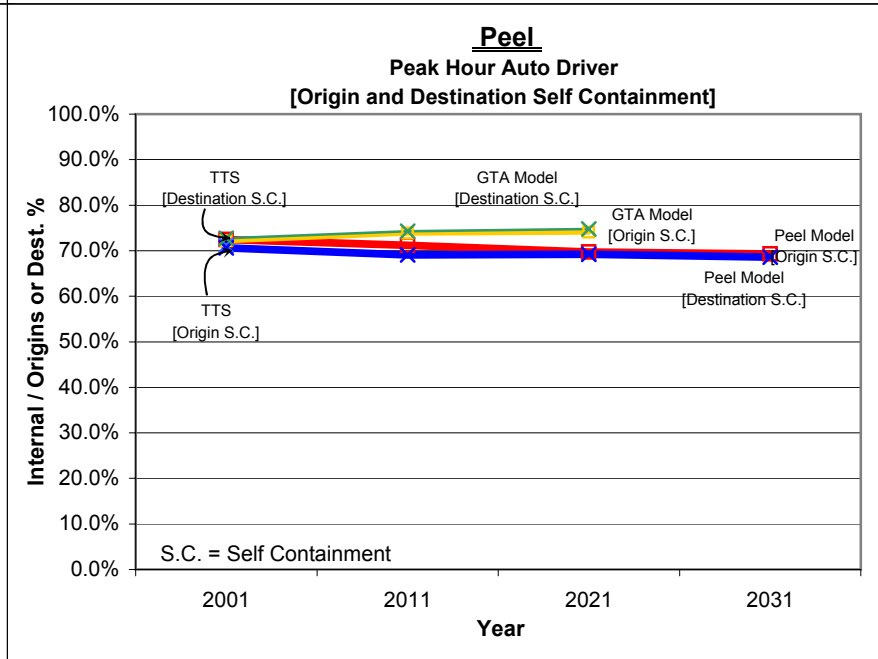
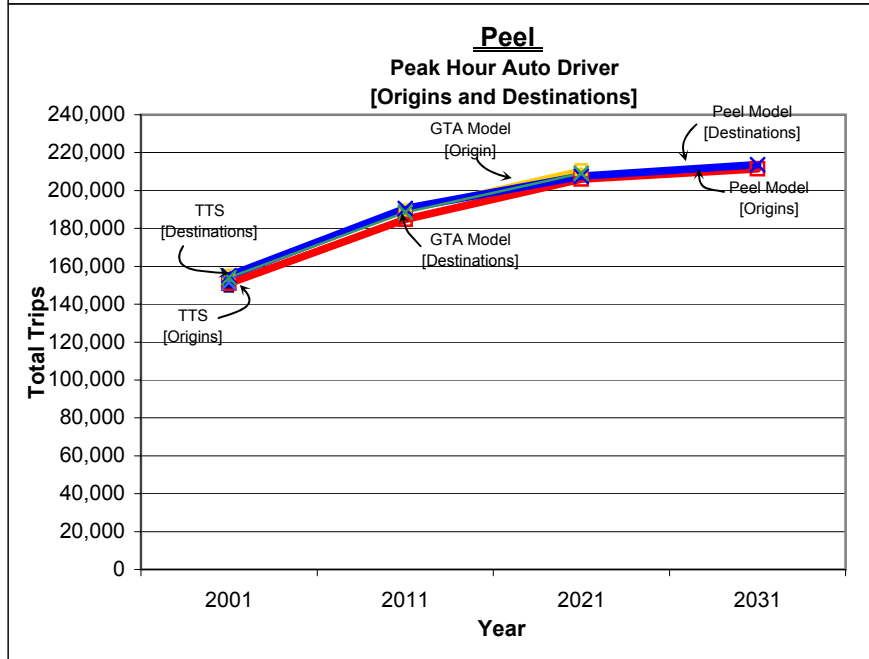
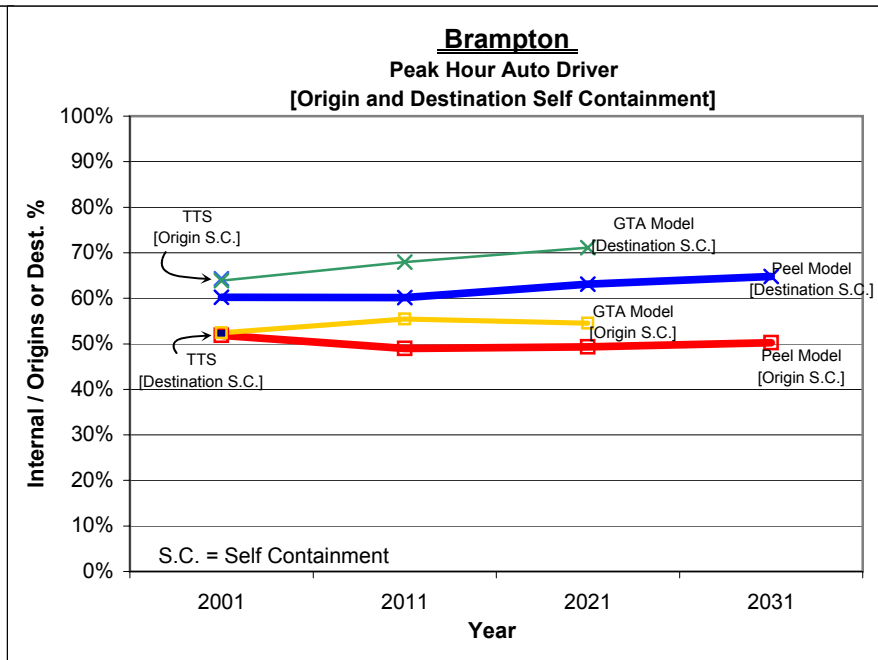
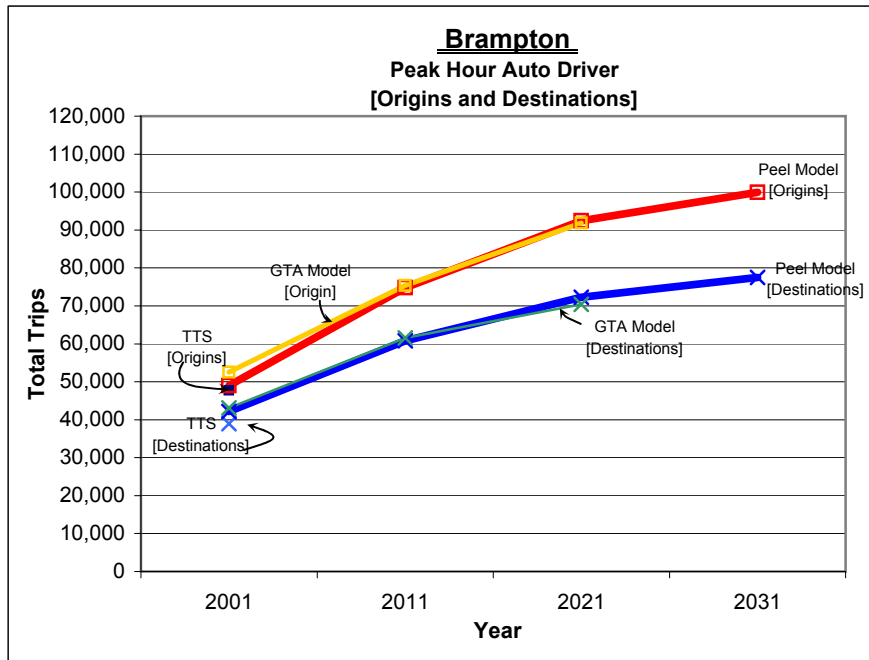
Brampton

Source Year	TTS 2001	Peel Model				GTA Model			
		2001	2011	2021	2031	2001	2011	2021	2031
Peak period Origins									
Work	94,596	92,613	140,309	179,493	208,304	97,557	135,684	160,678	
Trip rate per capita	0.302	0.282	0.296	0.302	0.307	0.300	0.286	0.271	
non-work	72,372	60,144	94,847	121,764	143,924	51,639	77,078	96,467	
Trip rate per capita	0.231	0.183	0.200	0.205	0.212	0.159	0.162	0.162	
Peak period Destinations									
Work	65,823	70,597	101,639	123,025	140,896	69,717	95,628	103,191	
Trip rate per employee	0.551	0.492	0.497	0.481	0.485	0.489	0.468	0.404	
non-work	68,913	57,558	85,902	105,957	122,597	50,033	71,876	87,129	
Trip rate per capita	0.220	0.175	0.181	0.178	0.181	0.154	0.151	0.147	
Peak hour auto driver									
Origins	47,733	48,981	74,786	92,412	99,905	52,527	75,419	91,850	
Destinations	38,999	42,186	60,839	72,249	77,475	43,086	61,559	70,435	
Internal	25,071	25,397	36,617	45,582	50,220	27,519	41,828	50,105	
Origin self containment	52.5%	51.9%	49.0%	49.3%	50.3%	52.4%	55.5%	54.6%	
Destination self containment	64.3%	60.2%	60.2%	63.1%	64.8%	63.9%	67.9%	71.1%	

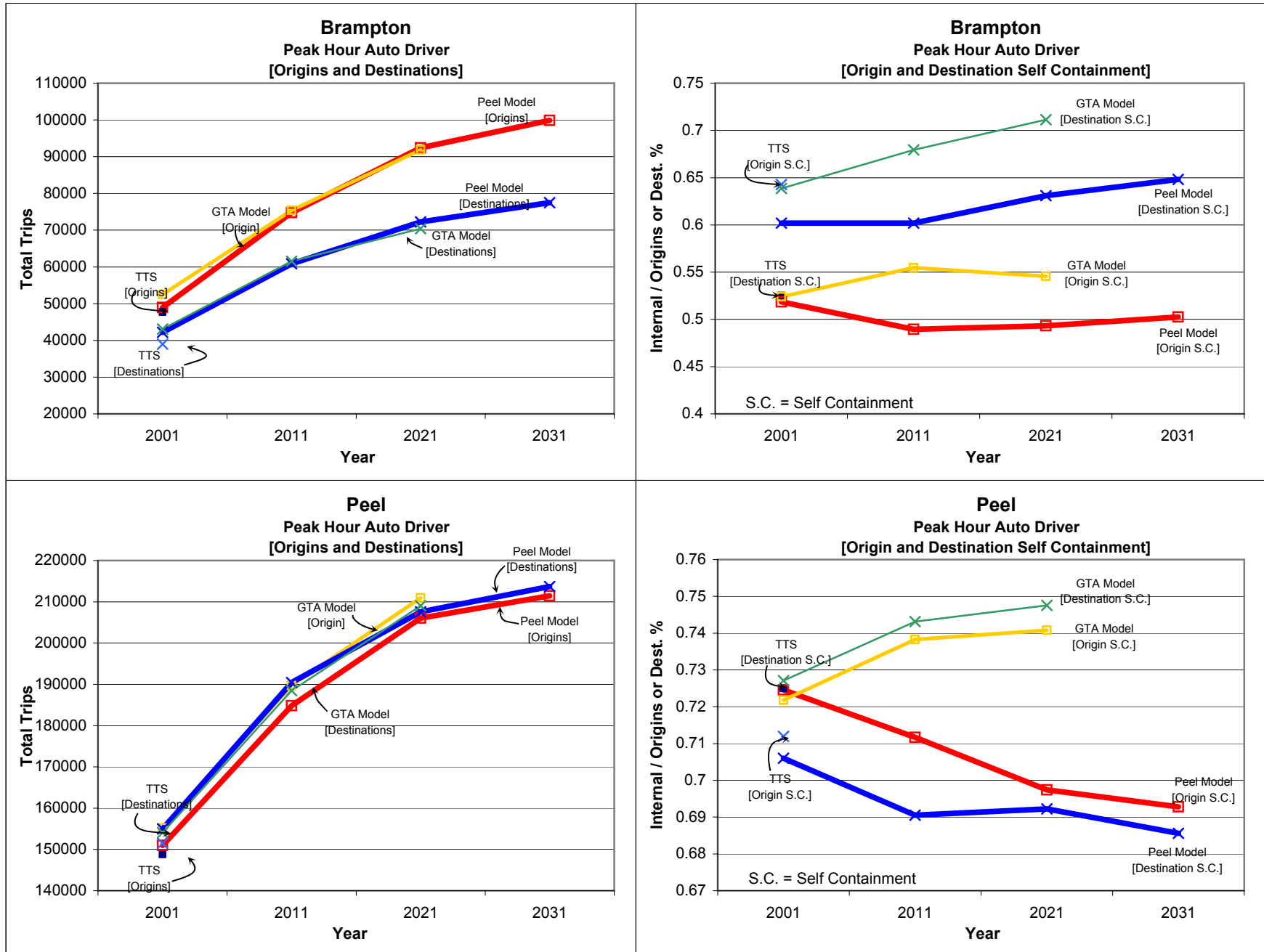
Peel

Source Year	TTS 2001	Peel Model				GTA Model			
		2001	2011	2021	2031	2001	2011	2021	2031
Peak period Origins									
Work	289,239	281,253	351,518	403,639	442,544	292,369	345,710	374,046	
Trip rate per capita	0.303	0.284	0.287	0.289	0.292	0.296	0.283	0.268	
non-work	222,704	193,864	237,603	279,313	307,764	153,762	199,089	229,024	
Trip rate per capita	0.233	0.196	0.194	0.200	0.203	0.155	0.163	0.164	
Peak period Destinations									
Work	279,138	279,156	343,754	376,816	408,009	277,716	325,978	351,758	
Trip rate per employee	0.580	0.518	0.513	0.495	0.498	0.513	0.487	0.462	
non-work	211,739	180,679	226,936	256,682	282,008	144,228	187,263	216,192	
Trip rate per capita	0.222	0.183	0.186	0.184	0.186	0.146	0.153	0.155	
Peak hour auto driver									
Origins	148,781	150,990	184,792	206,015	211,461	155,203	189,696	210,961	
Destinations	151,511	154,966	190,447	207,567	213,675	154,074	188,450	209,040	
Internal	107,871	109,403	131,510	143,681	146,495	112,023	140,045	156,276	
Origin self containment	72.5%	72.5%	71.2%	69.7%	69.3%	72.2%	73.8%	74.1%	
Destination self containment	71.2%	70.6%	69.1%	69.2%	68.6%	72.7%	74.3%	74.8%	

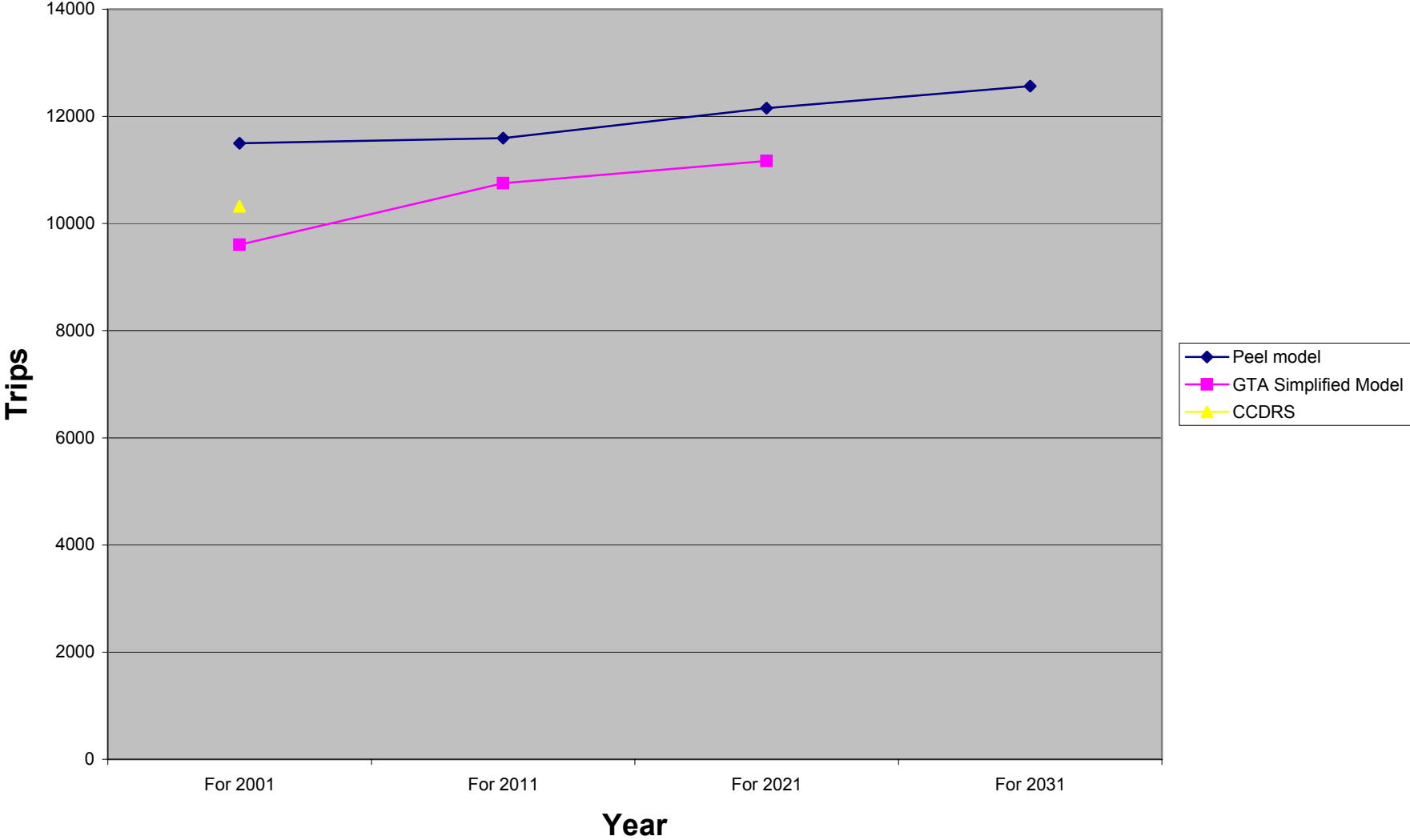




Same as p.3 except the scales for each of the graphs are truncated for better viewing the labels



Northbound Across Brampton/Mississauga Boundary



Southbound Across Brampton/Mississauga Boundary

