Chapter 2

A Solid Foundation For Growth

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2.1 BACKGROUND

The last Brantford Transportation Study was completed in 1997, and the Transportation Master Plan Update is being undertaken at the approximate mid point of the planning horizon used for this previous study. Since 1997, there have also been a number of significant changes in the transportation infrastructure in the Brantford area, including the completion of Highway 403, completion of sections of the Brantford Southern Access Road, additional multi-use trail system connections, and a 33% increase in transit usage.

The purpose of the Transportation Master Plan Update is to review the transportation needs of Brantford for the next 25 years and update the findings of the 1997 where required. The update is based on updated forecasts of future growth, and the changes to transportation patterns and infrastructure that have occurred since 1997. Through the work on this study, the benefits of the previous investments in the transportation system were examined, and those previously recommended projects which have not yet been implemented were reviewed to determine if they are still the most appropriate for the community.

The Transportation Master Plan Update was also been tasked with developing recommendations to address new or emerging transportation and land use planning issues. For example, with the introduction of the new provincial 'Places to Grow Plan' for the Greater Golden Horseshoe, the land use planning approach in the region has been changed. The focus has now changed to emphasize a more compact, mixed use, urban form that supports transit and reduces the dependence on the automobile for personal mobility needs. The implications of this change in policy will have a strong influence on the development in the City over the next 25 years and will change the nature of transportation in Brantford.

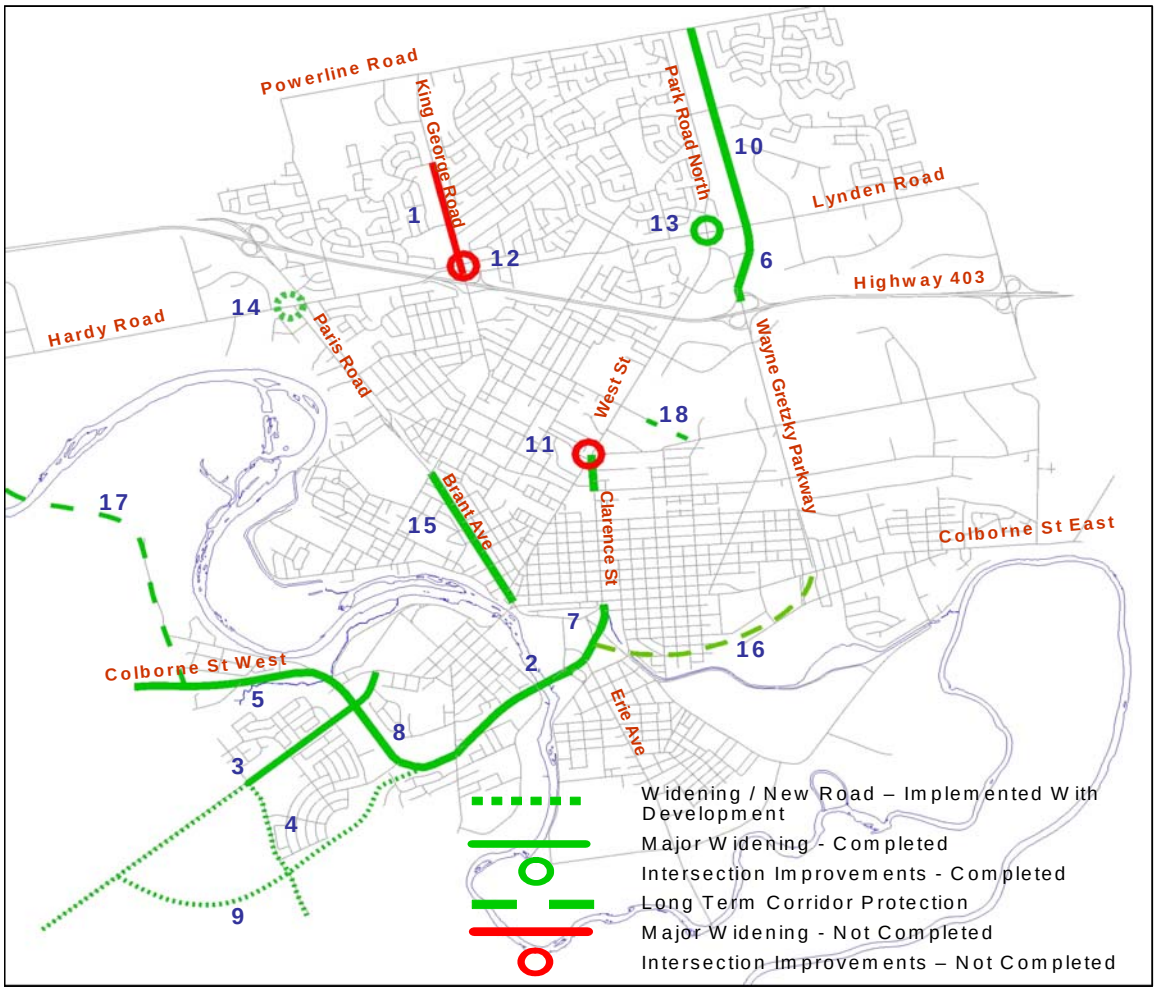
2.1.1 Status of 1997 Transportation Study Recommendations

Since completion of the last Brantford Transportation Study in 1997, many of the recommended projects from that study have been completed, except for a few of the longer range projects which were identified in the study. **Figure 2.1**, illustrates the key project recommendations from this study, and Tables 2.1 and 2.2 summarize the key projects and policy directions recommended in the previous plan.

The most significant road works recommended in the previous plan, include the construction of the Wayne Gretzky Parkway north of Highway 403 and portions of the ultimate Brantford Southern Access Road (BSAR), from Market Street westerly to Colborne Street West. Road improvements recommended for Conklin Road and Shellard Lane, within the southwest development area, are being implemented in conjunction with local development of the adjacent lands.

Notable projects that have not proceeded include, the King George Road widening to 5 lanes (Dunsdon to Toll Gate Road / Fairview Drive) and the realignment of the West Street / Clarence Street intersection. During the design for the new development of the Shoppers Drug Mart at the intersection, provisions have been incorporated into the site design to accommodate a modest re-alignment of this intersection in the future.

Figure 2.1 – Road Network Improvements - 1997 Transportation Study



In addition, longer term corridor protection routes were identified for the BSAR extension, between Market Street and Wayne Gretzky Parkway, and the Oak Park Road extension, between Hardy Road and Colborne Street West. These longer term projects were recommended for implementation beyond 2015, and therefore detailed planning and design phases have not yet begun. Similarly, the Charing Cross extension and capacity upgrades to Brant Ave have not been undertaken.

Comments received from the public at the first public information session indicate that many of these previously recommended projects are still viewed as being required to serve the longer term growth needs of the community.

Table 2.1 – Road Network Improvements – 1997 Transportation Study

Improvement Description	Timing	Status
Roadway Widening		
1) King George Rd. from Toll Gate Rd. to Kent Rd. from 4 to 6 lanes	1995 – 2000	Not Yet Done
2) Widen BSAR from Mt. Pleasant St. to Market St. South, and BSAR Bridge from 2 to 4 lanes	2001 – 2005	Completed
3) Widen/improve Shellard Lane to 4-lane arterial - west City limit to Colborne St. West	2001 – 2005	Being Done with Development
4) Widen/improve Conklin Rd. to 4-lane collector - Shellard Lane to Mt. Pleasant Rd.	2001 – 2005	Being Done with Development
5) Widen Colborne St. West from BSAR extension (at Spalding Dr.) to west City limit	2001 – 2005	Completed
New Road Construction		
6) New 4-lane arterial from Highway 403 to Fairview Dr. within new BSAR corridor	1995 – 2000	Completed
7) Extend BSAR from Bridge to Dalhousie St. via an extended Newport St. route	2001 – 2005	Completed
8) Extend 4-lane BSAR arterial from Mt. Pleasant St. to Colborne St. West	1995 – 2000	Completed
9) SW Area collector road loop from Shellard Lane to BSAR	2001 – 2005	Being Done with Development
10) New 4-lane arterial from Fairview Dr. to Powerline Rd. parallel to Park Rd. North within existing roadway corridor	2011 – 2015	Completed
Improvement Description	**Timing**	**Status**
Major Operational Improvements		
11) Intersection reconstruction at West St./Clarence St. to create West/Clarence “through” movement	1995 – 2000	Not Yet Done
12) Fairview/Toll Gate/King George Rd. intersection improvement	1995 – 2000	Not Yet Done
13) Improve Fairview Dr. intersections with West St., and Park Rd. North/WGP	1995 – 2000	Completed
14) Intersection improvements at Paris Rd./Hardy Rd.	2001 – 2005	Completed
Parking Restrictions		
15) Implement PM parking restrictions on both sides of Brant Ave and north portion of Clarence St.	1995 – 2000	Not Yet Done
Long Term Corridor Preservation		
16) BSAR corridor from Market St. to Wayne Gretzky Parkway	2015	Not Yet Done
17) Oak Park Road Extension south to Colborne St. West	2015	Not Yet Done
18) Charing Cross St. Extension corridor	2015	Not Yet Done

As with most long range Transportation Master Plan studies, transportation policies are a key component of the planning recommendations. These policies set targets for the

effectiveness of future transportation mode shares and provide guidelines for day to management of the transportation system.

The 1997 Transportation Study provided a series of policy recommendations centred around 3 key themes:

- Transportation Demand Management
- Pedestrian System
- Bikeways and Trails
- Transit System
- Parking Management
- Truck Routes

Table 2.2, below, summarizes the policy objectives outlined in the 1997 Transportation Study and key measures that have been implemented in the past 9 years.

In the transportation demand management (TDM) area, the City has not implemented any formal programs for TDM but they have enacted policies within their Official Plan and transit operating policies to encourage alternative forms of transportation, with a focus on improving transit ridership.

The 1997 Transportation Study established a target of 12% of future peak hour trips to be made by walking in 2015 and suggested that the implementation of pedestrian design guidelines and a focus on accessible pedestrian infrastructure would be required. In terms of cycling, the City also set an aggressive target in 1997, recommending that by 2015, 8% of all peak hour trips would be made by bicycle. The study identified the need to develop bicycle and trail standards and begin implementation of cycling and trails network.

In 2000, the City completed a Multi-Use Trail / Bikeway Implementation and Design Plan as the necessary first step in achieving the target. The City has since invested in a number of multi-use trails along the Grand River. To date, this has not translated into significant walking and cycling usage during peak periods, however. Based on 2001 Census data, walking and cycling make up about 6% of the trips made in the City; significantly lower than the forecast of 20% (combined) by 2015.

Prior to 1997, the Brantford Public Utilities Commission was in charge of the City's transit system. Following completion of the 1997 Transportation Study, the City took over management of the transit system and began implementation of a number of recommendations from the 1997 study. The 2003 Transit Review Study assessed the entire transit system, developed operational and policy standards, and reviewed the route structure. The City established a future target of 6% of peak hour tips made by transit for 2015, along with a target of 2.6 Million riders per year for a market penetration of 30 rides per capita. To date, the City is roughly half way to meeting this target, with a 33% increase in ridership since 1995.

Recommendations for truck route management, from the previous study have largely been implemented, and the City undertook a downtown parking study in 2004 to examine current needs and issues. Many of the previous parking recommendations have not been implemented.

Table 2.2 – Major Policy Recommendations – 1997 Transportation Study

Item	Improvement Description	Comments
Transportation Demand Management	Develop Policies to Support Transit	Land Use Polices Support Transit
	Implement Transit Route Recommendations	Implemented
	Support Flexible Work Hours	
	Support Ride Sharing Programs	
Pedestrian System	Increase walking share of total peak hour trips to 12% by 2015	
	Develop Pedestrian Supportive Design Guidelines	Have implemented many pedestrian signals and constructed new trails
	Consider Pedestrians with Special Needs	Audible signals and curb drops identified in City's Accessibility Plan
Bikeways and Trails Plan	Increase cycling share of total peak hour trips to 8% by 2015	Undertook Trail and Bikeway Master Plan in 2000, including development of standards
	Implement Bikeways and Trails Network	
	Develop Bikeway and Trail Standards	
Transit System	Increase transit share of total peak hour trips to 6% by 2015	3.2% (work trips)*
	Increase annual ridership to 2.6 Million by 2015	1.4 Million (in 2004**)
	Increase annual ridership to 30 Rides per capita by 2015	15 (in 2004 **)
	Implement Transit Route Recommendations	Undertook Extensive Transit System Review in 2003
Parking Management	Parking Supply Management	Completed a Downtown Parking Study in 2004 and have implemented various parking management initiatives in the downtown
	- Provision of On-Street Parking	
	- Reduce Minimum Parking Standards	
	- Negotiate Flexible Parking Requirements	
	Develop Parking Pricing Strategy	
	- Municipally Owned Lots	
	- Private Lots	
Truck Routes	Recommended Truck Route Additions	Implemented
	Truck Route Management	

* 2001 Census, Percentage used for Work Trips in Brantford

** Brantford Transit: 2003 Service Review

2.2 STATE OF THE CURRENT SYSTEM

The City's investment in transportation infrastructure since 1997 has resulted in a strong transportation system in the City that includes a road network that generally functions well during peak periods.

The City has an extensive network of trails and paths that provide recreational opportunities and transportation choices for residents, and over the past 8 years the City has experienced a steady increase in transit ridership, despite the continued reliance on the automobile for travel within the City.

2.2.1 How the Public Views Their Transportation System

To understand how Brantford residents view their transportation system today, and to gain insight as to resident's views on the transportation system of tomorrow, the City undertook a public attitude survey using a random telephone interview with 403 residents of the City of Brantford between October 26, 2005 and November 8, 2005.

The public attitude survey is one method that has been use as part of the Consultation Program for this study to try to determine how the 'average resident' feels about transportation, growth, the environment, and the viability of non auto modes in meeting 'their' transportation needs. The findings of the survey have provided a valuable perspective on the state of the current system and opportunities to influence an overall transportation strategy to meet the needs of Brantford residents in the future.

The telephone surveys were conducted in English or French as preferred by the respondent and the surveys included approximately 52 well rounded questions about growth and transportation, including demographic information. A copy of the survey questions are included in Appendix B.

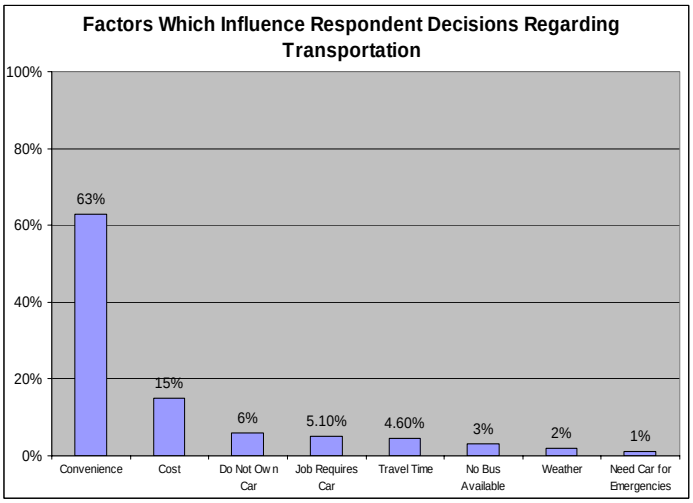
The survey was implemented using computer-assisted randomizing techniques and tabulation methods. No pre-imposed demographic quotas were set, as the survey method used was designed to ensure a representative sample of the general population. Based on the sample size obtained and a confidence level of 95%, the survey results are considered accurate within +/- 4.9%. For some questions, respondents were asked a series of follow up questions only if they answered "yes" to the original question. For these sub questions, the confidence level and level of accuracy is significantly lower than for the overall survey due to the limited sample size.

Key Findings

Based on the results of the survey, a few key observations can be made:

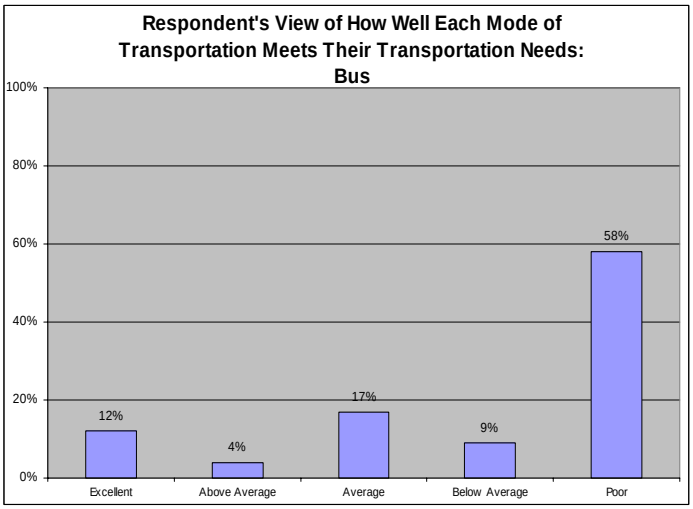
Residents generally feel that the existing road network in the City currently meets their transportation needs. Respondents did not appear to feel that major expansions or new road facilities are required today, although there appears to be general support for conversion of the one way street system in the downtown to a two way street system.

Auto travel is by far the most popular mode of transportation used in the City, and residents cite convenience and cost as the two biggest factors that influence current travel choices. Residents feel that the current road network generally meets their travel needs, with 80% providing an above average or excellent rating. Comments received at the public information centres have identified the need to improve signal co-ordination and traffic signal timing at key intersections in the City.



Despite the high reliance on the automobile, only 16-18% of residents felt that it was important to widen existing roadways or build new roadways around the outside of the City. At the same time, approximately 40% of residents felt that expansions to the number of transit routes, hours of service, and improved frequency were important. It was noted that the current public transit system does not meet the transportation needs of the majority of City residents, with 67% rating the system as below average or poor.

When it comes to cycling, over 80% provided a below average to poor rating to the current cycling system, and a similar proportion indicate that they almost never ride a bike. Interestingly, over 50% or respondents felt it is important to build new bicycle lanes or trails in the City.



A majority of respondents (56%) suggest they go for a walk "everyday" or a "few times/week", despite the relatively low share of peak hour trips that are made by walking. For Brantford residents, walking appears to be a recreational activity.

Brantford residents appear to support the need for protecting natural areas and reducing greenhouse gas emissions in general, however survey respondents did not appear to directly link these objectives with reducing auto use or increasing the use of transit / alternative travel modes.

Despite the high reliance on the private automobile, there appears to be some potential to encourage residents to use alternative modes of transportation, with 31% indicating they would consider the use of a different mode of travel to or from work. Roughly half of these are currently auto drivers. Many of these respondents would consider carpooling or shifting to transit if better information or support was provided. This trend

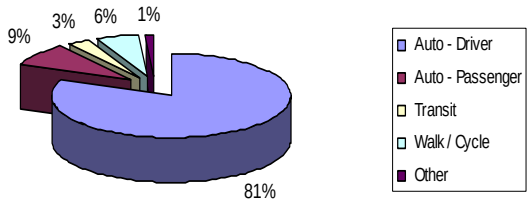
was also supported by a high level of general support for improvements to existing transit services in the City. This was reflected in the responses under a number of different lines of questioning.

The full results of the public attitude survey are provided in Appendix B, which provides a factual summary of the survey results and an overview of the demographic profile of survey respondents.

2.2.2 Existing Travel Patterns

Table 2.3 summarizes the current shares of peak hour trips made by Brantford area residents by different modes of travel. Approximately 90% of trips are made by the private automobile, with 3% made by transit, 6% by walking / cycling, and 1% by other modes.

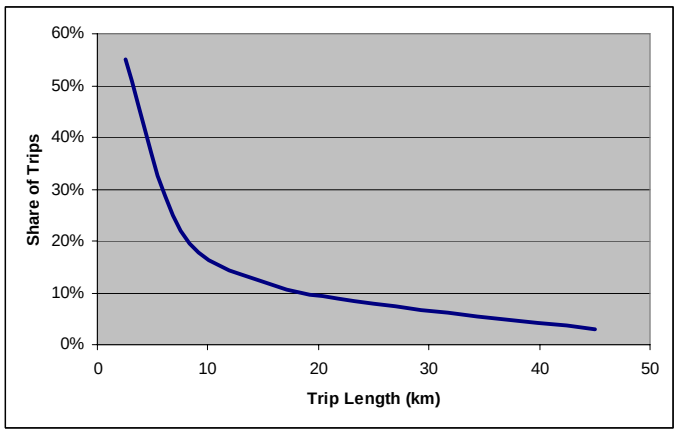
Table 2.3 – Current Mode Share – PM Peak Hour



Mode of Travel	Share of Work Trips
Auto - Driver	81%
Auto - Passenger	9%
Transit	3%
Walk / Cycle	6%
Other	1%

Figure 2.2 – PM Peak Hour - Trip Lengths

Given the relatively self contained nature of Brantford, the majority of trips are short trips, with over 55% of peak hour tips shorter than 5 km in length, as illustrated in Figure 2.2. Approximately 11% of peak hour trips are over 20km in length, which reflects the commuter pattern that exists today between Brantford and adjacent employment areas such as Hamilton and Cambridge.



There are approximately 36,200 auto trips made by Brantford are residents during the PM Peak hour of a typical day. Table 2.4 provides a summary distribution of the existing trip making patterns for auto trips in the City based on their origins and destinations. City trips are aggregated into three categories; trips to and from the downtown, trips to and from suburban areas, and trips to and from areas external to the City (including through traffic on Highway 403).

Table 2.4 – Distribution of PM Peak Hour Trips

To / From	Downtown Brantford	Suburban Areas	External	Total
Downtown Brantford	1,040	3,240	1,240	**5,520**
Suburban Areas	2,180	12,470	6,410	**21,060**
External	1,170	6,940	1,510	**9,620**
Total	**4,390**	**22,650**	**9,160**	**36,200**

By far the majority of PM peak hour trips in the City are oriented to and from the suburban residential areas in the City, which account for approximately 60% of all trips. Trips to and from the downtown represent 12% to 15% of the total trips made during the PM peak. The remaining trips have origins and destinations outside the City.

2.2.3 Road Network

The City of Brantford's major roadway network is comprised of approximately 1015 lane-km of roads, grouped into a series of functional classifications. The functional classification of an urban roadway facility depends on many factors, including traffic volumes and composition of traffic, type of development on adjacent lands, and the anticipated role that a given facility is expected to play in the transportation system. This includes consideration of adjacent land use, the degree of access control on the facility, and design elements of the facility (e.g. right-of-way, spacing of signals, parking, presence of turn lanes etc.). The 1997 Transportation Study recommended a classification system based on six basic categories of roadway.

Figure 2.3 – Brantford Roadway Classifications

The main roadway types are described below:

Major Arterial - These roadways are the major "traffic movers" in the urban environment. They are typically 4 lane facilities with well-spaced signals (more than 300 m apart). They have a limited number of driveways, and a generally serve major commercial, and employment centres. If there is residential development

The 1997 Transportation Study recommended the following roadway classification system:

1. Freeways;
2. Major Arterial Roads;
3. Minor Arterial Roads;
4. Major Collector Roads;
5. Minor Collector Roads;
6. Local Streets;

adjacent to these facilities, it is usually backs onto the roadway. There are left-turn lanes at major intersections and possibly right-turn lanes. In areas with higher driveway densities, a centre two-way left-turn lane may be present.

The PM peak hour planning capacity is typically 800- 900 vehicles per lane per hour translating into an Annual Average Daily Traffic volume of about 36,000 vehicles per day, for a 4 lane roadway. A desirable right-of-way for this type of facility is 35 m.

Minor Arterial - These roadways are the secondary "traffic movers" in the urban environment. They can be 2 or 4 lane facilities. Signals sometimes are more closely spaced than on the major arterials. They may serve residential, commercial, or industrial land uses. Residential properties typically have frontages on these facilities. Left-turn lanes are not always present at major intersections. In some cases there will be on-street parking permitted.

The PM peak hour planning capacity is 700-800 vehicles per lane per hour translating into a Annual Average Daily Traffic volume of about 32,000 vehicles per day, for a 4 lane roadway. A desirable right-of-way for this type of facility is 26 m.

Major Collector - These roadways are the primary "traffic movers" in the residential areas. They can be 2 or 4 lane facilities. Signals may be present at intersections with higher classification roadways. They primarily serve residential areas but may be found in larger commercial, or industrial areas. Residential properties typically have frontages on these facilities. Left-turn lanes are not always present at major intersections. In some cases there will be on-street parking permitted.

The PM peak hour planning capacity is 600-700 vehicles per lane per hour translating into a Annual Average Daily Traffic volume of about 26,000 vehicles per day, for a 4 lane roadway. A desirable right-of-way for this type of facility is 26 m.

Minor Collector - These roadways are the secondary "traffic movers" in the residential areas. They are usually 2 lane facilities. They are generally stop-sign controlled facilities. They primarily serve residential areas. Residential properties have frontages on these facilities. Left-turn lanes are present at major intersections. In most cases there will be on-street parking permitted.

The PM peak hour planning capacity is about 500 vehicles per lane per hour translating into a Annual Average Daily Traffic volume of about 10,000 vehicles per day, for a 2 lane roadway. A desirable right-of-way for this type of facility is 20 m.

Table 2.5 show the City's busiest roadway sections based on existing two-way peak hour traffic demands.

Table 2.5 - Top 10 Busiest Road Sections (PM Peak Hour)

Rank	Road Name	From	To	Lanes	Year	PM Peak Two Way Volume
1	KING GEORGE RD	DUNSDON ST	HIGHWAY 403	4	2005	2,730
2	BRANT AVE	WEST ST.	COLBORNE ST W	4	2005	2,560
3	WAYNE GRETZKY PARKWAY	EDMONDSON ST	HIGHWAY 403	4	2005	2,385
4	WEST ST	HENRY ST	CLARENCE ST	4	2005	2,375
5	COLBORNE ST W	BRANT AVE	BALLANTYNE DR	4	2005	2,230
6	WAYNE GRETZKY PARKWAY	HIGHWAY 403	HENRY ST	4	2005	2,230
7	WEST ST	MORTON ST	CHARING CROSS ST	4	2005	2,150
8	KING GEORGE RD	HIGHWAY 403	CHARING CROSS ST	5	2006	2,100
9	COLBORNE ST	WAYNE GRETZKY PARKWAY	BRETT ST	4	2005	2,075
10	KING GEORGE RD	POWERLINE RD	DUNSDON ST	4	2005	2,075

The City's investment in transportation infrastructure since 1997 has resulted in a strong transportation system in the City that includes a road network that generally functions well during peak periods.

Approximately 80% of respondents to the public attitude survey indicated that the road network generally meets their transportation needs today.

Despite some localized congestion on King George Road, Brant Avenue, West Street, and Clarence Street, residents feel that the their road system operates relatively well.

Based on the traffic data presented in **Table 2.5** above, the busiest roadway section in Brantford is on King George Road, between Dunsdon Street and Highway 403, with a combined two way volume of 2,730 veh/hr. Brant Avenue from West Street to Colborne Street carries about 2,560 veh/hour.

Table 2.6 provides the typical planning capacities for various roadway classifications.

Table 2.6 – Planning Capacities by Road Class

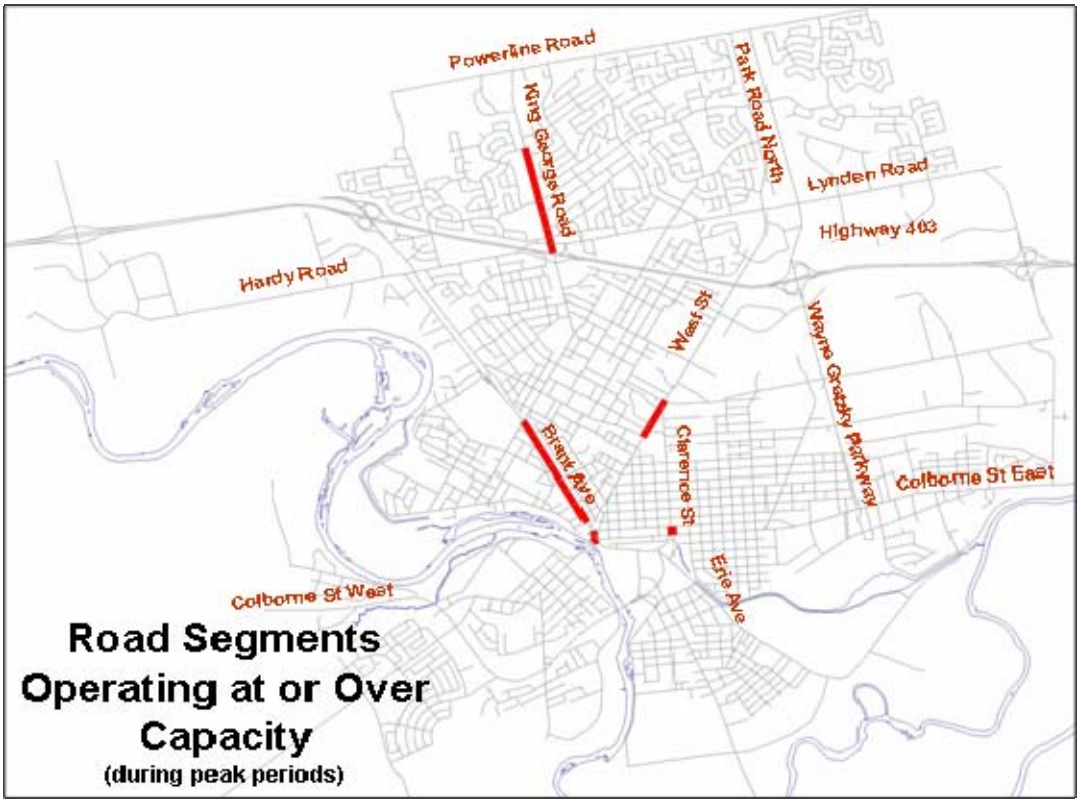
Type of Roadway	Planning Capacity (Vehicles Per Hour Per Lane)
Freeways	1,800
Highway/Expressway	1,000
Major Arterials/Rural Highways	800- 900
Minor Arterials	700-800
Major Collector	600-700
Minor Collector/Local	500

The planning capacity of a roadway reflects the influence of entrances and intersections on the capacity of a section of roadway. For roadways with controlled access and no intersections (such as a freeway) the planning capacity is approximately 1800 vehicles per hour per lane. For major arterial roads, where entrances are

controlled and turning lanes are provided, the major influence on the flow of traffic is at traffic signals. This is reflected by the lower capacity on these facilities, based on the need to alternate the right of way between conflicting directions. For lower class roadways, such as local roads, the capacity can be greatly influenced by the number of private driveways, the lack of left turn lanes (where turning traffic can block through traffic), and the need to stop at intersections with major roads.

Figure 2.4 illustrates current sections of road operating at or over their planning capacities based on current (2005) PM peak hour traffic counts.

Figure 2.4 – Roadways Operating At / Over Capacity



2.2.4 Transit System

Brantford Transit is a municipal transit system, owned and operated by the City of Brantford. The system provides conventional bus service throughout the City, on 12 fixed routes. Specialized transit service is provided by Operation Lift, a not for profit community organization. Brantford Transit reports to City Council through the Engineering, Public Works, Parks and Recreation Commission.

The conventional system consists of 27 buses, including twelve low floor accessible units[1]. Twenty buses are usually in active service during the peak period and 7 are kept as spares or in routine maintenance. The City has been actively renewing the fleet since 2002 and all twelve low floor buses have been purchased during that three-year period, replacing twelve aging high floor buses. This bus replacement program has lowered the average of the fleet from 18.6 years at the end of 2002 to 12 years at the end of 2005; however there are still 10 buses with over 21 years of service. While the average age of the fleet has improved with this investment, the average age of the fleet is at the high end of comparable sized transit systems in Canada. In the next five years the City will be replacing four buses each year so that all buses will be low floor accessible and there will be no buses that are more than ten years old in the fleet[2].

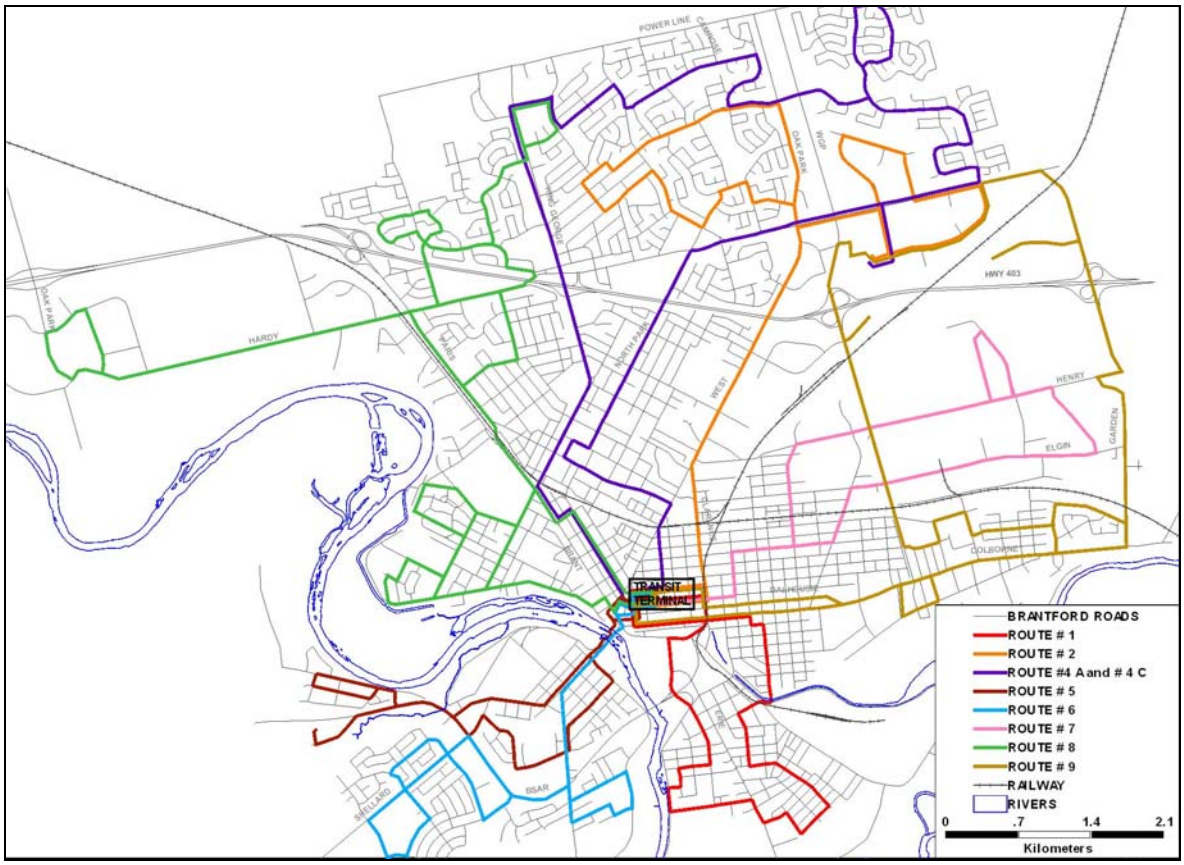
Transit operates 359 days per year offering service for a total of 9,536 service hours per year. The system runs Monday to Saturday between 6:00 am and 6:30 pm. During the afternoon peak period when schools are open, 19 buses are required to operate the nine fixed routes and five specials. The following is a summary of the current transit schedule within the City of Brantford:

- Half hour service is provided on nine fixed routes during the weekdays between 6:00 am and 6:30 pm;
- Hour service is also provided on nine fixed routes on Saturdays and Boxing day between 7:30am and 6:30 pm;
- Hourly service is provided on three fixed routes and zone bus service in evenings (6:30 to 11:30) and Sundays and Civic Holiday (9 am to 6:30 pm);
- There are four school specials operating during the week days, 1 for three hours in the morning and three in the afternoon;
- There are three other special routes which operate all year long, one for three hours in the morning, two for two hours and one for three hours in the afternoon;
- There is no transit service on eight statutory holidays including New Year's Day, Good Friday, Easter Sunday, Victoria Day, Canada Day, Labour Day, Thanksgiving Day, Christmas Day;
- Transit charters are available for travel within the City limits to public and other departments in the City on an hourly cost basis, subject to availability; and
- Transit services are also provided free of charge, when approved by council for the certain community events such as Canada Day shuttles, Air show shuttles, New Year's Eve and Clean Air Day.

All buses operate from the transit terminal located at 64 Darling Street. The terminal also provides ticket sales and access to inter-regional bus lines such as Greyhound buslines, Trentway Wager (Niagara region), and Cherrey Buslines (Kitchener Saturdays only). Figure 2.5 illustrates the City of Brantford's transit system.

[1] Based on 2005 statistics. By the end of 2006 the City operated 28 buses, including 16 low floor buses
[2] City of Brantford Transit Ridership Growth and Asset Management Plan, March 2006

Figure 2.5 – City of Brantford Transit Route System



Current Ridership

Transit ridership has increased each year since the City assumed operation of the Transit service in 1997. In 2005 there were 1.39 million fare paying passengers, which represents an increase of 340,000 more transit riders or a growth of 33% since 1997. It is estimated that the current transit modal share is 3%.

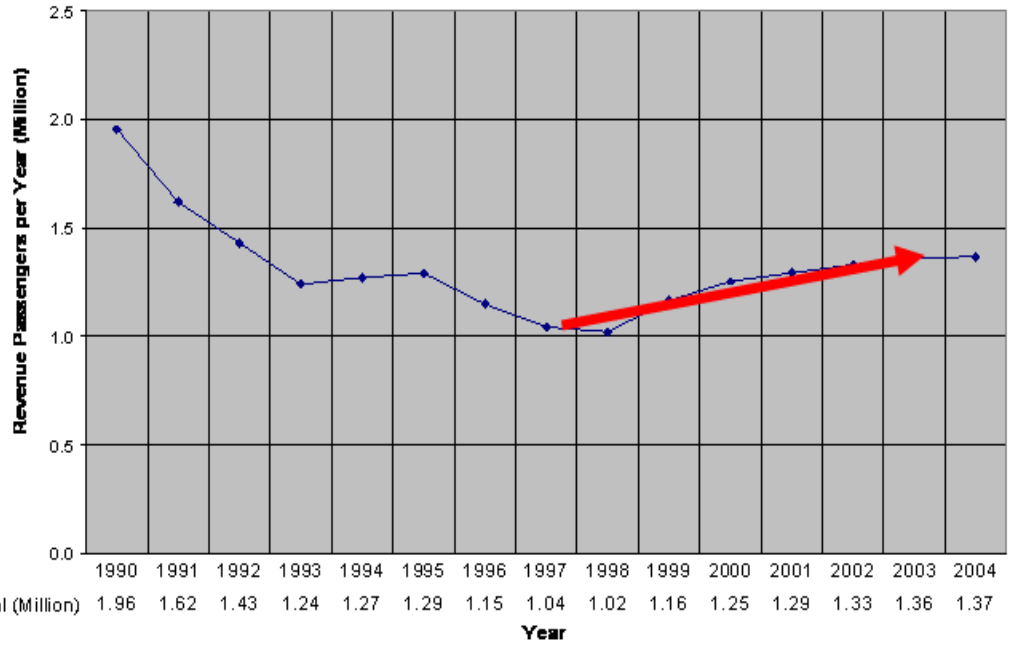
Figure 2.6 illustrates the annual number of paying customers on the transit system from 1990 to 2004, which shows that transit use is currently at the highest use in the past 10 years. Based on the current 2005 ridership and estimated population, the number of riders per capita is 15.2, compared to 15.0 in 2001. This growth trend is expected to continue as the City expands its residential and employment base.

Part of this increase may be due to changes in policies for secondary school students, which allows them to attend any school in Brantford rather than only the school in their district and the reduction service by school board bus service. However, a comparison of 1996 and 2001 Census data also provides an indication as to why transit use has increased over this period:

- 10% increase in total work trips due to the economic growth during that period

- 14% increase in work trips by transit due to the changes in transit marketing strategies and the general growth in population base.

Figure 2. 6 – Brantford Transit Annual Ridership Trends 1990-2004



Key Strengths of Current System

- The City has recently undertaken a transit service improvement and service standards study, and has implemented many of its recommendations.
- For the last three years, the city has been renewing its aging fleet.
- Current service structure with all routes converging to the city terminal, it provides an excellent opportunity to integrate the city's transit service with the inter-city transit service. It is critical since 54% of city's population commutes outside of the city to places like Hamilton, Kitchener, and Toronto.
- There has been significant growth (roughly 33%) in ridership over the last eight years.
- The City established a Transit Liaison Committee in 1998 to include key stakeholder interests (Seniors, Persons with disabilities, transit users, Chamber of Commerce, School Boards, etc.), which meets monthly to review transit issues, discuss new transit initiatives and address community concerns. This Committee will continue to be a valuable resource to improve relations with the community and secure greater community support of transit

Key Weaknesses of Current System

- Average age of bus fleet is relatively high at 12 years (Recommended level of 6 to 8 years). There are 10 buses with over 21 years of service.
- Current modal share by transit is low compared to a similar size city. Part of it can be attributed to the fact that a large portion of city's population works outside of the city.
- Currently, there is a poor perception about transit service by public.

  - Only 16% of residents feel that transit is currently meeting their needs
  - 58% feel that the transit system is doing a poor job of meeting their transportation needs.
  - Better bus system and transit service was quoted as the number one issue in a recent public attitude survey.
  - 43% of people consider expanding the transit routes important, 38% consider increasing the frequency of current service important.
- The transit system has an old fare collection system.
- It appears from the attitudinal survey that people would like improved information on routes and schedules.

Current Transit Funding

Fare box revenues currently offset approximately 45% of the annual operating costs for Brantford transit. Advertising and other operating revenues offset about 5% of the operating cost and include the following activities:

- Bus Advertising Contract
- Shelter Advertising Contracts
- Bus Bench Advertising
- Share of revenues from Tim Horton's Kiosk in terminal
- Commission on Greyhound ticket sales at Inter-City Transportation kiosk
- Lottery Sales
- New Year's Eve Sponsorship program
- Charters for Parks and Recreation or School Board functions

Municipal subsidies from taxes provide for the remainder of the operating costs for Brantford Transit. The following table summarizes a comparison of Brantford transit's operating budget for 2005 (actual) and 2006 budget based on the City's Transit Ridership Growth Plan, prepared in March 2006.

Table 2.7 - Summary of Annual Operating Expenses/Revenues - Brantford Transit

Category	***Actual 2005***	***Budget 2006***
Operating Expenses	$3,349,350	$3,437,400
Transit Fleet Direct Expenses	$1,046,850	$1,134,000
Total Expenses	**$4,396,200**	**$4,571,400**
Fare revenues	$2,062,830	$2,235,000
Other revenues	$252,600	$202,000
Tax supported subsidy	$2,080,770	$2,134,400
Subsidy per capita	$22.38	$22.95
Fare revenue/Expenses	46.9%	48.9%

Note: 2005 Actual figures differ from estimates summarized in the CUTA Canadian Transit Fact Book, 2005

Comparison with Similar Sized Systems

Benchmarking system performance against other transit systems is often done to highlight differences and similarities in transit performance data. Given the differences in data collection amongst the various transit agencies, and the very different profile of the services and customers one must be careful in drawing too many conclusions based on the statistics alone. Table 2.8 provides a comparison of a number of key operating characteristics of transit systems in medium sized communities across Canada.

Table 2.8 – Comparison of Municipal Transit Systems[3]

	Peterborough[2]	Niagara Falls	Saint John	Moncton[1]	Brantford[3]	Whitby	Kingston	Thunder Bay	Barrie	Guelph	Average
General Characterisitcs											
Population of Service Area	76,800	80,000	**90,762**	99,837	**91,720**	100,000	108,548	112,000	115,000	118,200	*97,106*
Service Area (km²)	63	81	321	n/a	**75**	45	132	256	**74**	88	*130*
Avg. Population Density (per/ha)	**12.2**	9.9	2.8	n/a	**12.2**	22.2	8.2	4.4	15.5	13.4	*10.5*
Number of Fixed Routes	14	15	18	23	**12**	11	**12**	14	21	16	*15*
Fully Accessible Routes	10	6	2	0	**0**	4	0	14	8	12	*5*
Number of Buses	40	23	47	23	**28**	**29**	41	49	35	53	*36*
Accessible Buses	63%	26%	17%	26%	**43%**	**45%**	39%	94%	83%	55%	*51%*
Average Age of Fleet (yrs)	13.6	11.6	**14.3**	7.4	**14.6**	11.1	12.3	6.9	5.6	9.9	*11.0*
Annual Ridership (000's)	2,342	1,225	2,550	**1,433**	**1,388**	1,027	2,829	3,073	2,153	5,256	*2,199*
Hours of Service											
Monday to Friday	06:00-00:40	05:30-00:00	05:30-00:30	06:30-22:30	**06:00-00:00**	06:00-02:00	06:00-23:30	**06:00-00:20**	05:45-00:30	05:30-01:00	
Saturday	06:40-00:40	05:30-00:00	06:00-00:30	06:30-22:31	**07:30-00:00**	08:00-19:00	06:00-19:30	09:00-00:20	**07:15-00:30**	05:30-01:00	
Sunday	08:00-17:20	None	10:00-18:30	07:30-20:00	**09:00-18:30**	None	**09:30-18:30**	09:00-23:00	10:00-19:00	**9:00-19:00**	
Fares											
Cash Fare											
Adult	**$ 2.00**	$ 2.25	$ 2.25	**$ 2.00**	**$ 2.00**	**$ 2.00**	**$ 2.00**	$ 2.25	$ 2.25	**$ 2.00**	*$ 2.09*
Children	$ 2.00	**$ 1.00**	$ 2.00	$ 2.00	**$ 1.00**	$ 1.25	Free	$ 2.25	$ 2.25	Free	*$ 1.72*
Student	**$ 2.00**	**$ 2.00**	$ 2.25	**$ 2.00**	**$ 2.00**	$ 1.75	$ 1.50	$ 2.25	$ 2.25	**$ 2.00**	*$ 1.93*
Senior	**$ 2.00**	**$ 2.00**	**$ 2.00**	**$ 2.00**	**$ 2.00**	$ 1.25	$ 1.50	$ 2.25	**$ 2.00**	**$ 2.00**	*$ 1.91*
Monthly Passes											
Adult	$ 50.00	$ 65.00	$ 59.00	**$ 56.00**	**$ 55.00**	$ 69.00	$ 65.00	$ 65.00	$ 68.00	$ 58.00	*$ 61.36*
Student	$ 45.00	$ 50.00	$ 49.00	**$ 40.00**	**$ 40.00**	$ 50.00	$ 48.00	$ 55.00	$ 52.00	$ 52.00	*$ 48.73*
Senior	$ 30.00	$ 50.00	$ 39.00	**$ 40.00**	**$ 40.00**	$ 40.00	$ 44.00	$ 55.00	$ 46.00	$ 52.00	*$ 44.18*

Notes: 1) Statistics for Moncton are for 2004 due to strike in 2005
2) Peterbrough transit statistics reflect 10 day strike in 2005. Hours of service and fares updated to reflect recent changes in Fall 2006
3) Brantford Transit Performance Indicators are based on estimated 2005 data which differs from actual 2005 data provided in 2006 Ridership Growth Plan. Figures are shown to allow for comparison with other systems.
Figures in bold highlight systems with statistics that provide the closest comparison to Brantford

[3] Figures based on CUTA Canadian Transit Fact Book – 2005 Operating Data except where noted

Table 2.9 – Comparison of Performance Statistics for Various Municipal Transit Systems[4]

	Peterborough[2]	Niagara Falls	Saint John	Moncton[1]	Brantford[3]	Whitby	Kingston	Thunder Bay	Barrie	Guelph	Average
General Characterisitcs											
Population of Service Area	76,800	80,000	**90,762**	99,837	**91,720**	100,000	108,548	112,000	115,000	118,200	*97,106*
Service Area (km^2)	63	81	321	n/a	**75**	45	132	256	**74**	88	*130*
Avg. Population Density (per/ha)	**12.2**	9.9	2.8	n/a	**12.2**	22.2	8.2	4.4	15.5	13.4	*10.5*
Annual Ridership (000's)	2,342	1,225	2,550	**1,433**	**1,388**	1,027	2,829	3,073	2,153	5,256	*2,199*
Performance Indicators											
Municipal Funding / Capita ($)	$ 36.02	$ 24.76	$ 32.17	$ 14.16	**$ 30.45**	$ 22.26	$ 37.87	$ 64.36	$ 29.17	$ 47.82	*$ 33.67*
Revenue / Cost Ratio	**45%**	41%	56%	53%	**44%**	41%	50%	38%	53%	55%	*47%*
Operating Cost / Passenger	$ 2.38	$ 3.85	$ 2.61	$ 2.58	**$ 3.75**	$ 4.13	$ 2.77	**$ 3.82**	$ 3.61	$ 2.19	*$ 3.26*
Total Operating Cost / Veh-hr	$ 70.94	**$ 82.62**	$ 76.44	$ 57.08	**$ 83.44**	$ 74.31	$ 65.09	$ 75.05	$ 62.76	$ 64.35	*$ 70.45*
Net Operating Cost / Passenger	$ 1.32	**$ 2.29**	$ 1.15	$ 1.21	**$ 2.11**	$ 2.74	$ 1.40	$ 2.37	$ 1.71	$ 0.98	*$ 1.81*
Passengers / Capita	30.50	**15.31**	28.10	14.90	**15.13**	10.27	26.07	27.44	18.72	44.46	*22.10*
Passengers / Veh-hr	30.62	21.45	29.24	**22.40**	**22.22**	18.03	23.98	19.72	17.39	31.75	*23.01*
Revenue Veh-hr / Capita	1.00	0.71	0.96	**0.67**	**0.68**	0.57	1.09	1.39	1.08	1.40	*0.94*

Notes: 1) Statistics for Moncton are for 2004 due to strike in 2005
2) Peterbrough transit statistics reflect 10 day strike in 2005. Hours of service and fares updated to reflect recent changes in Fall 2006
3) Brantford Transit Performance Indicators are based on estimated 2005 data which differs from actual 2005 data provided in 2006 Ridership Growth Plan. Figures are shown to allow for comparison with other systems.
Figures in bold highlight systems with statistics that provide the closest comparison to Brantford

[4] Figures based on CUTA Canadian Transit Fact Book – 2005 Operating Data except where noted

A brief comparison between transit systems serving a comparable population shows a number of key statistics:

- Brantford has an above average population density within its service area than the average of the other 9 systems. Based on 2005 estimates, the density of 12.2 persons/ha is comparable to the density in Peterborough, and is higher than the average of 10.5 persons/ha.

- Transit ridership appears to be lower in Brantford than in other Cities of a comparable size, except for Whitby. It should be noted that GO Transit trips, which make up a large share of the transit market in Whitby are not included in the statistics for Whitby Transit. The annual ridership and ridership per capita figures for Brantford are comparable to Moncton, NB and Niagara Falls, but are lower than the other 6 cities.

- It should be noted that a number of different agencies collect and report ridership differently, which could contribute to some of the differences between the systems reported above. Many of the systems with higher ridership levels also feature major college and university campuses which provide a consistent base transit market. Cities such as Peterborough, Kingston, Thunder Bay, Saint John, Moncton, and Guleph all feature relatively large university and or college campuses within their communities.

- The City tends to operate a fewer number of fixed routes than other transit systems of a comparable size, and therefore they tend to have a smaller fleet size. The smaller size of the fleet may be reflecting the lower ridership levels that are currently being obtained in the City.

- The City is slightly behind other transit systems in terms of the share of accessible buses within the fleet, with the average system reporting 51% of the fleet featuring accessible vehicles. The higher average age of the City of Brantford fleet, likely has an influence on this result, as older vehicles did not offer low floor capabilities. The City has been investing in the purchase of new low floor vehicles and projects that within 10 years the fleet will be 100% accessible.

- Brantford Transit's operating hours and fares are comparable to many of the other transit systems although it is noted that the adult monthly passes are typically cheaper than many other comparable sized Cities.

- Based on the 2005 figures reported by the Canadian Urban Transit Association (CUTA) the level of municipal subsidy provided in Brantford is similar to what is provided for other communities, particularly when Thunder Bay is removed from the comparison. Operating costs tend to be at the higher end of the average, which is likely reflective of the higher average age of the fleet.

Major Opportunities

There are a number of opportunities to improve the transit system and encourage significant ridership growth in Brantford over the next 25 years. The City is anticipating significant population growth; growing from its current population of about 93,000 to 108,500 by year 2016, and 132,000 by 2031. There is a high level of industrial activity, and new industrial expansions, such as the Ferro plant in the north-west area of the city. The City initiated improvements to the transit service serving the Northwest Industrial Park in October 2006 to provide enhanced serving to employees. Half hour peak period service, along with a half hour mid day service and hourly evening service between 9:30pm and 12:30am were introduced to better serve shift changes at the new industrial facilities in the area.

The emergence of post secondary campuses within the downtown will certainly enhance transit ridership in the future. The Laurier Brantford, and affiliated campuses of Nipissing University and Mohawk College have played a significant role in the recent ridership growth trend observed in the City, and the continued expansion of this sector should also support transit ridership growth.

Many of the typical indicators suggest that the downtown area may be ready for enhanced transit services. Current densities suggest enhanced transit service or increased frequencies could be viable, as existing densities in the core area are already higher than 100 persons and jobs per hectare. There is a significant student population in the downtown core area, and there is potential for additional employment growth in the downtown as well. Combined with this growth, the City has identified that long term (all day) parking in the downtown is in limited supply. Adjusting the cost and/or supply of all day parking is key factor in encouraging transit usage.

Only 16% of respondents said that transit currently meets their needs

Figure 2.2
Respondent's View of How Well Each Mode of Transportation Meets Their Transportation Needs:
Bus

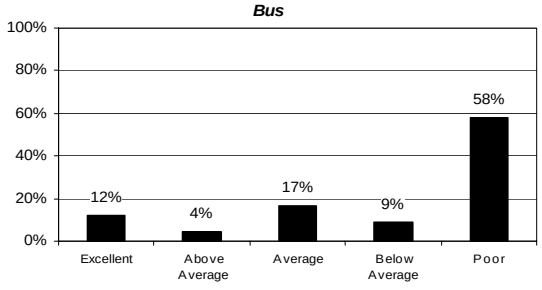
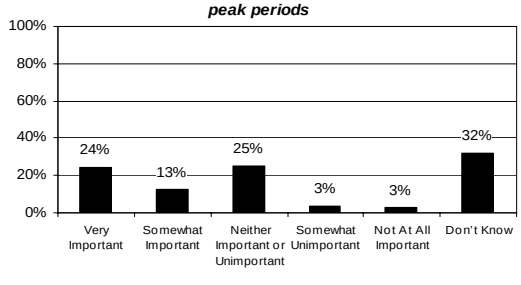


Figure 3.5
Respondent's view of how important it is to:
Increase the use of public transit for travel during peak periods



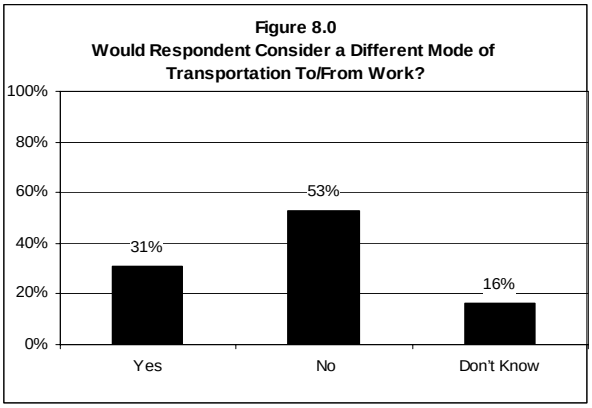
Yet:

37% of respondents feel it is important to increase transit use

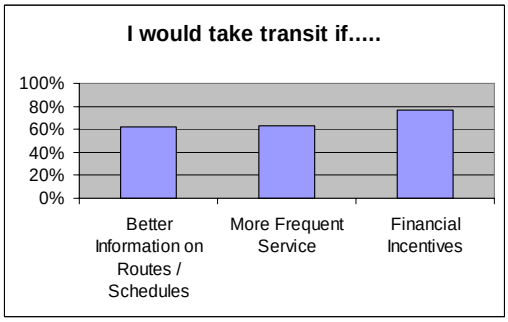
Based on results from the public attitude survey, there appears to be an opportunity to increase transit ridership if the proper incentives are provided. While only 16% of respondents indicated that the transit currently meets their needs, about 37% feel it is important to increase transit usage. More importantly, the Public Attitude Survey results also suggest that approximately 31% of residents would consider a change in travel modes to /from work. Of these, 60% are currently auto drivers or passengers, and 40% indicated that they would consider a shift to transit if they knew the routes and schedules better.

31% of respondents indicated they would consider changing their current travel mode

Almost 60% of them currently travel by auto



There are a number of strategies that can be used to encourage people to shift to transit for some or most of their travel. The provision of readily obtainable information about routes and schedules is one of the simplest ways to build awareness about transit services in a community. The City of Brantford has recently developed special transit maps that provide routes, schedules and highlight key origin-destination locations across the City. The maps are made available at key public buildings and on the internet free of charge. This is an excellent start.



When asked how the City could encourage this change, respondents said:

60% - Improved Information / Frequency
77% - Financial Incentives

2.2.5 Walking / Cycling Trail Network

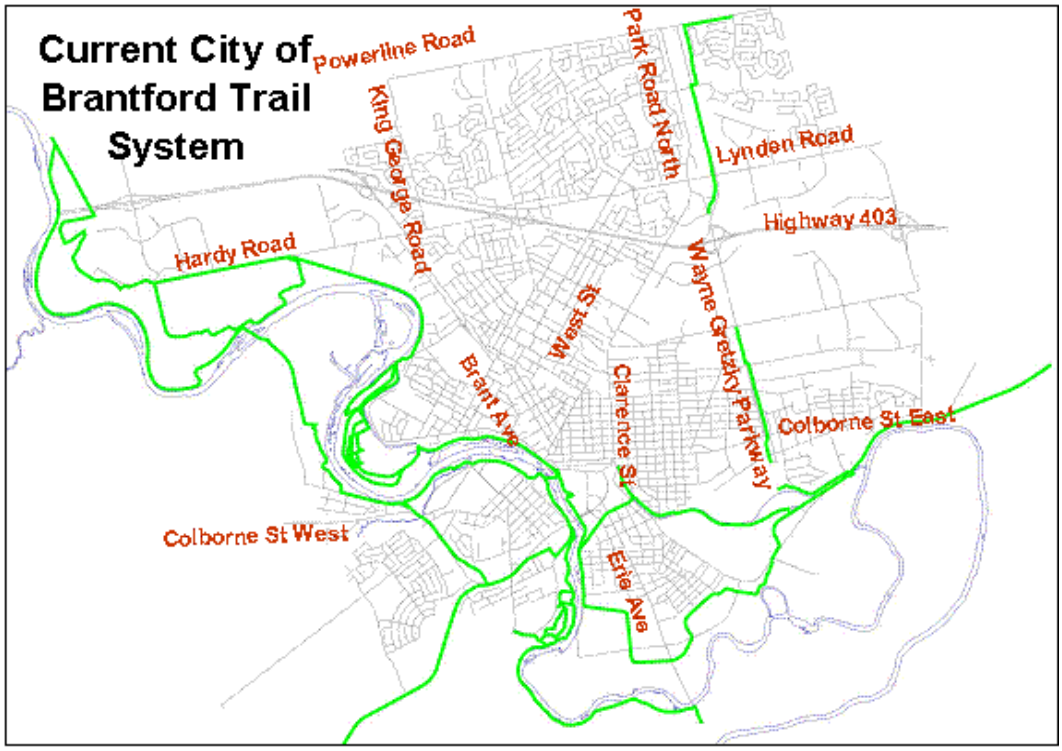
The City of Brantford has an extensive network of trails and paths that provide recreational opportunities and transportation choices for residents.

An extensive off-road cycling network, oriented around the recreational areas on both sides of the Grand River, forms a significant portion of the Gordon C. Glaves Memorial Pathway System. The system predominantly follows the Grand River Valley, and also follows a series of abandoned rail lines and the flood control dike in the south end of the City.

A multi-use trail has also been incorporated into the existing right-of-way along Wayne Gretzky Parkway, which allows for off-road cycling, walking, and rollerblading within this multi-modal transportation corridor.

Figure 2.7 illustrates the extent of the current trail system within the City.

Figure 2.7 – City of Brantford Trail System



Access to the Gordon C. Glaves Pathway System from all parts of the city, and the completion of this Pathway system, would encourage more residents to walk and cycle.

New developments on the west side of the Grand River and in the northwest are in close proximity to the trail system and would also benefit from improved connections to existing trails.

Currently in the City of Brantford, almost 6% of the work trips are made by walking/ cycling and the majority of the current trail system is "off road". Despite the relatively high share of cycling trips, residents seem to consider cycling as a recreational activity rather than a viable option for traveling to and from work. This focus on the recreational benefits of cycling is an important element in supporting healthy living in the City.

Despite solid support for the construction of new trails in the City, residents do not feel that trails or bike lanes will influence the travel patterns to / from work.

Results from the public attitude survey show strong support for the continued construction of new bicycle facilities in the City, with 58% of respondents indicating that the City should build new bicycle facilities on major roadways. Despite this strong level of support, only 16% suggested that more cycling facilities would encourage them to ride their bike to and from work.

58% of respondents indicated that the City should build new bicycle facilities on major roadways

Figure 10.11
How important is it to build new bicycle trails or dedicated bicycle lanes on major roadways in Brantford?

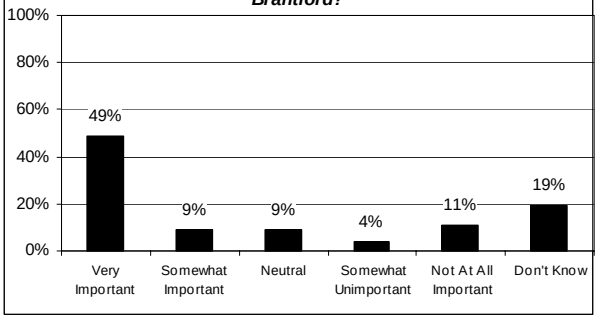
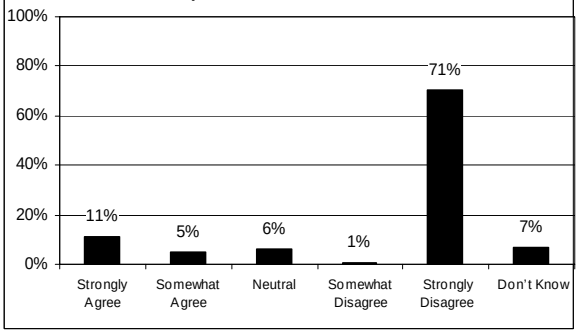


Figure 9.7
I would cycle to work if the city provided more separate bike lanes or trails



When asked if more bicycle lanes or trails would encourage them to cycle to work, respondents said:

72% - No
16% - Yes
12% - Don't Know

In 2000, the City completed a Multi-Use Trail / Bikeway Master Plan that identified a series of proposed off-road and on-road cycling facilities throughout the City. The City of Brantford multi-use trail /bikeway plan consists of 12 primary routes (designed to

connect major destinations within the City), 14 neighbourhood routes (designed to connect neighbourhood parks and other destinations), and 12 connecting links (designed to join primary routes). The plan included 115 km of primary routes and 47 km of neighbourhood routes and connecting links for a total network of 162 km. Thirty-seven kilometres of existing trails are included in this network. The final network would provide 7 distinct trail crossings of Highway 403, between Garden Avenue and the Grand River.

Key destinations and attractions that would be served by the recommended network include high schools, parks, community and sport centres, City Hall, Lynden Park Mall, downtown Brantford, libraries, Grand River and D'Aubigny Creek, golf courses, industrial developments, Mohawk College, Ben Mar Family Fun Centre, Myrtleville House, and the Bell Homestead.

Each route or link in the recommended network was defined as a multi-use trail, hiking trail, signed route, bike lane, or wide shared lane based on the type of users targeted, the surrounding environment, roadway cross-section, speed and volume of traffic. The total cost to construct the Multi-Use Trail/ Bikeway concept was estimated to be $6.7 million dollars (1999 Dollars).

Since 2000, the City has been successful in implementing many of the proposed off-road cycling / trail facilities, but has had difficulties garnering enough support to implement many of the on road cycling routes. Often, concerns about traffic impacts, reduction in on street parking, or other neighbourhood concerns are cited in opposition to the proposed cycling lanes.

2.2.6 Truck Route System

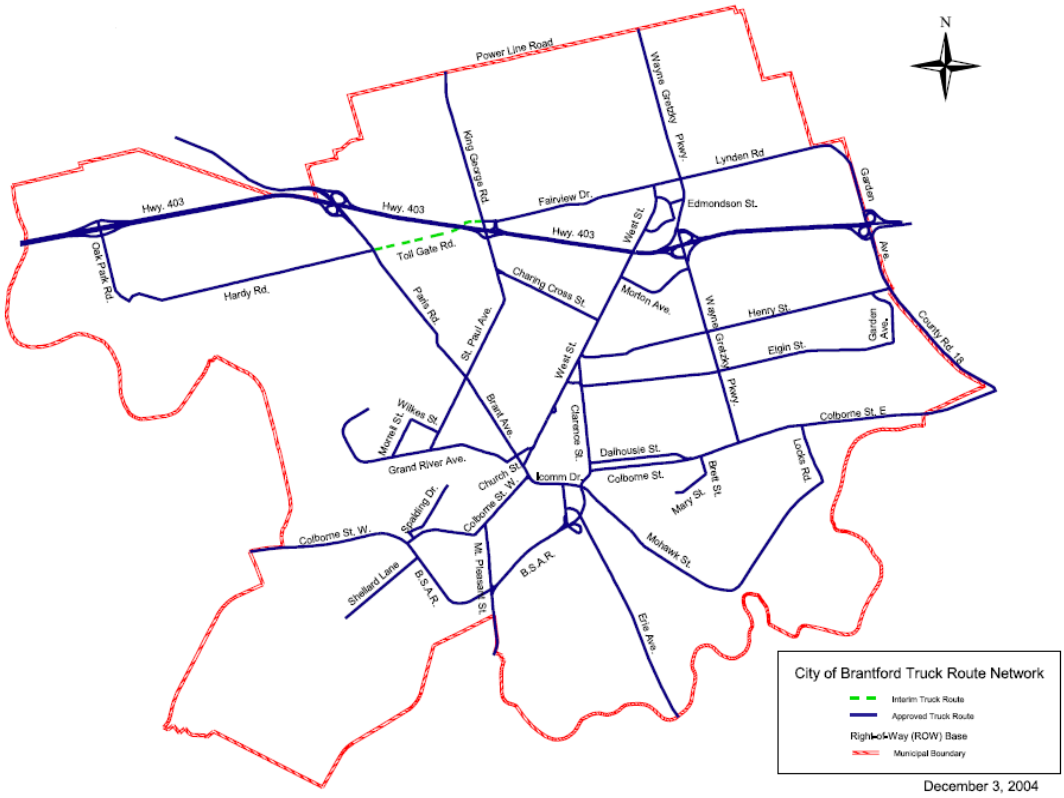
In the City of Brantford, truck movements are largely directed through the use of a permissive truck routing system. Brantford's current truck route system and bylaw originate from a truck route study completed in 1991. The route system was developed to balance the needs of the trucking industry with the need to minimize truck impacts on residential and institutional developments.

The current truck route by-law designates existing roadways as suitable for truck traffic, and signs are posted that indicate the route is acceptable for truck traffic. The by-law prohibits trucks from using non-designated routes, although there are some provisions that allow for local deliveries and use of non posted routes where the route forms part of the short path to the truck's destination. These provisions, enacted to address concerns of fairness raised by truckers and industry, have resulted in a truck route by-law that can be, at times, difficult to enforce.

The current truck route network is strongly oriented to the industrial districts at the west (North Ward/Holmedale) and the east (Cainsville/ Braneida) edges of the City. Major retailing areas are served by truck routes along arterials, and provide a number of inter-connecting links.

Figure 2.8 illustrates the currently designated truck routes in the City.

Figure 2.8 - Designated Truck Routes in Brantford



2.2.7 Railway System

Passenger Rail Service

Brantford is served by regular scheduled passenger rail service seven days a week. It is a regular stop for VIA passenger trains traveling both east and west along the Windsor - Toronto corridor. VIA uses the CN track on the Dundas Subdivision.

Source: Brantford Economic Development Website

There are five trains heading westbound to London each weekday. Four of these continue on to Windsor and one continues to Sarnia. Eastbound to Toronto there are five daily trains during the week, and four on weekends. The Via Train Station is centrally located at 5 Wadsworth Street (West Street at Market Street) and provides free parking to passengers.

Commuter Rail Service

According to TransFocus 2021, the Strategic Transportation Plan of the Niagara-Lake Erie Area prepared by the Ministry of Transportation in April 1995, the VIA passenger service to Brantford provides commuter service to Toronto in lieu of GO Transit service.

Based on the findings of the public attitude survey about 3% of residents use the existing Via Rail service to the Greater Toronto Area on a weekly basis, while 4% use it a few times per month and up to 20% use it a few times per year. A similar result was found when residents were asked about driving to Hamilton to catch to existing GO Train service.

The recently adopted Places to Grow Plan for the Greater Golden Horseshoe has identified the need for improved intercity transit services to link Brantford with the GTA and the Region of Waterloo. While the longer term objective may service these destinations with rail based transit service, it is expected that a bus based system would be the first implementation phase.

Freight Rail Service

CN Rail has the only active freight transport operations through the City of Brantford.

CN Dundas Subdivision (London to Oakville) - The Dundas Subdivision links London to Oakville. To the east, this CN main railway line connects Brantford to Aldershot (Burlington), and Oakville, with further connections to Port Credit (Mississauga), and Toronto. Communities westbound on the line include Paris, Woodstock, Ingersoll, and London. From London there are links to the gateways at Windsor and Sarnia. CN's Dundas Subdivision through Brantford is now the only eastbound rail link to Brantford, Toronto and the

Source: Brantford Economic Development Website

Niagara gateway.

With the abandonment of the Caledonia to Fort Erie stretch of the Dunnville Subdivision, this route also serves as the link from Brantford to Niagara Falls and U.S. markets through Brantford on the Grimsby Subdivision. Southern Ontario Railway (SOR), based in Hamilton, Ontario, operates the former CN Dunnville Subdivision between Nanticoke and Brantford which includes 35 miles of main track and approximately 6 miles of spur tracks, with a CN interchange at Brantford.

CN also operates a short rail spur line along Clarence Street from the old TH & B line in the downtown to the Dundas Subdivision.

CP Rail no longer has active rail transport operations on trackage within the City of Brantford. CP did run trains on two lines; the Lake Erie and Northern Railway (LE & N) and the Toronto Brantford and Buffalo Railway (TH & B).

2.2.8 Brantford Municipal Airport

The Brantford Municipal Airport is primarily a recreational airport, serving as the base for the Brantford Flying Club, however there are a number of corporate users and the facility serves some charter and freight operations. The airport was initially constructed in 1940/41 as a military training centre.
The Brantford Municipal Airport is a Canadian Customs Port of Entry, and its runways can handle all types of business aircraft with instrument approach.

The airport currently consists of:

- three runways (two of which are 2,600 feet in length, with the longest measuring 5,000 feet),
- an administration building housing passenger processing, a restaurant and automated weather advisory service,
- a ten bay small aircraft hanger, a series of T hangers, two commercial hangars and a private commercial hangar; and
- two ancillary buildings.

Source: Brantford Economic Development Website

The airport is managed by the City, under the guidance of the Airport Commission, which is comprised of one city councillor, one county councillor and four community representatives. Based on recent review of operations conducted in 2003, the airport generates an estimated 25,000 annual flying movements, with about 72-76% attributed to the Flying Club. The remaining movements are other local movements or flights to and from other airports[5]. The Airport host the annual United Way Airshow, attracting aircraft from across Canada and the nearby Canadian Warplane Heritage Museum.

The City completed an Airport Master Plan in 1991 which identified a number of airside improvements necessary to maintain the airport. Improvements include runway resurfacing, taxiway resurfacing, some runway reconstruction, electrical updates, and

[5] Review of Brantford Municipal Airport, Marshall Macklin Monaghan, Jan 2003.

other asset management activities. The recent review of the airport operations was completed by the City in 2003, by Marshall Macklin Monaghan which concluded that improvement needs significantly exceed the Airport's ability to generate revenue from current operations.

The review estimated that the airport generates a direct annual economic benefit to the community of about $2.4 million, and have estimated the indirect benefit to local business that use the airport at $52 million per year.

The 2003 Airport Review identified a number of development opportunities for the airport lands in consultation the Commission, staff, tenants and airport users. The review indicated a potential to Market Brantford as an alternative to Hamilton for general aviation users, offering a less busy, lower cost alternative. It was suggested that airport facility improvements, such as better car parking facilities and an improved corporate lounge would be required. The development of an aviation campus was also identified to support aviation related training in conjunction with Seneca College or Mohawk College. Additional marketing of the airport was also identified to highlight the benefits for local area businesses.

2.3 DEVELOPMENT OF A TRANSPORTATION MODEL

As part of this type of project, the use of a transportation model allows for the examination of future transportation demands across an entire city or region, and allows for the testing of "What-If?" scenarios, to examine the benefits of different improvement strategies.

A transportation model attempts to simulate the travel demands using the major infrastructure in a community based on existing observed travel patterns and forecasts of future growth. The model uses a series of Traffic Zones to represent areas with common land uses or areas that load traffic onto the road network at key points. Information on existing travel patterns (number of trips, trip purpose, mode of travel, etc) between traffic zones is typically obtained from household travel surveys or on- road travel surveys.

The model forecasts traffic flows on the roadways by 'assigning' these travel demands to the major collector and arterial roadways within a community, based on a series of characteristics that describe the travel time, speed, and capacity of each segment of the road. The assignment procedure looks to minimize overall travel time for all trips by assigning traffic to the shortest path considering the affects of travel volumes and average speeds.

The last travel survey undertaken in the City of Brantford was completed as part of the 1997 Transportation Study. The City of Brantford is currently participating in the 2006 Transportation Tomorrow Survey, a large scale household travel survey of residents throughout the Greater Golden Horseshoe. This data, once made available for use in mid-late 2007, can be used to update the City's Transportation model. For the purpose of this Transportation Master Plan Update, the original travel survey data was used and was updated with Census Place of Work data to estimate base year travel demands.

The development of the new transportation model and the forecasting of future travel demands for the City involved the following steps:

1. Update the Traffic Zone System
2. Update the Road Network Characteristics
3. Update the Home to Work Travel Patterns
4. Update the Travel Patterns for Other Trip Purposes
5. Develop Trip Generation Rates
6. Validation of Model
7. Forecast Future Travel Demands

A full discussion about this methodology is contained within the model development report, in Appendix D.

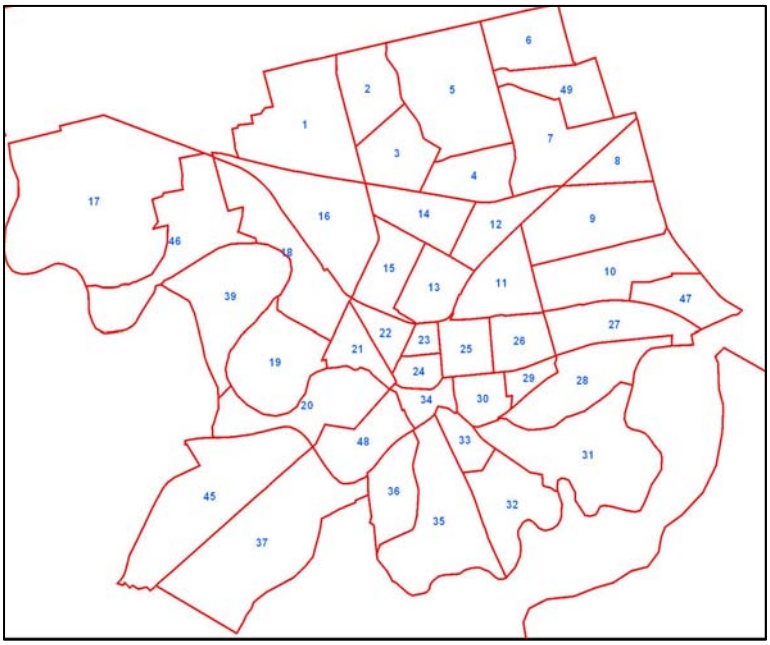
2.3.1 Updating the Traffic Zone System

As part of the model update, the existing City traffic zone system was expanded to include all the areas within Brant County. The purpose of this expansion is to build flexibility into the model to simulate and forecast trip making patterns between the City,

County, and Provincial road network in the broader Brantford area. While the current model does not contain any existing travel pattern data for the areas outside of the City boundary, it is anticipated that the 2006 Transportation Tomorrow Survey (TTS) will collect travel data from Brant County residents, allowing for better estimates of inter-municipal travel demands. Once the full TTS data is released in Fall of 2007, the City should consider updating their model to include this broader coverage area.

Figure 2.9 – City Traffic Zone System

The Traffic Zone system within the City is divided to 43 internal traffic analysis zones (TAZ), which are based on previous transportation studies for the City and are consistent with planning areas used in the City. These boundaries are established to be consistent with the Federal Government's census zones; the City's planning zones, and the City's current geographic boundaries. The model also uses a series of smaller zones that replicate basic neighbourhoods and allow for more realistic loading of traffic onto the model road network.



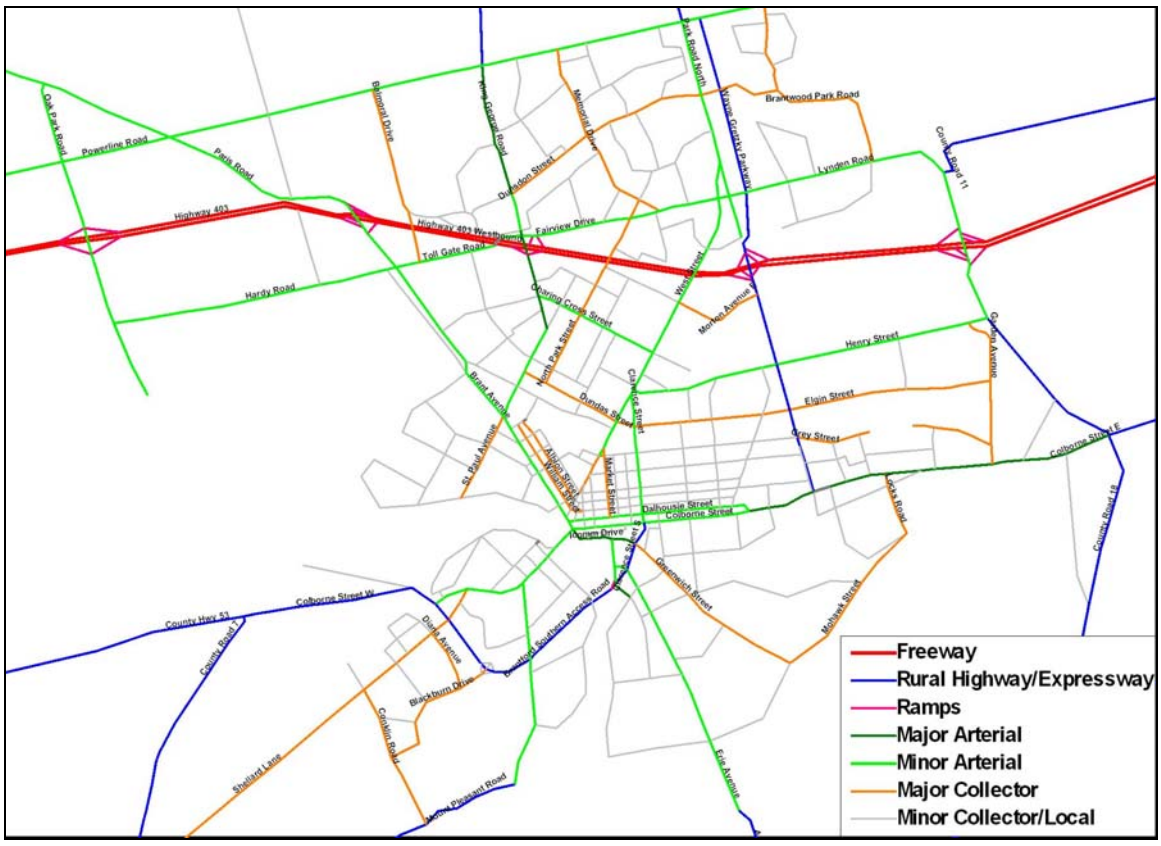
2.3.2 Updating the Road Network

The road network in the transportation model is represented by a series of links (roadway segments) and nodes (intersections). The transportation model for the City of Brantford includes all collector and higher class roadways within the City. In addition, some important local roads have been added to the model, where necessary to allow for proper trip routing and loading to the arterial road network.

Each of the road network links are grouped by their functional classification so roadways having the same basic function and design characteristics are treated the same for modeling purposes. The key attributes used by the model are; road classification[6], Free Flow Speed (which typically represents average operating speeds as opposed to posted speed limits), Length, Capacity and Number of Lanes by Direction, and the Volume Delay Function for each road (which describes how the speeds and travel times change as the volume of traffic increases).

[6] The road network in the transportation model has been divided into 6 functional classifications based on the prevailing traffic volumes, degree of access restrictions, and general nature of the land use around the roadway. These road network classifications may not correspond to the road network classification system used in the official plan, particularly for collector / local road segments.

Figure 2.10 - Model Road Network Within City



The planning capacities for each road classification used in the City of Brantford model are comparable to the assumed planning capacities used in a number of other jurisdictions in Ontario, as summarized below. The planning capacities used for the links in the model already account for the effect of stop signs and signals on the through movement of traffic, which is one reason why roadways with higher classifications typically have higher planning capacities.

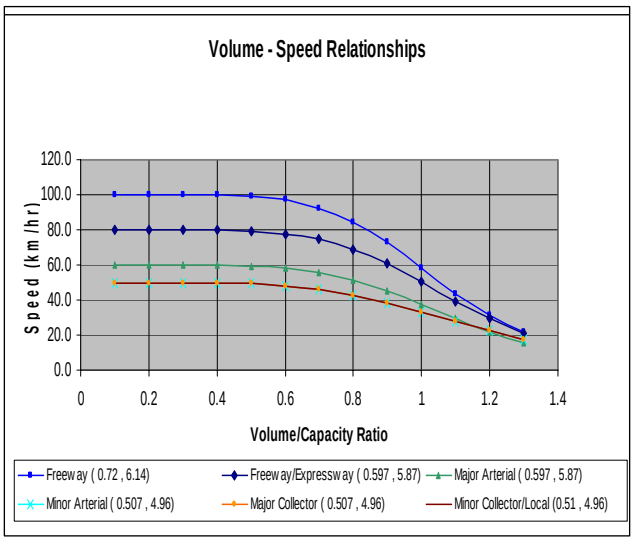
Table 2.10 - Roadway Capacity Comparison with Other Jurisdictions
(vehicles per hour per lane)

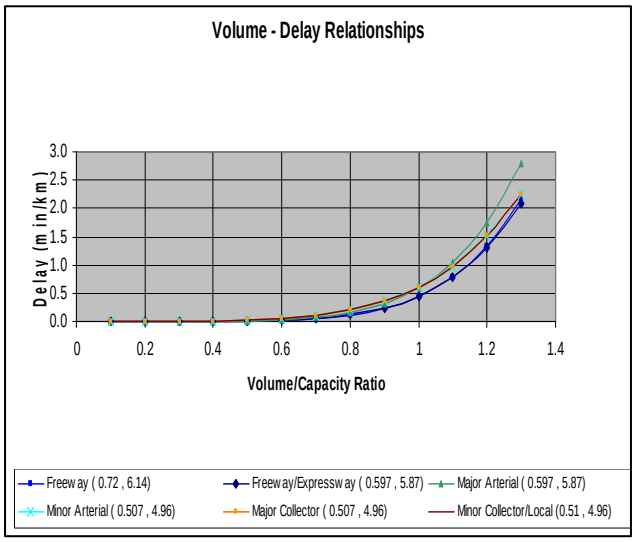
Road Type/Jurisdiction	City of Brantford	City of Peterborough	City of Greater Sudbury	MTO GTA Model
Freeways	1800	1800	1800	1800
Rural Highway	1000	1000		1200
Major Arterials	900	800-900	900 - 1000	900
Medium Capacity Arterials	-	700-800	800	700
Minor Arterials/CBD Arterials	700- 800	600	700	500
Major Collectors/Collectors	650	500	500	400
Minor Collector/Local	500	400/300	-	

As the ratio of a link's volume to its capacity (known as the volume-capacity ratio) increases, the speed on the link will drop as vehicles become more closely spaced, lane changing becomes more difficult, and the impacts of vehicle slowing to turn into driveways and entrances becomes more pronounced.

This in turn, increases the amount of delay that driver experience on this link and increases the travel time that a motorist will experience. As a link reaches its planning capacity, the link speeds drop significantly and delay increase exponentially. The model uses these relationships to determine the routes and total amount of traffic that will use each link in the network.

Figure 2.11 - Volume-Speed/Volume-Delay Relationships for Road Types





2.3.3 Updating Home to Work Travel Patterns

Much has changed since the original travel survey was done as part of the 1997 Transportation Master Plan. Within the City, the completion of the north-south portion of Wayne Gretzky Parkway and portions of the BSAR, have affected local travel patterns compared to 1995.

Completion of Highway 403 through the City has also changed travel demands in the City by providing a direct connection between the GTA / Hamilton / Niagara Falls and the London / Windsor area. This route is heavily used by commuter, tourist, and commercial traffic. The influence of this connection is demonstrated with the increased growth in industrial development in the northwest corner of the City, adjacent to the Highway 403 at the Oak Park Road interchange. Where Brantford used to operate largely independent of the GTA and Hamilton, new residents seeking lower housing costs and improved quality of life are increasingly relocating to Brantford. This has resulted in an increase in work related travel demands to and from the GTA & Hamilton, largely influenced by the completion of Highway 403.

The Census, undertaken every 5 years, provides an excellent data source to update work related travel patterns through the Place of Residence – Place of Work component

of the survey, which is administered to approximately 20% of the population. The Census data identifies daily home-to-work trips based on mode of travel.

Since the Home Based Work (HBW) trips make up 38% of the total travel demand during the PM Peak hour, it was determined that an update to this component of the travel demands, using the recent 2001 census Place-of-residence (POR)/ Place-of-Work (POW) data for Brantford, would significantly enhance the model for the purpose of this study.

From the Census data, the number of residents living within a zone and working in another zone was obtained. Since the model simulates PM Peak hour travel patterns, a methodology to convert the place of residence and place of work to PM Peak Hour Trips was developed that includes:

1. Conversion of place of residence and place of work to daily trips,
2. Conversion of daily trips to peak hour trips, and
3. Determination of peak hour flow directions.

The comparison of original 1995 HBW auto person matrix with the updated 2001 HBW person trip matrix derived from the census data shows the resulting changes in internal and external trips made to/from Brantford as a result of the changing commuter travel patterns over the past 10 years.

Table 2.11 - PM Peak Hour Person Trip Distribution

Trip Type	1995 HBW Auto Person Trips	2001 HBW Auto Person Trips
Internal Trips	56.4 %	37.8 %
Internal to External	20.8 %	26.8 %
External to Internal	19.4 %	32.5 %
External Trips	3.5 %	3.1 %

The updated travel patterns show a significant increase in the share of work trips between internal and external zones during the PM Peak Hour. This increase is highest for the return movement, from external (employment) zones to internal (residence) zones, which matches observed traffic count patterns on Highway 403 and other key commuter links in the area.

This pattern supports the notion that due to the introduction of Highway 403 in Brantford, people are commuting more for work. This happens for trips from Brantford to outside and vice-versa. As a result the proportion of total trips that remain within the City boundaries during peak periods is significantly reduced.

2.3.4 Update the Travel Patterns for Other Trip Purposes

Detailed information of travel flows for other trip purposes will be provided as part of the data obtained as part of the Transportation Tomorrow Survey. Recent traffic counts undertaken on the roadways and Highways within the study area were used to update the overall travel demands in the model.

Figure 2.12 - Roadway Links with Traffic Counts

The City of Brantford provided turning movement counts at a number of intersections within the City, while traffic counts were obtained from the Ministry of Transportation (MTO) for provincial highways in the area, including Highway 403 and Highway 24. A total of 310 links, representing 25% of all the links in the network, were updated with observed P.M. Peak Hour count data. The updated links are widespread throughout the network to capture the changes in traffic volumes in all the major areas of the City.

A comparison of the 1995 P.M. Peak Hour auto matrix with the 2005 estimated P.M. Peak Hour Auto matrix shows an overall growth in auto trips of 2.6% per year, with the majority of the growth related to internal-external travel demands. Growth in internal trips has been slightly below 1% per year. Population growth over the same period has averaged 1% per year, from a population of 84,764 in 1996 to the estimated 2005 population of 92,806.

Table 2.12 -1995 Versus 2005 PM Peak Hour Trips

Auto Trip Category	1995 Auto	2005 Auto	% Growths in trips/yr
Internal to Internal	17,838	19,088	0.7 %
Internal to External	4,903	7,718	4.6 %
External to Internal	4,550	8,177	5.9 %
External to External	994	1,522	4.4 %
Total	28,285	36,505	2.6 %

The high growth of trips related to external trips, as explained before, is due to the introduction of Highway 403 in Brantford after 1995. Historical AADT volumes from the Ministry of Transportation show that between 1995 and 2003, daily traffic volumes on Highway 403 and Highway 24, to the north of the City, grew by an average of 4% per year, which supports the external trip growth rates obtained from the model.

Between 1995 and 2005, the south-west area of Brantford around Shellard Lane has seen a huge growth in residential construction, and this growth makes up nearly half of the overall population growth in the City between 1995 and 2005. To ensure that the model was accurately portraying the growth in auto trip making over this same period, a comparison of the population growth and the growth in PM Peak Hour trips in this area was assessed.

Table 2.13 - Trip Growth - Population Growth in South-West

Year	Population	PM Peak Hour Auto Trips
1995	1,393	398
2005	5,689	1,365
Growth	15%	13%

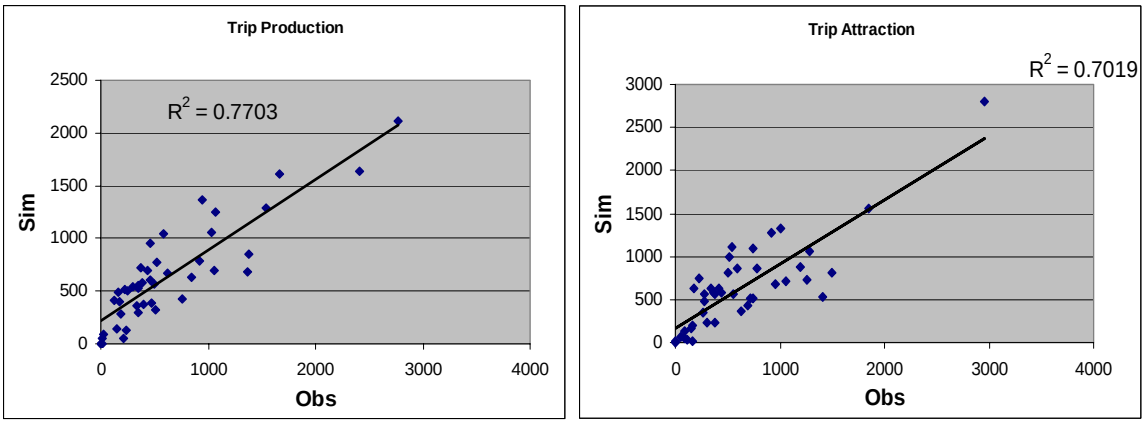
While the above table shows a huge increase in trips to and from South-west area of the City, the growth in population is similar to the growth in traffic, which is to be expected.

2.3.5 Development of Trip Generation Rates

Land use is the key determinant in trip making, and the type of land use pattern of an area will have an influence on the trip generation to/from traffic zones within the area. Traditionally, population and employment have been used to represent land use in an area. Based on estimates of new population or employment growth, the model can be used to predict how many trips will be generated or attracted to specific areas in the City. Prior to forecasting the future conditions, trip generation rates for the existing conditions have to be developed that represent existing trip making patterns across the City. To do this, existing population and employment data for each traffic zone were provided by the City and formed the basis for the development of trip production and attraction rates for the City[7].

Separate trip generation rates were developed for internal to internal and internal to external trips (or vice-versa), to recognize the different trip making patterns of each trip type. For internal trips, statistical analysis was done using linear regression to relate population and employment data by zone to estimated trip production and attraction by zone.

Figure 2.13 - Comparison of Predicted vs Observed Trip Productions / Attractions



The R-squared values for both trip production and attraction indicate that a fair correlation exists between trips made and the predictor variables, population and employment.

For internal-external and external-internal auto trips separate equations were developed for each external zone based on the total population and employment within the City.

To test the overall reasonableness of the trip generation approach used in the model update process, a comparison with overall trip generation patterns from the City of Peterborough and City of Sudbury models was undertaken. Each model forecasts travel in the PM Peak Hour; however, each uses a different approach to trip generation. Therefore, for comparison purposes, the overall number of trips generated during the PM peak hour was compared on a per capita basis.

[7] Attachment 1 contains Existing Population and Employment numbers used for the trip generation process.

Table 2.14 - Trip Generation Per Capita Comparisons

City	Base Population	PM Peak Hour Auto Trips	PM Peak Hour Trips per Person
Brantford	92,800*	34,983**	0.377
Peterborough	76,290***	28,275**	0.370
Sudbury	155,225	60,260	0.388

* Population within City, excluding townships in surrounding Brant County
** Internal plus Internal-External Trips
*** Population within City, excluding townships in surrounding Peterborough County

Based on the above assessment, it was concluded that the updated base year trip matrix, and the resulting trip generation equations generated by the model, were suitable for use in forecasting auto trip generation patterns in the City of Brantford at a city wide level. To provide refined corridor level forecasts, it is recommended that the City update their model in 2007 / 2008, upon the release of the full TTS survey data.

After determining the number of trips that will be generated and attracted by each zone due to future growth, trip distribution is a process used to estimate the destination choices for trips generated by trip makers. There are two basic types of trip distribution models currently in use:

- **Growth Factor Methods** – which involve factoring an existing matrix based on projected productions and/or attractions generated by each zone in the matrix using an iterative process. This method is often referred to as an unconstrained approach, since the capacity and performance of the transportation network is not considered in forecasting the number of trips that will travel between zones.
- **Gravity Model** – which predicts the flows between zones based on the difficulty of traveling between these zones, usually determined by travel times or other costs, and the total number of trips produced and attracted by each zone. Although this approach has good technical merits and is widely used in transportation planning models throughout North America, it requires extensive base data to calibrate the equations for each individual trip purpose.

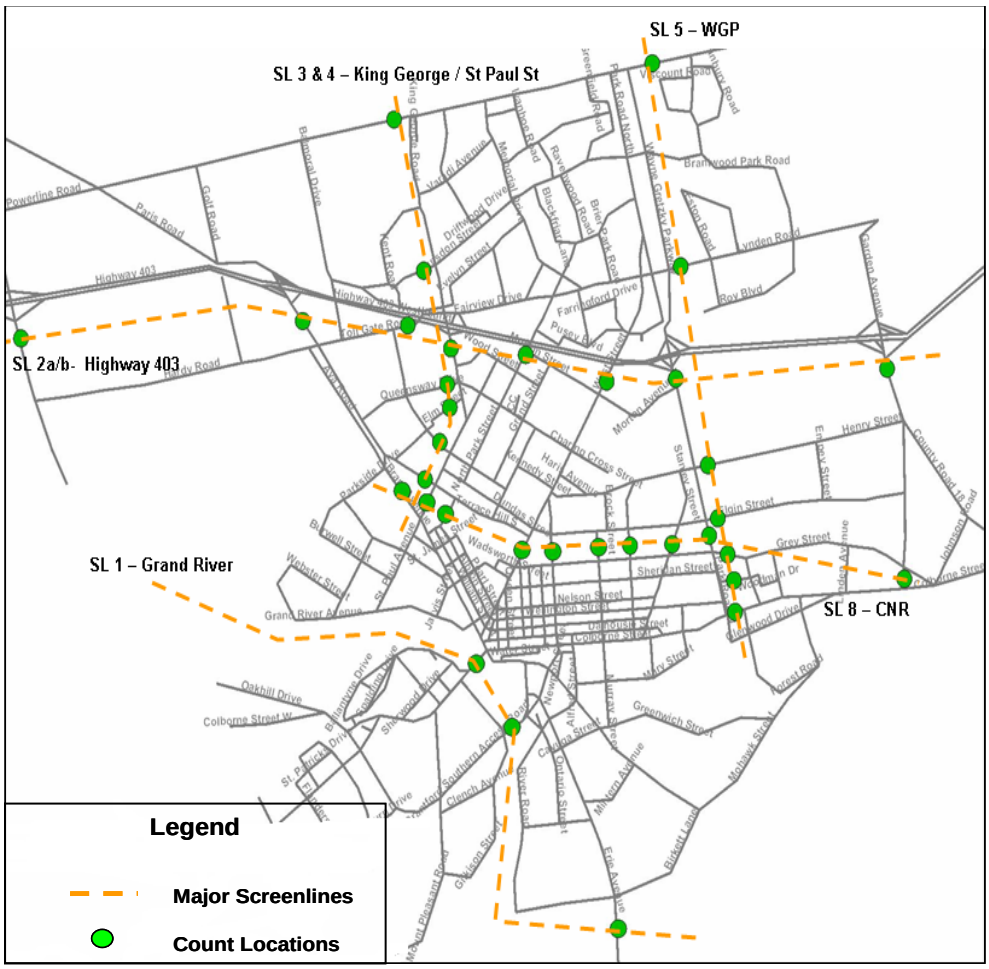
For the purpose of this model update, we utilized a doubly constrained “Growth Factor” method, often referred to as a fratar balancing approach, to predict future trip patterns between zones. The fratar method uses the existing trip matrix as a basis for forecasting the future patterns, and develops growth factors for total trip productions and attractions by traffic zone.

2.3.6 Model Validation

Once the trip generation model has been calibrated to predict base year trips, the model must be tested to determine if the trip assignment process can replicate existing observed volumes on the road network. This process is referred to as validation.

Validation of the model is done by comparing the observed volumes from existing count data with the simulated volumes for the same links or a series of links from the model.

Figure 2.14 – Validation Count Locations



Since the existing traffic counts, provided by the city, were used in the process of updating the model to the 2005 base year, these counts could not be used to test the model validation.

Therefore, a new set of traffic counts were conducted in May 2006 at 34 cordon stations throughout the city, corresponding to the major internal screenlines used in the model.

Based on the validation results presented in Figure 2.15, below, the model is capable of forecasting flows across all major screenlines in the City within 12%. The maximum

allowable deviation at a screenline, ranges between 19% and 25% depending on the prevailing volumes using the roadways in accordance with standards established by the Transportation Research Board. In addition to the screenline totals, the majority of the major roadway links in the model are also showing simulated volumes within 10-15% of observed traffic volumes. Detailed model validation results for the 5 key screenlines in the City are summarized in the Model Development Report contained in Appendix D.

A plot of simulated link volumes compared to the observed volumes was also developed to better understand the performance of the model predicting traffic at the link level. The figure below shows that overall the directional link volumes are well represented by the model with R-squared value of 0.88. Generally, the number of links are fairly balanced on both sides of the projected straight line, and the fitted curve equation shows that the model is slightly under simulating existing traffic volumes on an overall basis.

Figure 2.15 - Simulated Vs. Observed Link Volumes

Analysis of the above results shows the model is generally able to predict traffic well at the link level. At the screenline level, the model can predict traffic more accurately, with enough precision required for an urban model for the City of Brantford.