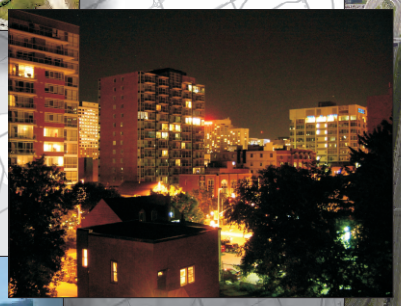
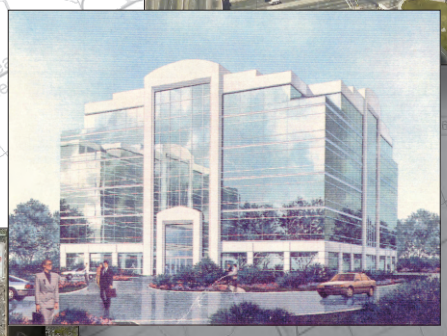
TRANS Trip Generation
Residential Trip Rates





McCORMICK RANKIN
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Study Report

August 2009

Oct 06, 2009

City of Ottawa
Planning, Transit and the Environment
Planning Branch, Transportation & Infrastructure Planning Division
110 Laurier Avenue West, 4th Floor
Ottawa, Ontario
K1P 1J1

Attention: Mr. Ahmad Subhani, P. Eng.
Project Manager, Transportation-Strategic Planning

RE: TRANS TRIP GENERATION RESIDENTIAL TRIP RATES W.O. NO: 7165

Dear Mr. Subhani,

We are pleased to submit our Final Report for the above noted project. In addition, as discussed, we have forwarded under separate cover, an electronic copy of the report in pdf format.

It is a pleasure to have been able to assist Ottawa-Gatineau in its ongoing efforts to inform staff and practicing transportation planning professionals of the results of detailed analysis of transportation data and collection efforts undertaken locally in Ottawa-Gatineau. The preparation of the 2009 TRANS Trip Generation Residential Trip Rates has been achieved with concerted effort from TRANS Member Agencies. The Study has produced as requested three documents; a Summary Report, the Study Report and the Technical Appendices as separate documents. We appreciated the timely input and suggestions from participating TRANS Agencies throughout the conduct of this assignment. We also wish to express our appreciation of your efforts in guiding this project, providing both timely and thorough feedback on specific project deliverables.

We welcome and look forward to an opportunity to work with you again in the near future.

Yours very truly,

McCORMICK RANKIN CORPORATION

Don Stephens, P. Eng.
Senior Project Manager

DOS/
Encl.

Study Participants

The TRANS Committee is comprised of the following member agencies: the National Capital Commission (NCC), the Ontario Ministry of Transportation (MTO), the City of Ottawa (including OC Transpo), le Ministère des transports du Québec (MTQ), la Ville de Gatineau and la Société de transport de l'Outaouais (STO).

The study was conducted under the direction of a TRANS Steering Committee that included representation from the following agencies:

- **City of Ottawa**: Transportation – Strategic Planning- Transportation
- **Ministère des Transports du Québec** : Direction de l'Outaouais and Modélisation des systèmes de transport;
- **Société de transport de l'Outaouais**: Stratégies et développement;
- **Ville de Gatineau** : Section transport.

The study progress was supervised by the Trip Generation Sub-Committee, led initially by Mr. Sami Qadan, Transportation Planner in the Transportation – Strategic Planning Unit (City of Ottawa) and later Mr. Ahmad Subhani, P. Eng. Senior Project Manager in the Transportation – Strategic Planning Unit (City of Ottawa). The Sub-Committee also included Mr. Colin Simpson, Planner in the Transportation - Strategic Planning Unit (City of Ottawa), as well as Mr. Paul Baby, Responsible Circulation et planification des transports, Services des inventaires et du plan, Direction de l'Outaouais (MTQ), and Mr. Luc Deneault, Transportation Analyst, Modélisation des systèmes de transport division (MTQ) and Mr. Carmel Dufour, Conseiller et chargé de projets, Stratégies et développement, Société de transport de l'Outaouais (STO) and Carol Hébert, Responsible Section Transport Service d'urbanisme, Ville de Gatineau.

The practical guidance and assistance of the above-mentioned organizations is gratefully acknowledged.

The TRANS Trip Generation Study is comprised of the following separate documents

1. TRANS Trip Generation Residential Trip Rates Summary Report
2. TRANS Trip Generation Residential Trip Rates Study Report
3. TRANS Trip Generation Residential Trip Rates Technical Appendices

TRANS Trip Generation
Residential Trip Rates

STUDY REPORT

August 2009

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1.0 Introduction

1.1 Background

While planning agencies located on both sides of the Ottawa River have different policies and procedures in fulfilling their respective mandates to review and approve development applications, each have a common interest in ensuring the impacts of proposed developments on the transportation systems are fully assessed and understood as part of the development review process. The City of Ottawa in 2006 approved their Transportation Impact Assessment Guidelines (TIA), thereby defining the development proponent's responsibilities to undertake a detailed study of the transportation impacts of their development proposal as part of the development review process. The TIA guidelines recognize the value of local trip generation rates and as such, the new TIA guidelines call for the continued application of trip generation rates. The guidelines referenced the use of trip rates documented in the 1988 TRANS Trip Generation Manual as the preferred source of local trip generation rates. Where appropriate rates were not available in the TRANS Trip Generation Manual, other sources included but were not limited to further original data collection activities centered on similar developments as well as the use of appropriate rates as summarised in the Institute of Transportation Engineers' (ITE) *Trip Generation* publication. It is also noted that the ITE Trip *Generation Report* is an informational report that compiles data collection efforts across the USA and Canada and presents the resulting trip rates for a wide ranging spectrum of land uses.

An update of the previous TRANS Trip Generation Manual was initiated by area planning agencies in recognition of the need to focus attention on local travel behaviour. This was initiated to ensure that the trip rates being referenced in the TIA's of development proposals reflect the unique travel behaviour for the region. The previous TRANS Trip Generation Manual was prepared in 1988 based on detailed analysis of a number of local data collection efforts undertaken by regional planning agencies in the previous decade. With the initiation of this study of local trip generation rates, area planning agencies in Ottawa-Gatineau, like many other Canadian urban centers, are supporting the development of local trip generation rates to reflect the locally observed travel behaviour.

A primary objective of this update is to review data sources with respect to their applicability and usefulness in establishing local trip rates and to build on the success of previous reports and trip generation studies. Equally important, this study will ensure the rates developed for application in this region are supported by locally collected data and it also identifies key data gaps which can be addressed over time through the implementation of additional local data collection efforts initiated by the city and/or through the development application and approval processes.

2.0 Trip Generation – Data Sources

Comprehensive data collection programs are becoming increasingly cost prohibitive due to the large expense incurred in undertaking any original data collection efforts. Consequently they are being undertaken with much less frequency than in the past. That being said, well designed local data collection programs offer the most significant opportunity to obtain valuable insight with respect to the impact of specific land use developments of interest to planners, engineers and developers by ensuring an increased understanding of local trip patterns and travel behaviour. Opportunities to observe and record travel behaviour associated with existing developments similar to that which is being proposed offers increased confidence in the analysis of transportation impacts, thereby ensuring appropriate mitigation measures are adequately identified in advance of the development.

Due to the high cost of data collection, opportunities to share experiences and to ensure any related data that may provide additional insight to travel behaviour should be fully maximized by agencies charged with the responsibility of overseeing the approval of future land development applications. In this respect, this section outlines past local experiences, data collection efforts undertaken locally, nationally and internationally as well as the experiences of similar planning agencies across Canada.

2.1 1988 TRANS Trip Generation Manual:

This study was prepared jointly by area planning agencies (under the umbrella organization of TRANS which includes participation of the National Capital Commission, the City of Ottawa, the City of Gatineau, the Ontario and Quebec Ministries of Transportation, and the transit agencies of Ottawa and Gatineau, STO and OC Transpo). The Manual was prepared to identify local trip generation rates for a wide range of land uses. Prior to the 1988 Study, the 1977 Trip Generation Manual and the 1979 Special Generators Analysis Report laid a solid foundation for ongoing data collection thereby ensuring up-to-date trip generator studies were available to monitor and develop future trip rates for a wide range of land uses. At the time of these studies, regionally significant shopping centres were being further expanded and/or developed; consequently, specific attention in terms of local data collection was placed on these land uses. In addition, the earlier studies had identified a number of regionally significant traffic generators which also needed to be evaluated and monitored to ensure these generators were adequately reflected in the strategic long range planning model developed for the broader region.

The earlier studies ('77 and '79) were also largely responsible for identifying the need and justification as well as commitment for an ongoing data collection program (Special Traffic Generator Counts) which provided local agencies with a rich "in-house" traffic dataset for various land uses and locations across the region. The development of the special traffic generator count program also required further refinements with respect to "the how to" collect the required data at the various sites by the local planning agencies. The procedures developed ensured that a complete cordon was drawn around the site and that person travel by all modes (walk, cycle, public transit, car etc.) was fully tabulated for all possible access/egress points to the site. As a result, the 1988 TRANS Trip Generation Study was initiated to review, analyze and develop trip generation rates based on the extensive inventory of special traffic generator counts undertaken over the period of 1977 to 1987. In addition, the comprehensive region wide 1986 Origin-Destination Survey had been completed the previous year and was made available to the Study Team to identify resident-based travel behaviour and associated trip generation rates.

2.2 TRANS 2005 OD Survey

Local agencies recently completed their comprehensive TRANS Origin-Destination Survey with resident interview surveys being administered in the Fall of 2005. Surveys of this nature are extremely important in understanding the ever-changing transportation needs of large communities. Information about where people go, as well as why, when and how they choose to get there is an important resource for transportation planners. Almost 25,000 households throughout the National Capital Region (approximately 5% of the population) were randomly selected to participate through confidential telephone interviews. Participants were asked questions about all trips made on the previous day by each person in the household. In addition, some statistical information was collected including age, gender, employment status, and number of vehicles available to the household. Reported existing travel behaviour: trip patterns, travel mode choices and socio-economic characteristics are critical inputs in developing long range planning tools aimed at understanding and identifying future transportation demands associated with longer term regional growth strategies. Typically carried out on a ten year cycle, comprehensive travel surveys are critical to obtaining a strong understanding of today's regional travel patterns and consequently fundamentally important in identifying tomorrow's transportation needs.

However, the very nature of reported resident based travel and the sampling frame applied does limit its use for small area analysis. Further discussion in the subsequent sections of this report identify both the strengths and weakness of comprehensive area wide OD resident based surveys in the development of specific land use trip generation rates.

2.3 Local Special Generator Traffic Studies

Over the time period following the preparation of the 1988 Manual, planning agencies, in particular the City of Ottawa, have reduced the coverage of their ongoing annual traffic data collection programs as a result of ongoing budgetary pressures. Traffic data collection programs are carried out for major signalized intersections to facilitate traffic signal re-timing plans and for the Annual Screenline Classification and Occupancy Count Program to support long range planning. As well, ongoing monitoring programs have been streamlined to reduce the ongoing budgetary pressures associated with original data collection efforts. The completion of the 1988 Manual was followed by changes in the way in which regional governmental services were administered, the realignment of departmental responsibilities and a number of municipal amalgamations in Ontario and Quebec. These changes also impacted on a range of governmental services and resulted in the annual special generator traffic data collection program no longer being undertaken. It is noted that municipal staff responsible for these data collection activities as well as the end users of the data had been located within one department (i.e. Transportation Department in the former Regional Government, Ontario). Following amalgamation, responsibilities for collection and application of trip rates reside in separate departments.

In the end, area planning agencies have not compiled an ongoing "in-house" inventory of traffic counts of sufficient detail which could be used to develop trip generation rates for specific land uses.

2.4 ITE Trip Generation

The Institute of Transportation Engineers has prepared an informational report which documents observed trip generation rates for a wide range of land use categories. The report was first prepared in 1976 and was based on trip generation studies submitted voluntarily to ITE by public agencies, developers, consulting firms and associations across the US and Canada. The report is currently in its 8th Edition and has increased the number of land use categories reported as well as the number of studies within each of these categories strengthening the overall sampling rates for various land use categories. As an information report the ITE

publication (three volumes) is an educational tool aimed at planners, developers, transportation professionals, zoning boards and others who are interested in estimating the number of trips generated by proposed developments. It is important to note that the report does not contain recommendations by ITE on the best course of action or the preferred application of the data outlined in the report but rather is intended as information report.

More recently, ITE has prepared a companion publication, the ITE *Trip Generation Handbook* is intended to provide guidance on the proper use of the data presented in the *Trip Generation* publication as well as dealing with related aspects of trip generation including the percentage of pass-by traffic and multiple trips associated with mixed use sites.

In any case, while the ITE publication is a widely used and referenced document, concerns and limitations regarding its application have been raised and are briefly discussed below.

- **Vehicular trip generation rates:** the information presented has been based solely on vehicle trip ends and only more recently has there been a discussion of understanding all mode choices offered as practitioners are becoming increasingly interested in the identification of the total number of person trips generated by a site. Person trip information allows for further analysis and understanding of the proportion of travel by public transit and/or non motorized modes. This type of information (person trip generation rates) ensures that locations with a high proportion of either public transportation and/or non-motorised modes are identified. This also ensures that land use trip generation rates developed fully account for the impacts of all modes. It is noted that the most recent publication of *Trip Generation, 8th Edition (Nov 2008)* has expanded the data collection form (for the conduct of trip generation studies) to include a section which supports the collection of pedestrian and cycling trip generation data. As a result, future trip generation studies submitted to ITE may now contain valuable information from which person trip generation can be partially developed. Further vehicle/truck/bus occupancy data would also need to be collected to fully develop person trip generation rates.
- **Suburban locations:** it is noted that in most cases the trip generation data submitted to ITE reflects surveys largely in suburban areas. As a result, vehicle trip rates may be higher in the suburban areas where person travel by alternative modes (public transportation, cycling and/or walking) is typically lower.
- **Little or no transit:** pedestrian amenities or travel demand management programs are implied in the ITE rates; again this is reflective of the predominately suburban locations where vehicle trip generation studies have been conducted. Most municipalities over the past decade have been increasing public transportation infrastructure and services with a view to capturing a higher share of the travel market and thereby reducing their reliance on the private automobile. Consequently, applying ITE trip rates may result in an overestimation of the proportion of vehicle travel for a proposed development as the rates applied do not fully recognize the role of public transportation or other more sustainable modes. While not specifically quantified in the ITE Publications, the “rule of thumb” of practitioners has been to estimate that ITE rates on average reflects an approximate 10% modal split for public transportation.
- **Primarily single use locations:** again it is noted that in most cases the trip generation data submitted to ITE have been associated with single use locations. More recent development proposals have larger elements of mixed use developments and consequently without the application of reduction factors to reflect the trips undertaken within a single site (i.e. trip origin and destination within the site), the empirical data if applied for individual land uses within a mixed development site would tend to overestimate the site trip generation.

- **Studies conducted in the United States and Canada since the 1960s:** the age of trip data within specific individual categories may no longer represent currently observed trip generation rates for various land use categories due to changing travel behaviour. While data is being added with each new edition of the publication, there has not been a concerted effort to evaluate whether historical data should be removed from the database. In many cases for example, trip generation studies undertaken a number of years ago may no longer reflect the current trips generated by the same location today. It may be that business hours have changed significantly for a number of land use categories. For example, Sunday shopping and/or the introduction of extended business hours for many retail outlets including e-commerce as well as changes to banking industry with ATM's and internet have likely all contributed to some reduction to trip generation rates for typical banking outlets.

  Due to changes in the banking industry, the most recent ITE Trip Generation publication (8th Edition) has removed all trip generation studies undertaken prior to the year 2000. However, this represents a single land use category and it is noted that many of the land use categories are based on trip generation studies which span the 1970's to the current year. Future editions of the ITE Trip Generation may offer improved opportunities for data dissemination and include enhanced user interfaces which could allow for users to partition the data both temporally and geographically.

In summary, the wealth of data contained in the ITE *Trip Generation* publication which includes more than 162 land use categories and more than 4,800 individual trip generation studies ensures that it remains a valuable resource to planning agencies, planners, and transportation professionals.

2.5 Experience of Other Agencies and ITE Research Efforts

2.5.1 Other Canadian Planning Agencies

While ITE has created a tremendously strong foundation of trip data related to specific land use categories and development thresholds, TRANS agencies have also recognized the need for adjustments to reflect Ottawa-Gatineau's local factors including high transit ridership and impacts on their ease of application in the region.

Ottawa-Gatineau is not alone in recognizing the need to identify local trip generation rates to ensure the identification of future transportation impacts associated with proposed developments are well supported by empirical evidence.

A scan of representative municipalities was undertaken as part of this study to identify if other jurisdictions across Canada are developing trip generation rates for their regions. Specific areas of interest included:

- whether local rates were being developed and published;
- whether local data collection programs had been designed and implemented to assist in identifying and monitoring changes in local trip making characteristics including trip generation;
- whether local experience suggested use of trip rates different from those published in the ITE Trip Generation publication;
- whether local trip generation adjustment factors were applied to account for local conditions.

The planning agencies contacted as part of the review are highlighted in Table 2.1: Canadian Planning Agencies Contacted. The majority of responses received indicated that the ITE rates published in *Trip Generation* are not always representative of their communities. A number of

cities do use the ITE rates but also indicated that their use often requires a number of adjustments/modifications to reflect the local characteristics of their community. The City of Edmonton's trip generation rates, for example are not significantly different from ITE except for a few defined land uses which included sites where 'drive through windows' were a key element of the development proposal. In addition, the Region of York has over time made adjustments to the ITE published rates for residential land use developments based on local experience.

Table 2.1: Canadian Planning Agencies Contacted

Region/City	Agency	Department/Branch
Calgary	City of Calgary	Transportation Planning Department
Edmonton	City of Edmonton	Transportation Planning Department
Toronto	City of Toronto	City Planning Division
York	Region of York	Transportation & Works Department
Montreal/Quebec	Province of Quebec	Service de la modélisation des systèmes de transport, Ministère des Transports du Québec
Halifax	Halifax Regional Municipality	Traffic and Right-of-way, Transportation & Public Works

The Province of Québec, on behalf of its municipalities undertakes local area-wide surveys of travel patterns and trip generation and as a result Québec municipalities are less dependent on the ITE Trip Generation publication. It was noted that Provincial representatives indicated that their focus has been on developing disaggregated transportation models based on comprehensive municipal O-D Surveys. Much of the planning is therefore based on identification of future changes in the population from which the changes in transportation demands are modeled and monitored over time.

It was noted that for the most part, Cities currently do not publish their own trip generation rates. Based on those surveyed, published rates were only available for North York Centre in the city of North York. In this case, peak hour peak directional trip rates for residential and commercial land uses as part of the North York Centre Secondary Plan have been developed and published.

The City of Calgary is likely the most progressive jurisdiction having made significant progress in developing a local data base of trip generation rates for a variety of land uses. City of Calgary planners have access to the rates from the city's database and based on specific study requirements justify their use of rates from either the city's database or appropriate ITE rates. As is the case in many jurisdictions it remains the consultant's responsibility to support and/or justify the use of individual rates – and the city ultimately approves the use of selected rates. Staff with the City of Calgary indicated that the contents of the City database have not been published as additional data validation remains outstanding. Based on past criticism of ITE's *Trip Generation* where the focus has been on vehicular trip rates, it is also noted that Calgary has developed its program for developing trip generation rates based on person trips rather that vehicular trip rates.

Trip rate adjustment factors are most commonly called upon where transit usage represents a sizeable portion of the travel market. These adjustments when considering proposed developments in close proximity to primary transit corridors, including rapid transit stations are twofold; i) reflect key opportunities for increased modal shifts to transit ii) express concern

regarding overbuilding road capacity which can result in lower transit mode split. In Toronto, for example, the vehicle trip rates decrease as a direct function of proximity to the nearest Subway station entrance. The City of Edmonton indicated that their practice is to apply a 5% reduction if the proposed development is located within walking distance of the rapid transit station. The Region of York currently does not apply reduction factors but with the expansion of rapid transit in the region, has expressed interest in further investigating and developing appropriate adjustment factors which reflect transit mode splits.

The following table summarizes some of the results from the survey.

Table 2.2: Summary of Survey of Canadian Planning Agencies

Agency	Uses ITE Rates	Publishes Own Rates	Adjusts ITE Rates	Other Comments
City of Calgary	✓	✓		City is compiling database of trip generation rates
City of Edmonton	✓		✓	5% blanket reduction if within walking distance to rapid transit.
City of Toronto	✓	✓	✓	North York Centre has published rates. Generally rates are a function of proximity to Subway Stations.
Region of York	✓		✓	Consultants must provide justification if ITE rates are not used.
Province of Quebec			n/a	Trip Generation is based on comprehensive O-D Surveys
Halifax Regional Municipality	✓			

The Urban Transportation Monitor is published in the United States on a weekly basis and reports on urban transportation issues, travel trends, emerging technologies, new developments and research activities of interest to the broader transportation industry. A recent publication "The Urban Transportation Monitor" December 12, 2008 issue (VOL 22. NO. 22) reported on a survey administered by the Monitor which was aimed at capturing current opinions and practices regarding the conduct of traffic impact studies. Traffic engineers and practitioners were contacted across North America and replies were received from 72 jurisdictions. In general, the findings of the Urban Transportation Monitor Survey which relate to the application and use of trip generation rates are highlighted in Table 2.3: Survey of Adjustment Factors – Urban Transportation Monitor.

While not widely carried out, the conduct of "before and after" studies can offer valuable feedback with respect to the monitoring, use and application of trip rates and associated reduction factors. The Urban Transportation Monitor Survey also identified current practice in this respect and noted that very few jurisdictions (11% of large and 9% of small) follow up to see if the reductions applied were realised. It would appear that for more controversial emerging land uses and/or reduction factors, particularly where most jurisdictions are aware that more similar developments are on the horizon, the use of before and after studies would provide valuable input to future studies.

Table 2.3: Survey of Adjustment Factors – Urban Transportation Monitor

Type of Trip Reduction	Percentage of Respondents Trip Reductions Permitted		Maximum Percentage Reduction Allowed (range of maximum percentages provided by respondents from both large and small jurisdictions)
	Large Jurisdictions >100,000 population	Small Jurisdictions <100,000 population	
Transit use	52%	29%	5% - 30%
Transportation Demand Measures (excluding transit)	22%	25%	5% - 10%
Pass-by trips	65%	75%	10% - 50%
Internal capture of trips	65%	63%	10%- 30%
Non-Motorised Modes Bicycle & Walking trips	19%	25%	No maximum %'s specified
Other reductions (undefined)	6%	8%	No maximum %'s specified

Source: The Urban Transportation Monitor, December 12, 2008; (VOL 22. NO. 22)

2.5.2 ITE Trip Generation Research Efforts

TRANS Member Agencies were invited to participate in a Web Briefing on an update to ITE Trip Generation Research Efforts. The consultant organized the participation of staff from TRANS Member Agencies by registering Ottawa City Hall as a Host Site for the Web Briefing on September 24, 2008. The Web Briefing was organised by ITE and provided a number of presentations on current research related to trip generation rates at transit oriented development, mixed-use development and influences from other land use variables.

Key stated objectives of the course were to provide a status report of ITE trip generation research, identify land use and transportation variables that influence vehicle trip generation rates, identify unique characteristics of trip generation for mixed use developments and discuss the basic procedures for estimating internal capture. Three presentations were provided which covered each of the following topics:

- An improved method for estimating mixed-use trip generation: The method includes not only density (dwellings, jobs per acre) but also diversity in the mix of housing, jobs and retail, design in the connectivity of the neighbourhood, regional accessibility for destinations, distance to transit and demographics of the generator. It was noted that the application when publicly available will include nomographs where multiple factors can be applied to a site to look-up the trip generation rate.

- A new procedure for estimating internal capture for mixed-use developments. The research results of this project showed that the ITE method of estimating internal capture for a mixed site is the most used and while it is a sound concept there are limited land uses, time periods and data available. The research project expanded the ITE method

to six major land uses (office, retail, restaurant, residential, hotel and cinema), provides both weekday AM and PM peaks and contains more data. The preliminary results calculated that 10-40% of trips are internally captured dependent on the land-use trips.

- Transit oriented development (TOD) - right sizing TODs and travel implications. The presentation reviewed 17 TODs, measured their actual performance and compared these trips to those calculated in ITE. The results have suggested a suburban bias with existing parking standards and may assume that everyone drives. The author of the study found that ITE rates overstate TOD trip generation by 50% on a 24 hour basis. The author also reported that ITE rates of 6.67 trips per unit differed significantly from detailed site counts which suggested approximately 3.55 trips per unit. As a result, with differing scenarios for transit use analysed substantial reductions in vehicle trip rates could be achieved through TODs and these differences also had contributed to additional parking savings for typical TOD developments.

Approximately 15 persons were in attendance at the briefing and included representatives from the City of Ottawa, Transports Québec, Société de transport de l'Outaouais (STO) as well as the members of the consultant team.

3.0 Development of Trip Generation Rates

3.1 Approach and Methodology

Site impact studies require the estimation of trip generation rates so that the full impact of proposed developments can be identified as part of the development application, review and approval process. Trip generation rates are often based on observed traffic counts of similar developments so that the future transportation conditions of the completed development can be estimated with a high degree of confidence. There are three sources of travel data available to calculate the trip generation rates for the Ottawa-Gatineau area:

- **Local Trip Generation Studies:** Traffic count data as part of a target trip generation study for a variety of development sites offer critical opportunities to observe and record local travel patterns and trip rates. Unfortunately, despite the initiation of a rigour count program as part of this study there is insufficient data to support the development of representative trip rates for each of the residential land use categories under consideration.
- **ITE Trip Generation Manual:** The vehicle trip rates published by the ITE reflect a wide range of trip generation studies largely carried out in the United States and in some cases Canada. The ITE Survey sites reported provide good coverage of the various land use categories and consequently the vehicle trip rates presented are reliable and a valuable source of trip generation data. However in many cases the background underlying travel behaviour in terms of transit usage or support for sustainable transportation varies considerably from that experienced in Ottawa-Gatineau.
- **2005 OD Survey:** The TRANS 2005 Origin Destination Survey represents the most comprehensive travel and trip data for the planning area. Reported travel from OD surveys is based on a stratified sample of the population and tends to be statistically strong when evaluating trip characteristics associated with various segments of the population rather than a specific land use. This is because data collection methods and data organization is person based rather than development based (i.e. various businesses/categories of land uses such as shopping centres, medical offices etc). Region wide resident based OD surveys can provide insight to the number and purpose of trip making, small changes however, in how the rates are calculated can occur due to differences in how the information has been collected and therefore limits their utility elsewhere.

Due to the limited number of recent local trip generation studies, a blended trip rate was developed using a combination of vehicle trip rates from the local trip generation studies, the ITE trip rates and the OD Survey trip rates as shown in Table 3.16. This methodology takes into account local trends while using the regional and international data sources to ensure the development of reliable trip rates. In the future as more local data is collected in the form of trip generation studies and added to the local database of trip rates, the future development of vehicle trip rates can be carried out in manner which places more emphasis on these data over the OD Survey and ITE rates.

3.2 Vehicle Trip Rates from the Local Data Collection Program for 2008

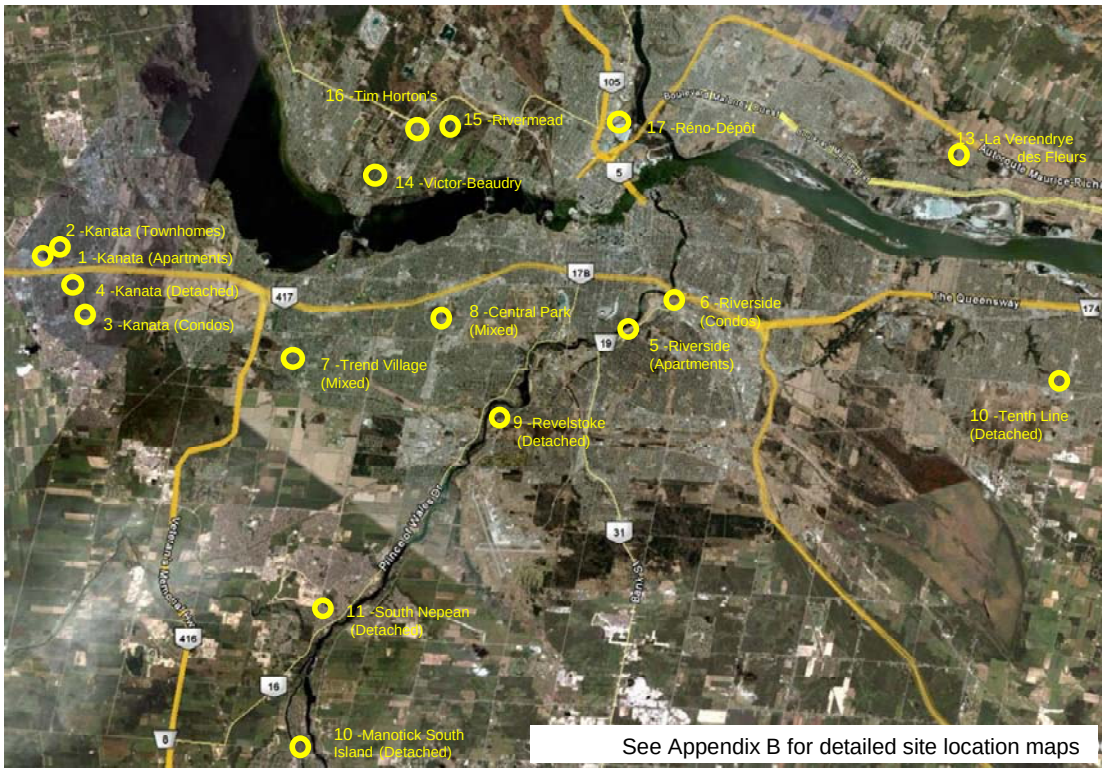
Following a review of the existing traffic data inventories held by local planning agencies, it was noted that trip generation studies have not been conducted since the publication of the previous TRANS Trip Generation Manual. As a result, a need exists to update all land use categories of interest through a local data collection program. In the context of this study, the opportunity to

design and implement a comprehensive trip generation data collection program for a wide encompassing group of land use categories was not reasonable given the existing study scope with both time and budgetary constraints. A more plausible strategy was to initiate a data collection program (June 2008) focused on the residential land use categories. Discussions with both Gatineau and Ottawa were held to identify possible neighbourhoods of homogenous residential land uses and/or additional site locations of interest to each of the agencies. Key considerations in the identification of specific site locations to undertake local trip generation studies were the following:

- Limited through traffic – the best results are obtained if the traffic observations made can be fully attributed to the specific land use targeted (i.e. various households located within the study area).
- A distribution of residential locations across the survey area

A key map and a tabular listing of the sites are presented in Exhibit 3.1: Key Map of 2008 Special Generator Count Locations and Table 3.1: 2008 Local Count Program and Land Use Variables.

Exhibit 3.1: Key Map of 2008 Local Count Locations



Fifteen of the seventeen sites identified for the collection of trip generation data were residential land uses with different levels of access to rapid transit facilities. The number and variation of housing types located within the trip generation study area were also identified and categorized for consistency purposes according to the same definitions applied in the 2005 TRANS OD Survey. The four housing types used for classification purposes were i) single-detached homes, ii) semi-detached homes, or iii) row or townhomes and iv) apartments.

Table 3.1: 2008 Local Count Program and Land Use Variables

Residential Neighbourhoods/Land Use		Number of Households by Type				Population
		Single	Semi	Town	Apt	
1	Apartment Buildings - Kanata				339	755
2	Town Homes - Kanata			94		212
3	Condominiums - Kanata			124		315
4	Single Residential Units - Kanata	40				120
5	Apartment Units - Riverside Dr/Frobisher				819	1,450
6	Riverside Condominiums - Hurdman				544	926
7	Trend Village	645	114	168	210	3,017
8	Central Park	380	145	492	270	3,240
9	Revelstoke	134				356
10	Tenth Line east of Prestwick	205				610
11	South Nepean	133				446
12	Manotick South Island	249				682
13	La Verendrye Des Fleurs	270	172	27		1420
14	Victor-Beaudry	202	498			1646
15	Rivermead	430				1213

Non Residential Land Uses		Employees	Seats	Drive-Thru	GLA (Square feet)
16	Tim Horton's	15		1	2,422
17	Réno-Dépôt	180	80		125,000

See Appendix A-1 for detailed site locations

3.2.1 Local Trip Generation Studies – Traffic Counts

In general, the traffic counts associated with trip generation studies need to be conducted in a manner which identifies all person trip travel to/from the site by all modes. Surveys in the City of Ottawa were undertaken using the City's *Cordon Count Program* methodology with surveyors recording trips entering and leaving the study area over the typical 12 hour count period (7:00 am to 7:00 pm). The City of Gatineau also followed a similar methodology for the trip generation studies on the Quebec side of the Ottawa River however, the period of the count was reduced to 8 hours in duration (7:00 am to 10:00am, 11:30 am to 1:30 pm and 3:00 pm to 6:00 pm). All person trips leaving and/or entering the site were observed and recorded, including walking and cycling trips with a view to fully identify the total number of person trips generated by the land use.

Appendix A-1 provides the summary sheets of all traffic data collected for the trip generation studies undertaken by the Cities of Gatineau and Ottawa. Each of the June 2008 count sites were analysed and individual charts prepared which highlighted the trip activity to and from the trip generator for the duration of the traffic counts. Samples of the trip activity recorded for two sample trip generation sites are presented as Exhibit 3.2: Trip Generation Rivermead Neighbourhood and Exhibit 3.3: Trip Generation Revelstoke Neighbourhood.

Exhibit 3.2: Local Trip Generation Rivermead Neighbourhood

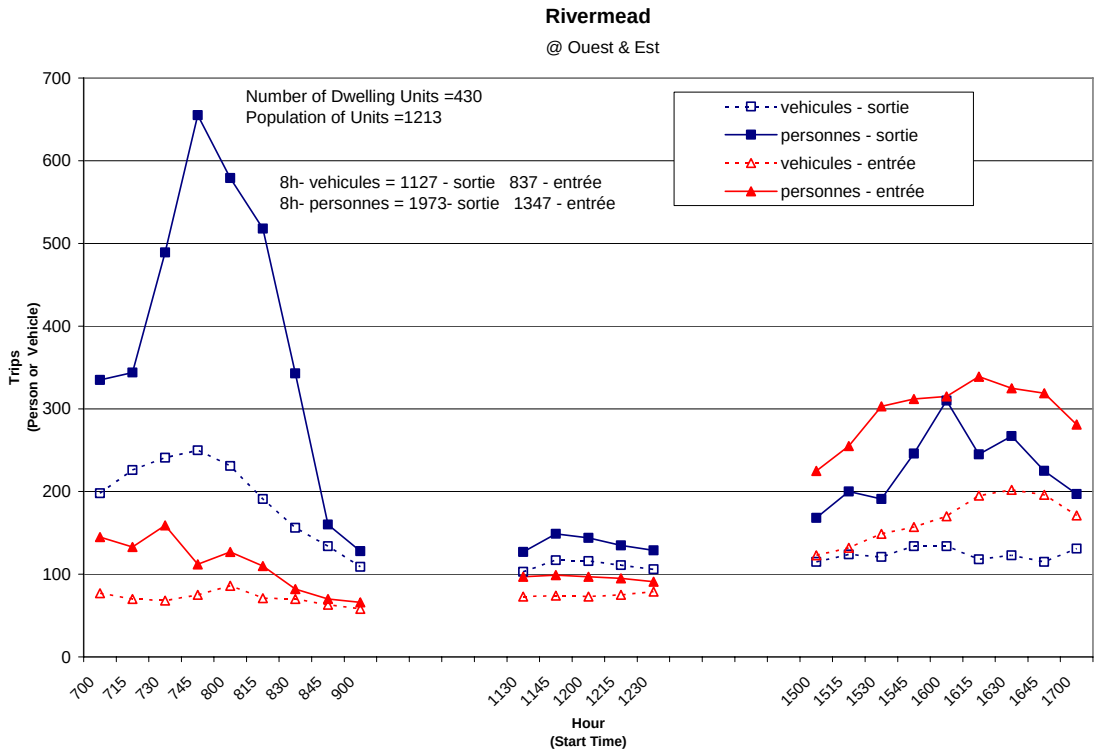
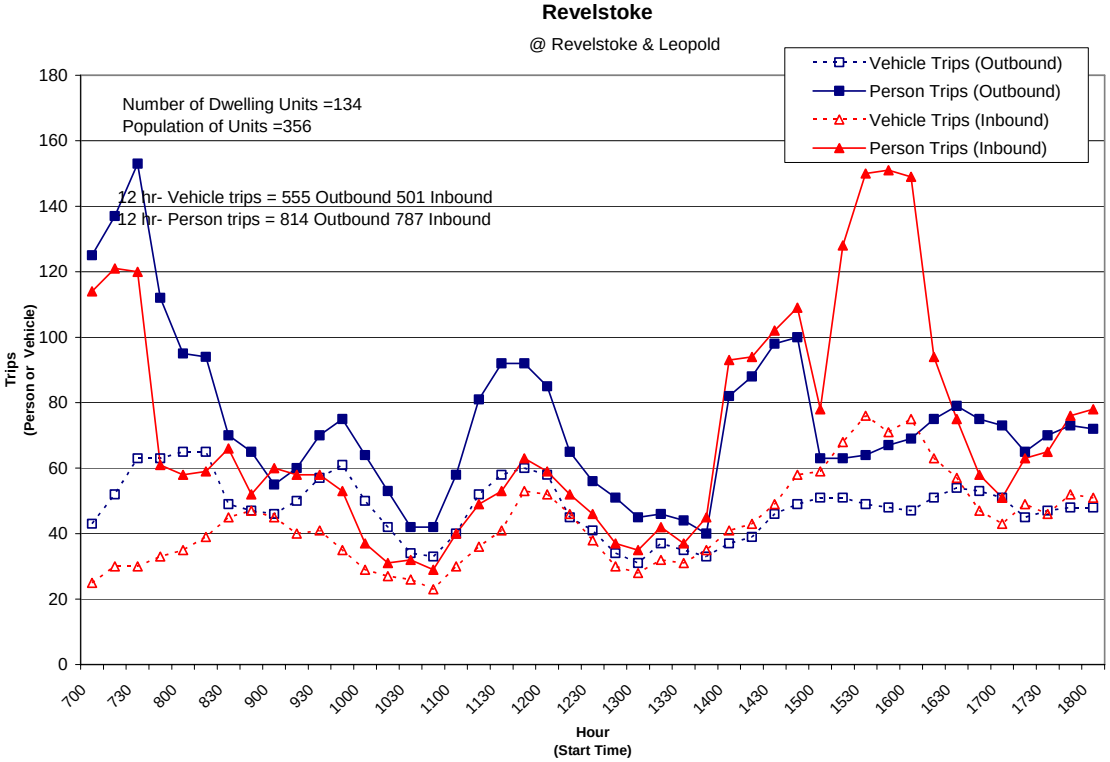


Exhibit 3.3: Local Trip Generation Revelstoke Neighbourhood



Each of the exhibits chart the hourly volume for the survey count period based on consecutive fifteen minute increments and indicate for each direction of travel the number of trips (both persons and vehicles) entering the development (inbound direction) and leaving the development (outbound direction). From the charts prepared for each of the 2008 trip generation studies the following observations were noted:

- Exhibits chart the peak travel directions associated with residential developments, persons leaving the development (Outbound) in the morning (7:00 to 9:00 AM and returning (Inbound) in the late afternoon (15:00 to 17:00 PM). Note that all volume data is hourly and has been tabulated for every fifteen minutes across the survey period.
- The high number of person trips when compared against the number of recorded vehicle trips is reflective of the proportion of school trips using yellow school buses, particularly in the early morning and early afternoon. In addition some school bus activity was also noted over the lunch hour period, again reflecting movement of ½ day school children. In some cases, the impact of school bus movements through the neighbourhood impact on the total number of trips observed inbound and outbound within the same count period.
- The exhibits prepared are intended to identify the magnitude of the vehicle trips generated by the development on an hourly basis across the full survey period, however it is acknowledged that the occupancy count methodology of estimating bus occupancies (number of persons on individual school and in some cases transit buses) can impact the number of person trips calculated for peak traffic periods.

3.2.2 Local Trip Generation Studies – Data Analysis

The development of trip generation rates were subsequently carried out based on the independent land use variables identified in Table 3.1. Again detailed charts were prepared and have been included as Appendix B for all trip generation studies conducted in 2008. The trip rates identified for the two previous examples are presented below:

Exhibit 3.4: Local Trip Generation Rates – Rivermead Neighbourhood

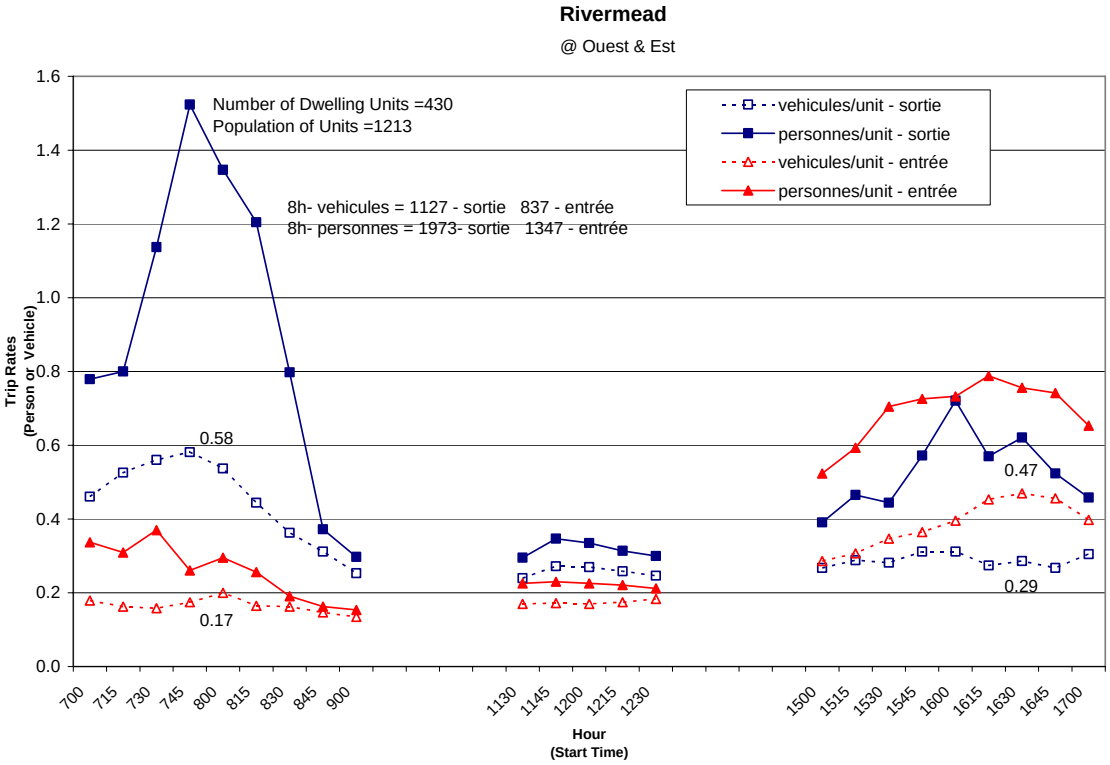
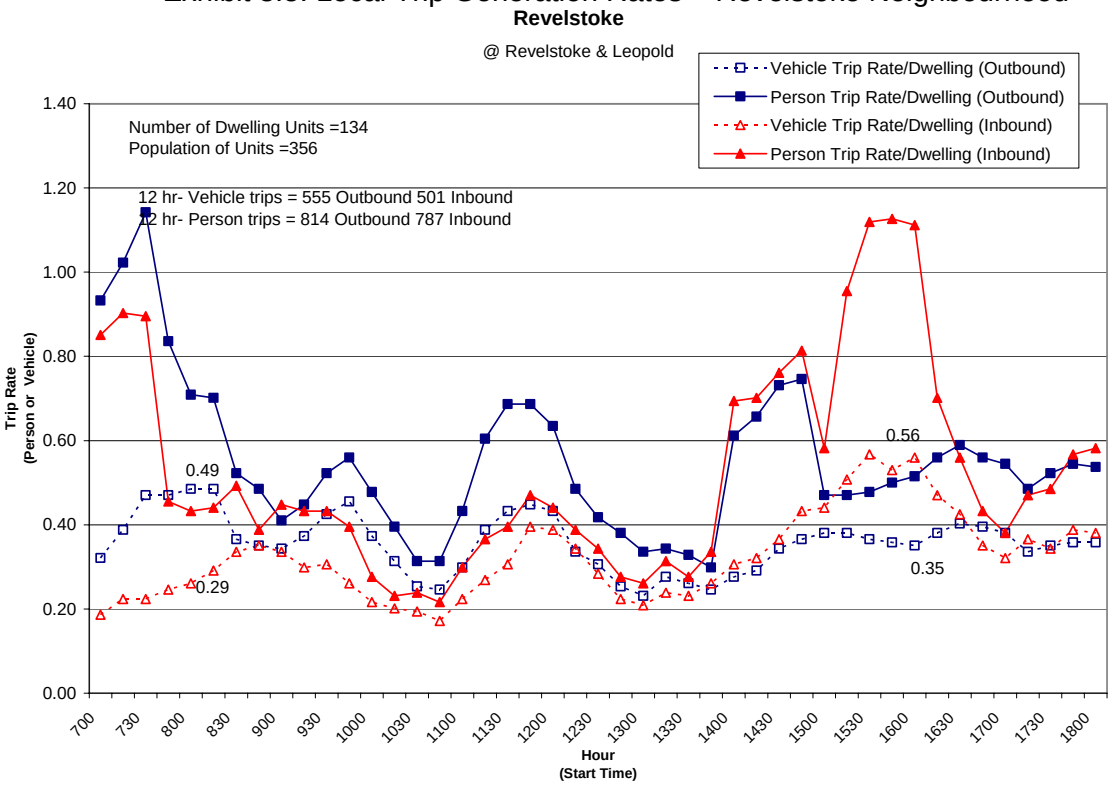


Exhibit 3.5: Local Trip Generation Rates – Revelstoke Neighbourhood



The trip generation studies identified both the number of person trips as well as vehicle trips entering and/or leaving the development and the corresponding trip rates were calculated based on the number of units contained within the study area. The variation of trip generation rates across a typical day (from 7 a.m. to 7 p.m.) are highlighted in the charts prepared. The peak hour trip generation rates have been calculated based on hourly observed trips for fifteen minute intervals across the count period. This approach of observing and recording trips across an 8 to 12 hour period ensures that both the peak trip generation rate of the development as well as the trip generation rate corresponding to the typical peak hour of the adjacent arterials can be determined. For residential land uses, the peak hour of the generator is most often coincident with the commuter peak hours. A number of observations and comments regarding Exhibits 3.4 and 3.5 as well as the tabular summary of the trip generation rates presented in Table 3.2: Local Trip Generation Rates (2008 Counts) are noted as follows;

- The exhibits highlight the independent variables; number of dwelling units (households) as well as the overall population level for each of the residential areas as provided by city staff.
- The dashed lines reflect the vehicle trip rates which are typically only reported in ITE surveys. In addition, the trip rate value for the peak hour is noted for both the inbound and outbound peaks separately and for the morning and afternoon peaks. The trip rate variations are highlighted across the survey count period and are consistent with the data collection program (i.e. calculated hourly rates with start times staggered by fifteen minutes across the full count period).
- The total number of trips recorded (both vehicles and person trips) for the duration of the count is noted in the charts. More balanced flows are noted across the 12 hour counts undertaken by Ottawa when compared with the non-consecutive, 8 hour counts undertaken by Gatineau. It is noted that the total trips inbound and outbound are more balanced for the 12 hour count periods.

Table 3.2: Local Trip Generation Rates (2008 Counts)

Category of Land Use		Observed Trip Rates				
		AM Peak		PM Peak		Independent Variable
Study No.	Location	Person Trips	Vehicle Trips	Person Trips	Vehicle Trips	
	Single Detached (ITE Code 210)					
4	Single Residential - Kanata	3.86	1.28	1.60	1.23	40 units
9	Revelstoke	1.14	0.78	1.63	0.91	134 units
10	Tenth Line east of Prestwick	0.94	0.49	1.37	0.97	205 units
11	South Nepean	1.10	0.64	1.69	1.17	133 units
12	Manotick South Island	0.73	0.51	1.15	0.83	249 units
15	Rivermead	1.78	0.75	1.38	0.76	430 units
	Weighted Average	***1.34***	***0.66***	***1.40***	***0.89***	No. of Units (Detached)
	Apartment (ITE Code 220)					
1	Apartment Buildings - Kanata	0.71	0.30	0.48	0.32	339 units
5	Apartments - Riverside Dr/Frobisher	0.34	0.14	0.30	0.17	819 units
	Weighted Average	***0.45***	***0.19***	***0.35***	***0.21***	No. of Units (Apartment)
	Townhome (ITE Code 230)					
2	Town Home - Kanata	0.73	0.4	0.82	0.64	94 units
	Condominiums (ITE Code 233)					
3	Condominiums - Kanata	2.55	1.67	0.94	0.74	124 units
6	Riverside Condominiums -Hurdman	0.38	0.27	0.53	0.33	544 units
	Weighted Average	***0.78***	***0.53***	***0.61***	***0.41***	No. of Units (Condominiums)
	Studies with a Mix of Unit Types					
7	Trend Village	1.18	0.51	0.65	0.33	Total # Units
8	Central Park	1.08	0.73	0.68	0.48	Total # Units
13	La Verendrye Des Fleurs	1.71	0.75	1.84	1.03	Total # Units
14	Victor-Beaudry	1.56	0.64	1.11	0.66	Total # Units
	Non Residential Land Uses					
	Coffee/Donut Shop (ITE Code 937) with Drive through Window					
16	Tim's Horton's	308	240	165	102	2,422 sq ft
	Buildings Materials and Lumber Store (ITE Code 812)					
17	Réno-Dépôt	2.84	2.30	3.54	2.84	125,000 sq ft

See Appendix A-1 for detailed site locations

3.3 ITE Vehicle Trip Generation Rates

The trip generation studies undertaken as part of the previous section identified the vehicle trips entering and/or leaving the developments. This approach in determining vehicle trip rates is consistent with the trip generation studies submitted to ITE and published in their report "Trip Generation".

The vehicle trip rates published by the ITE reflect a wide range of trip generation studies largely carried out in the United States and in some cases Canada. The ITE publication is a widely used and referenced document but in many cases the background underlying travel behaviour in terms of transit usage or support for sustainable transportation varies considerably from that experienced in Ottawa-Gatineau. Section 2.4 discussed a variety of concerns and limitations regarding the application of ITE rates which included:

- Vehicular trip generation rates
- Suburban locations
- Little or no transit (other practisers apply a "rule of thumb" of 10% for public transportation)
- Primarily single use locations
- Studies conducted in the United States and Canada since the 1960s

The development sites reported usually provide good coverage of the various land use categories and consequently the vehicle trip rates presented are a valuable source of trip generation data. The applicable residential rates contained in Table 3.3: ITE Vehicle Trip Generation Rates (8th Edition) reflect extensive coverage of single-detached housing units but limited data for the apartment, condominium and townhouse housing types/categories. While some land use categories reflect a limited number of surveys, the ITE *Trip Generation* publication in general includes more than 162 land use categories and more than 4,800 individual trip generation studies and consequently it remains a valuable resource to planning agencies, planners, and transportation professionals.

Table 3.3: ITE Vehicle Trip Generation Rates (8th Edition)

ITE Vehicle Trip Generation Rates (8th Edition) AM and PM Peak Hours						
ITE Land Use Code	Residential Land Use		No. of Studies	Average No. of Units	Peak Hour Trip Rate	Peak Hour Trip Range
210	Single-detached dwellings	AM PM	286 314	194 208	0.75 1.01	0.33 - 2.27 0.42 - 2.98
224	Semi-detached dwellings, townhouses, rowhouses	AM PM	1 1	103 103	0.70 0.72	N/A N/A
231	Low-rise condominiums (1 or 2 floors)	AM PM	5 5	234 234	0.67 0.78	0.33 - 0.82 0.38 - 1.11
232	High-rise condominiums (3+ floors)	AM PM	4 5	543 444	0.34 0.38	0.31 - 0.48 0.34 - 0.49
233	Luxury condominiums	AM PM	4 4	110 110	0.56 0.55	0.50 - 0.62 0.48 - 0.63
221	Low-rise apartments (2 floors)	AM PM	27 27	257 257	0.46 0.58	0.25 - 0.86 0.38 - 0.93
223	Mid-rise apartments (3-10 floors)	AM PM	7 7	120 120	0.30 0.39	0.06 - 0.46 0.15 - 0.54
222	High-rise apartments (10+ floors)	AM PM	17 17	420 420	0.30 0.35	0.18 - 0.47 0.23 - 0.50

3.4 TRANS 2005 Origin Destination Survey Trip Generation Rates

The TRANS OD Survey is administered by area planning agencies. The survey represents the most comprehensive area-wide survey of local resident based travel behaviour and has been carried out on an approximate 10 year planning cycle. The survey is designed to provide detailed information on the number of daily trips by local residents, the reason for their trips and the modes used. Equally important the survey provides a framework to link reported travel decisions and behaviour with socio-economic household characteristics such as, type of dwelling unit and composition (including number of persons, age, employment status/job category and other) as well as auto ownership levels. Each of these variables impact the number and type of trips made to/from individual households and the detailed analysis of comprehensive travel surveys offer considerable opportunities to understand why and how often people travel. For example, socio-economic or neighbourhood variables typically associated with travel behaviour include:

- Household size including life cycle factors which identify
  - Number of persons more than 5 years old
  - Number of persons more than 16 years old with driver licenses
  - Employment status and occupation group / retirees / students
- Household income
- Type of dwelling unit (detached, semi, townhouse, apartment)
- Car ownership or availability
- Distance to the CBD, and urban or suburban locations

While each of these factors are important in understanding the potential for variation among residential trip generation rates, it is understood that the very nature of proposed residential development applications often vary considerably. In many cases, the number of residential dwelling units by broad category (i.e. single detached, semis etc.) is the only primary piece of information which defines the scale of residential development and as a result, average trip generation rates for various categories of dwelling units are important elements in the assessment of the transportation related impacts.

Despite the valuable information gained from OD travel surveys, it is important to highlight that when compared against trip generation studies undertaken from field observations using ground counts, differences in the development of trip generation rates are not unusual. Table 3.4: Data Collection Instruments and Factors Influencing Trip Rates summarize many of the issues surrounding the collection of trip data based on the two common methodologies identified.

Comprehensive OD surveys can capture person based travel behaviour which is not easily identified in other data collection techniques. This is critically important in developing tools and models to identify and analyse impacts associated with future regional growth strategies. However, in an effort to breakout more site specific data from the area-wide database, a level of detail available at the aggregate level of analysis is lost when finer levels of analysis are undertaken. **Of particular significance is the loss of the non-resident based travel which is directly related to residential developments.** As noted, apart from underreporting issues, OD survey results while representing an important element of the travel associated with residential land uses, fail to identify or quantify the number of trips made to/from surveyed households by non-residents. This represents the most significant difference between developing trip rates from broad OD surveys versus detailed ground counts. As noted, by virtue of the roadside observations (or ground counts) all travel is included by all modes to and from the residential development and therefore all travel is recorded independent of whether the trip is made by an area resident. Examples of travel by non-residents (that techniques used to calculate trip rates form OD surveys fail to consider) include but are not limited to the following:

- Service vehicles making calls to residential homes – these may include household maintenance activities, or delivery vehicles, including daily mail delivery and related municipal services.
- Private home child care operations or similar home based businesses, housekeeping of household cleaning services and/or other health related services.
- Visiting friends and relatives, etc.

The OD surveys by their very nature report and quantify household based travel of the residents but do not capture all trips to and from the household or the broader residential neighbourhood. The methodology used to identify and develop trip rates also focuses on the travel reported by the specific residents of the household and then only for those trips which either started or ended at their residence (household).

Table 3.4: Data Collection Instruments and Factors Influencing Trip Rates

Origin Destination Surveys (telephone interviews)	**Trip Generation Studies** (field observations/counts)
Survey Methodology Overview	
Focus is on reported travel either through a mail back household survey instrument or as is the more current practice based on detailed household telephone interviews. Most often the surveyors speak with a single household spokesperson (member of the household), who is asked to provide details regarding all trips made by members of the household for the previous day. These surveys include considerable depth of information regarding all aspects of the travel. Detailed trip starting times, origins, destinations, trip purposes and the primary modes used are all within scope of these types of interview surveys.	Detailed field observations are undertaken and counts record all persons entering and/or leaving the development by all travel modes. These counts are generally undertaken to coincide with the peak traffic times on the adjacent roadways, however they often extend beyond to the typical peak traffic periods. While vehicle counts have traditionally been the information collected, more recent interest in travel by alternative modes has seen a more focused approach to include all modes. This means observation and recording of travel to/from the development either by public transportation as well as walking or cycling.
Constraints and/or Opportunities	
Travel recorded is typically recorded for all members of the household surveyed and these trips which either start and/or finish at the home are included in the trip rate calculation. ▪ Some underreporting occurs particularly for discretionary travel as well as in the off peak travel times as spokespersons tend to be less familiar with this segment of travel for all members of the household. These trips tend to be less frequent and not made each and every day. ▪ Travel generated by the development by non-residents is not captured. The survey is designed to capture only reported resident based travel. Unlike traditional trip generation studies the use of surveys are not well designed to quantify the number of service related trips, commercial and/or visitor trips to/from households. A coarse estimate of the influence of non-resident travel suggests that this type of travel related to residential developments may be responsible, on average, for an additional 10 to 15% in terms of total trip generation.	All travel associated with the development is recorded from the field observations carried out at all access locations to/from the development. The survey therefore quantifies all travel including non-resident travel such as: ▪ Service related trips – utilities, mail, courier, deliveries, maintenance and renovation related trips for example made by non residents are observed and recorded. ▪ Visitors, either friends and/or family would be captured ▪ Commercial trips made into/out of the development are captured as are heavy vehicle trips which tend to be generally tabulated as part of the traffic counts. Through trips (i.e. trips entering and leaving the site access points without a trip end within the development) are difficult to quantify and/or exclude from the analysis. Care is generally exercised in the identification of trip generation study locations to ensure a low potential for through traffic.
Reported transportation mode usage is defined and reported as the primary mode (based on trip length) and as such public transportation usage as a proportion of all travel can be obtained accurately for resident household travel.	Transportation mode usage can be difficult to obtain. ▪ Estimates of vehicle occupancies are necessary to assist in identification of all person travel. ▪ Public transit use may be under-estimated depending on the distance to bus stops as in some cases; field observations may identify these trips as walk trips depending on the residential development size and/or layout. ▪ Non motorized links into/out of the development need to be identified and surveyed to ensure all travel to/from the development is captured.
OD Surveys typically capture significant socio-economic data which can be linked to the trip data which offers considerable depth in explanatory factors influencing local travel behaviour.	Trip generation studies typically identify primary and secondary independent variables such as the number of dwelling units by type and possibly the overall number of resident population.

3.4.1 Reported Trip Behaviour from the TRANS OD Survey

As indicated previously, traffic impact assessments are typically carried out based upon a good understanding of the proposed scale of the development in terms of number and type of dwelling units. When establishing local trip rates based on observed or reported travel behaviour the following are important considerations which influence the trip rate and transit usage:

- Identification of peak hour rates for various categories of housing types. The TRANS OD survey methodology in this respect, categorized housing types into the following categories:
  - Single-detached house
  - Semi-detached house
  - Row/townhouse
  - Apartment
  - Other (e.g. trailer, cottage, etc)
- Variation in trip making based on locational factors (i.e. downtown Core Area, Urban Area for areas inside the greenbelt etc.) has a strong history and interest with area planners and consequently the comprehensive region wide OD survey offered opportunities to explore and quantify these influencing factors. Also since development applications are location specific, should the rates differ by area then adjustment factors may be appropriate based on the location of the proposed development.
- Trip rates are heavily influenced by both the size of the household, employment status as well as the age of the household members. However, information regarding these specific life cycle factors is not readily available as part of the development application process. Proposed developments are typically only able to define the housing type and do not provide information on the potential occupant's age(s) or household size and consequently adjustment factors for these specific factors are not useful.
- Transit usage is influenced by a number of household attributes including the age of household members, employment status, car availability and overall transit service attributes. In many cases both household and area type can act as proxies for many of the variables which influence overall transit shares and consequently these factors are further explored in subsequent sections of this report.

A scan of the reported travel for each of the various dwelling types reported in the travel survey and the location of the residence was carried out for various levels of geography consistent with both currently established traffic zone and planning district boundaries. Exhibit 3.6: TRANS Traffic Zone System and Exhibit 3.7: TRANS Planning Districts and Aggregation highlight the various levels of geography which the TRANS OD Survey has been pre-coded: the Traffic Zone system (approximately 550 individual geographic units) and the 26 planning districts often used by TRANS agencies.

The detailed nature of the coding of the OD survey highlights opportunities to extract site specific travel behaviour as reported in the OD survey for various levels of geography as well as residential dwelling types. In addition to reporting out on the variation of trip generation rates across various detailed levels of geography, interest by the Steering Committee had been expressed to explore and identify possible variations across the urban area with regard to the following four broad categories: Core Area, Urban, Suburban and Rural areas. These categories have been highlighted in Exhibit 3.7: TRANS Planning Districts and Aggregation and further defined below:

- Core Area (1): The core area was defined as including the CBD's on both sides of the Ottawa River including the inner area. It is comprised of Ile de Hull, Ottawa Centre and

Ottawa Inner Area. The large concentration of employment located in this area combined with resident population located in the Inner Area (defined by the Rideau River and CP Rail) result in relatively higher densities which impact on the travel behaviour of the resident population.

- Urban Area (2): On the Ottawa side of the Ottawa River, the residential development located within the greenbelt due to a number of factors including proximity to the CBD, automobile dependency and the general organization of land uses provides an obvious separation between urban and suburban like development patterns. A review of Gatineau planning districts proximity to the downtown and the overall character of the development patterns placed the Hull Périphérie within the Urban category for the purposes of this analysis.
- Suburban Area (3): The planning areas which capture the suburban area are predominately located outside the greenbelt and in Gatineau include the planning districts which are located distant from the CBD. Commuting patterns with Ottawa-Gatineau remain focused on the concentration of employment located within the two CBD's of Ottawa-Gatineau and consequently the grouping of these more distant planning districts respects the travel behaviour associated with these districts.
- Rural Area (4): The planning districts largely located beyond Gatineau and Ottawa's urbanised development were included in this category. These planning districts include village centres as well as typical rural land uses, predominately agricultural based.

Exhibit 3.6: TRANS Traffic Zone System

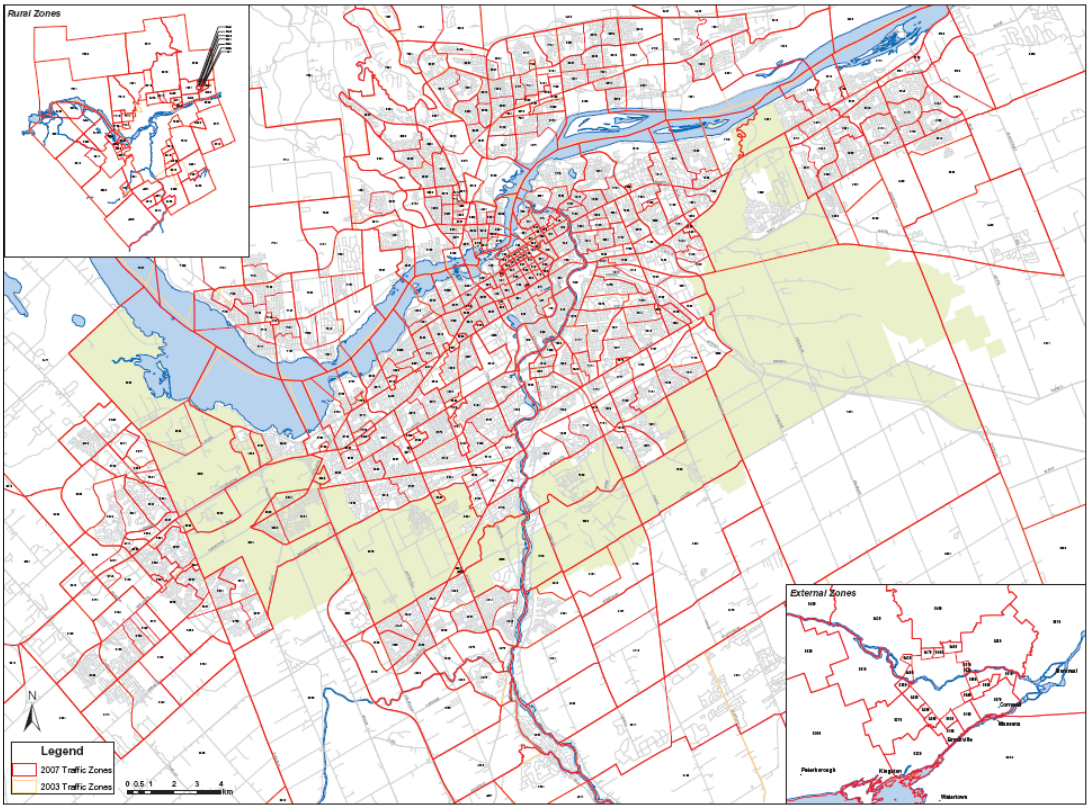
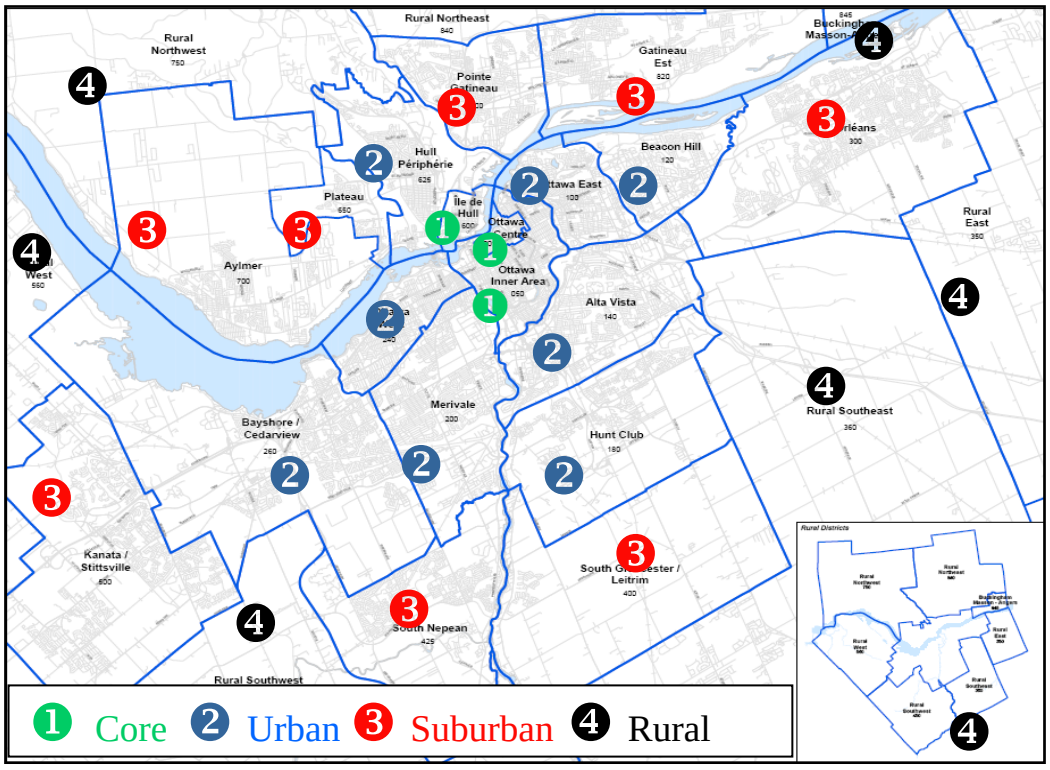


Exhibit 3.7 TRANS Planning Districts and Aggregation



3.4.2 Reported Trip Rates and Transit Usage - OD Survey

The determination of trip rates for residential dwelling types was carried out for each of the categories noted. Charts were prepared which highlight the variation in trip rates as reported through the TRANS OD Survey. Exhibits 3.8 through 3.11 highlight the analysis of trip rates identified for the AM peak hour for the four primary categories of dwelling unit types namely, single-detached, semi-detached, row/townhouses and apartment units. Comparable charts for the PM peaks were also prepared and are presented as part of the Appendix material.

The series of charts presented in this section provide the trip rate (vertical axis) based on the reported travel from the TRANS OD Survey associated with each of the planning districts and categories by the three primary geographies; core area, urban and suburban. The rural area is tabulated separately in the Technical Appendices. Caution needs to be exercised with respect to trip rates developed for the rural areas due to the limited sample size and or number of surveys undertaken. The Technical Appendices highlight specific household sampe sizes for the various housing categories reported.

In addition, along the horizontal axis of the single family unit type (Exhibit 3.8) for example, the Core Area Ottawa planning districts are presented first, followed by Gatineau planning districts and then the weighted average for Ottawa (0.73 person trips AM peak hour) and Gatineau (0.43 person trips AM peak hour) are presented as well as the weighted average of the National Capital Region Core Area Planning Districts which includes both Ottawa and Gatineau.(i.e. Core Area NCR Planning Districts: 0.70 person trips AM peak hour). The chart also presents similar trip rates for each the Urban and Suburban areas in the same format noted previously which is also followed by a NCR average trip rate (all NCR Planning Districts: 0.73 person trips AM peak hour) for the dwelling unit type classified as single-detached units.

The presentation of the trip rates in this manner is helpful in comparing the reported trip generation rates across the geographic areas for each dwelling unit type. In addition, any potential differences and/or similarities among the various trip rates are readily discernable.

The AM peak hour trip generation charts have been presented in this section of the report as they are generally higher than the PM peak hour rates. This may be attributed to the commuter travel peaking characteristics, school travel for example, being coincident and concentrated temporally in the AM when compared against the PM peak period which tends to be spread across a wider time frame with school and commuter trips being separated temporally.

Exhibit 3.8: Single-Detached AM Peak Hour Trip Rate Variation

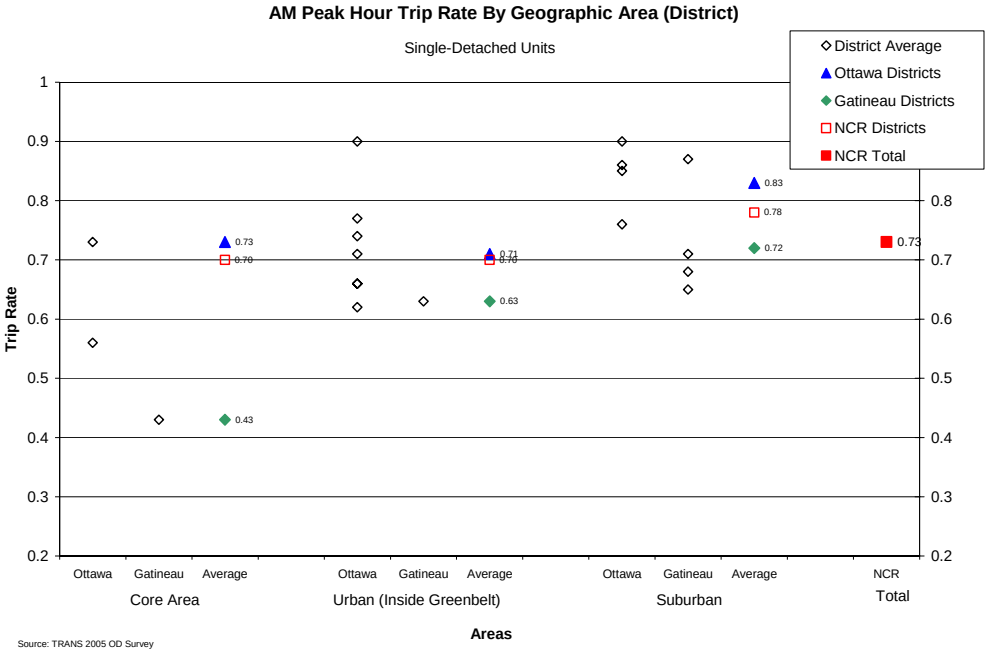


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Exhibit 3.9: Semi-Detached AM Peak Hour Trip Rate Variation

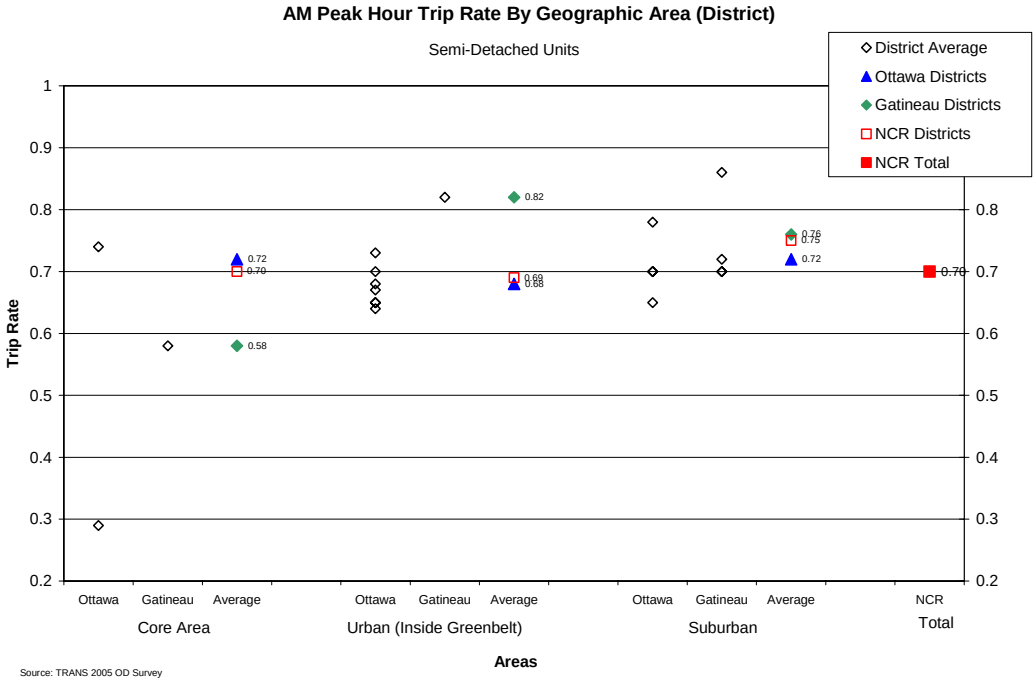

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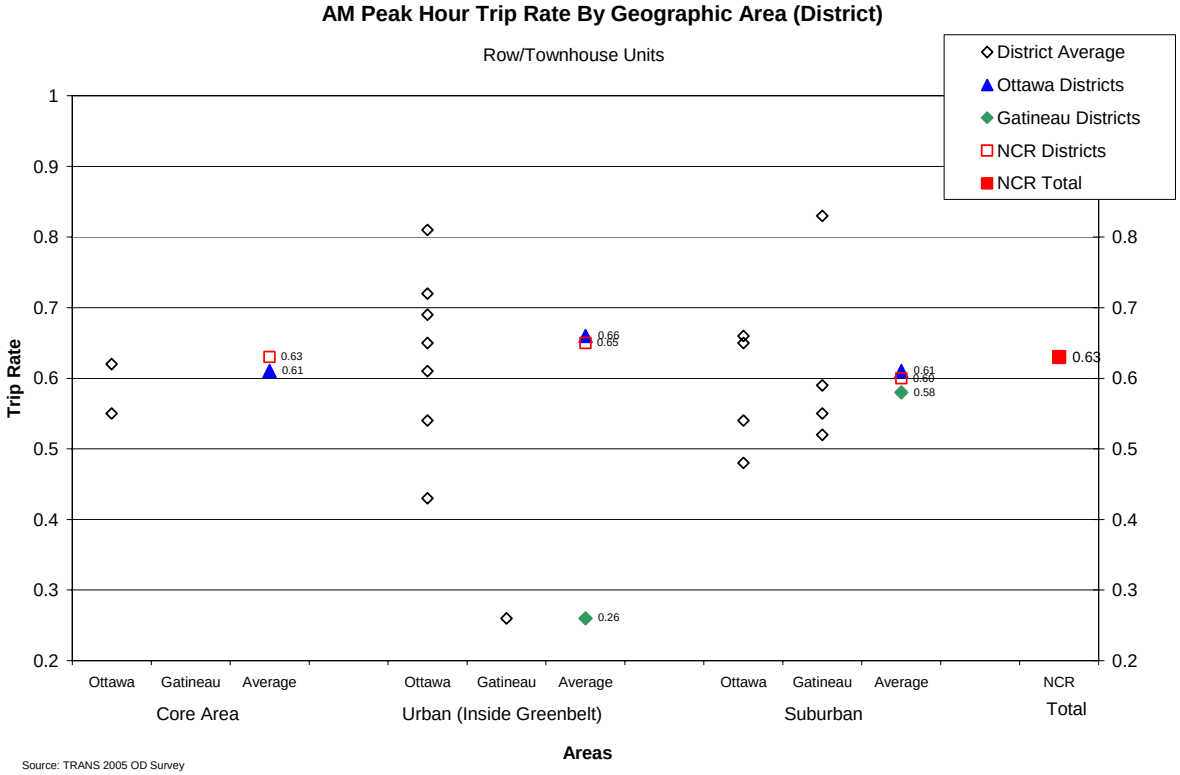
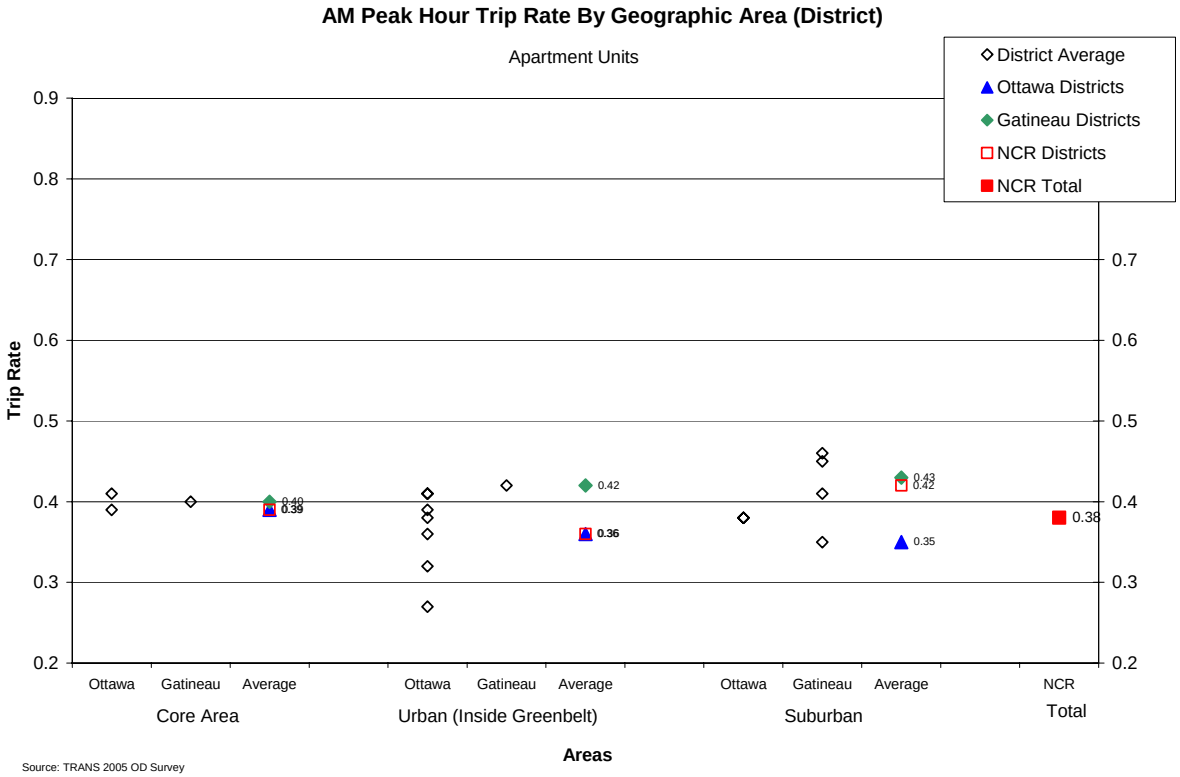
Exhibit 3.10: Row/Townhouse Units AM Peak Hour Trip Rate Variation



Source: TRANS 2005 OD Survey

Exhibit 3.11: Apartment Units AM Peak Hour Trip Rate Variation



Source: TRANS 2005 OD Survey

Similar charts were prepared for the PM peak hour based on both the Planning District level of aggregation as well as the more detailed Traffic Zone level. The Traffic Zone trip rate data provides more detailed insight regarding the variation as the smaller geographic areas result in a larger number of data points. These data and charts include transit usage rates for both AM and PM peak hours as well as the various geographic areas and are included as Appendix B.

Summary tables of the trip rates and the reported transit usage for each of the dwelling unit types and for the four broad geographic areas are presented as Table 3.5: Person Trip Generation Rates & Variation by Area Type and Table 3.6: Mode Share & Variation by Area Type. Trip generation rates by dwelling unit type are highlighted for each of the geographic areas as well as the percentage difference or variation between specific geographic areas and the weighted average across all geographic areas for individual dwelling types. The mode share percentages in Table 3.6 have been presented such that when applied to the person trip rates the following elements are easily determined:

- Vehicle trip rates, consequently the vehicle percentage provided allows for the direct conversion of a person trip rate to the vehicle trip rate. As a result the occupancy of the vehicles would be calculated separately. The sum of the three percentages presented do not sum to 100 percent, as the vehicle passengers have been deliberately excluded.
- The transit percentage is based on the proportion of travel that was reported to have used pubic transit and considers travel by non-motorised modes.
- The non-motorised mode has also been presented, as past experience has indicated that higher shares for non-motorised modes have been recorded in more centralized downtown locations.

Table 3.5: Person Trip Generation Rates & Variation by Area Type

Person Trip Generation Rates
(Full OD Sample)
AM and PM Peak Hours

Dwelling Unit Types \ Geographic Areas		Core Area		Urban Area (Inside the greenbelt)		Suburban (Outside the greenbelt)		Rural		All Areas
		Person Trip Rate	%▽	Person Trip Rate	%▽	Person Trip Rate	%▽	Person Trip Rate	%▽	Person Trip Rate
Single detached:	AM	0.70	- 4 %	0.70	- 4 %	0.78	+ 7 %	0.66	- 10 %	0.73
	PM	0.59	- 8 %	0.60	- 6 %	0.69	+ 8 %	0.62	- 3 %	0.64
Semi-detached:	AM	0.70	0 %	0.69	- 1 %	0.75	+ 7 %	0.52	- 26 %	0.70
	PM	0.66	+ 2 %	0.56	- 14 %	0.71	+ 9 %	0.60	- 8 %	0.65
Row Townhouse:	AM	0.63	0 %	0.65	+3 %	0.60	- 5 %	0.66	+5 %	0.63
	PM	0.54	- 7 %	0.56	- 3 %	0.61	+5 %	0.55	- 5 %	0.58
Apartment:	AM	0.39	+ 3 %	0.36	- 5 %	0.42	+ 11 %	0.29	- 24 %	0.38
	PM	0.40	+ 3 %	0.36	- 8 %	0.44	+ 13 %	0.59	+ 3 %	0.39
All Types:	AM	0.53	- 17 %	0.60	- 6 %	0.71	+ 11 %	0.64	0 %	0.64
	PM	0.50	- 14 %	0.53	- 9 %	0.65	+ 12 %	0.60	+ 3 %	0.58

Note: 5 % (+ or -) represents the percentage delta change in trip rate when compared against the average trip rate across all geographic areas

Table 3.6: Mode Share & Variation by Area Type

Mode Shares Percentage
(Full OD Sample)
AM and PM Peak Hours

Dwelling Unit Types / Geographic Areas		Core Area			Urban Area (Inside the greenbelt)			Suburban (Outside the greenbelt)			Rural			All Areas		
		Vehicle Trips	Transit Share	Non-Motorised	Vehicle Trips	Transit Share	Non-Motorised	Vehicle Trips	Transit Share	Non-Motorised	Vehicle Trips	Transit Share	Non-Motorised	Vehicle Trips	Transit Share	Non-Motorised
Single - Detached:	AM	39%	18%	31%	52%	25%	11%	56%	25%	8%	64%	23%	4%	56%	24%	9%
	PM	48%	11%	29%	61%	16%	11%	65%	18%	5%	73%	11%	3%	65%	16%	7%
Semi-Detached:	AM	38%	24%	30%	48%	31%	10%	52%	26%	10%	64%	25%	4%	50%	27%	12%
	PM	50%	23%	9%	62%	23%	4%	65%	18%	4%	78%	10%	1%	64%	19%	4%
Row / Townhouse:	AM	36%	17%	40%	44%	35%	10%	54%	29%	8%	73%	12%	5%	48%	30%	11%
	PM	63%	19%	13%	57%	29%	2%	66%	21%	2%	77%	9%	-	62%	24%	5%
Apartment:	AM	28%	28%	43%	40%	42%	14%	42%	33%	13%	67%	5%	29%	37%	36%	22%
	PM	37%	39%	13%	49%	36%	4%	61%	27%	1%	82%	2%	-	50%	34%	5%
All Types:	AM	34%	22%	36%	49%	29%	11%	55%	26%	8%	65%	22%	4%	52%	26%	11%
	PM	46%	23%	20%	58%	22%	8%	65%	29%	4%	73%	11%	3%	63%	19%	6%

Note: Percentages do not necessarily sum to 100% as the proportion of automobile passengers have not been tabulated. Vehicle trips reflect the percentage of vehicle drivers.

A review of the resulting trip rates and mode shares as presented in Table 3.5 and Table 3.6 as well as the variations among these rates and mode shares revealed the following observations:

- As previously highlighted the trip generation rates reported, on average, are higher for the AM peak hour when compared against the PM rates, uniformly across all dwelling unit types and geographic areas.
- Similar to the person trip rates, the reported transit shares are higher in the AM peak hour and consequently this may reduce the impact of the higher vehicle trip generation rates for the AM compared against the PM peak. Conversely, the vehicle percentage for the AM trip rate is lower than that reported for the PM peak.
- The non-motorised modes (walking and cycle modes) are the highest for the core area with shares of almost 30% for many categories. This was likely responsible for the core area also reporting the lowest proportion of vehicle trips when compared against the proportion of vehicle trips noted for the remaining geographic areas. The Core Area is also fairly confined in terms of geographic size and has the highest allocation of district employment.
- The Urban Area reported, on average, higher transit shares than the other geographic areas, noting of course that the high rates of non-motorized shares in the core area was responsible for the Core Area's lower transit shares when compared with Urban Areas.
- The summary of trip rates by dwelling unit types indicated that little difference was reported between single-detached and semi-detached housing types. The rates calculated for row/townhouses were lower than the single and semi-detached units (approximately 10% lower than the average rate for all unit types). The apartment unit category reported the lowest rate of all dwelling categories analyzed (approximately 40%

lower than the average rate for all unit types). This trend was also observed in the trip generation studies undertaken in the spring of 2008 and reported in earlier sections of this report.

- Similarly for mode shares, the reported proportion of travel reported by vehicle was highest for single-detached, followed by semi-detached, row/townhouses and apartment. Conversely the reverse trend of increasing transit shares for these categories was noted.
- **The rural area is largely comprised of single-detached dwelling unit types and consequently care needs to be exercised in the remaining dwelling unit types presented for the rural area.** In this respect the reader is directed to review the detailed tables presented in Appendix B which highlight the number of units, trips reported and the resulting trip generation rate for each of the categories analyzed.
- Of particular interest to area planners was the variation of trip rates across the broad categories of area type and the results indicate that Suburban trip rates were largely reported as being much higher than the average rate across all geographic areas and within each of the dwelling unit types surveyed.

While these reported rates correctly portray the travel tendencies reported in the TRANS OD Survey, the issue of location may not be the sole factor behind the trend which has emerged. For example, other factors which may contribute to the reported trip rates and/or mode shares could well be associated with any one of the following potential biases:

- Larger households in the suburban areas versus inner areas.
- General biases in the population distribution, i.e. different levels of elderly or retirees could all contribute to differences in the reported trip rates.

Table 3.7: Distribution of Household Types by Geographic Area - TRANS OD Survey Sample highlights the impact of the survey sample distribution across the survey area types. As indicated more than 23,000 households had been surveyed across the region representing an approximately 5 percent sample of all households in the region. This table while reporting on household type and distribution does not provide any stronger evidence that the reported trip rates may be geographically skewed by household life cycle factors which impact on household trip rates or travel modes used including the number and ages of the household members and/or employment status. It does however indicate that only 5% (694 units) of the sample of all single-detached housing types (13,477 single-detached units) were located in the Core area while this number of units (694) also represented 30% of all units types within the Core Area (2,251 all units) . The low sampling frame associated with all unit types other than the single-detached is also noted for the Rural Area which, while highlighting the availability of these housing types, also raises concerns with respect to the reliability of rates associated with these few samples within the rural area for these specific housing types.

Never the less the distribution of household size and the reported age of the oldest member in the household were also tabulated and analyzed. Exhibit 3.12 Distribution of Household Size and Age presents graphically the accumulated total of households, as a percentage for each of the distinct areas explored. A summary of the charted data is outlined below:

- A comparison of the age of the oldest member in the household was used to identify any specific differences in the distribution of perhaps higher proportion of retirees for example. Overall the Urban areas (inside the greenbelt) reported higher proportions of their households with persons older than 55. The dashed red line for the Urban area indicates that in approximately 37% of its total households (100%- 63%) the oldest person was 55 years or older. The three other areas all reported that for the same age

Table 3.7: Distribution of Household Types by Geographic Area - TRANS OD Survey Sample

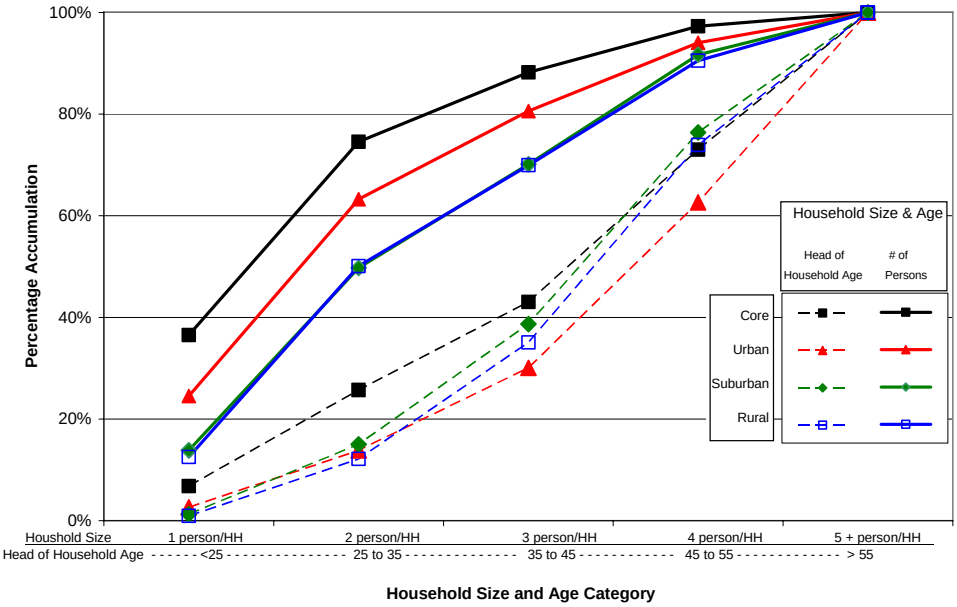
Sample Size of Number of Households					
Dwelling Unit Types \ Geographic Areas	Urban Core	Urban (Inside the greenbelt)	Suburban (Outside the greenbelt)	Rural	All Areas
Single detached	673 5% (30%)	4,419 33% (50%)	6,372 47% (65%)	2,013 15% (87%)	13,477 (58%)
Semi-detached	192 9% (9%)	697 34% (8%)	1,052 51% (11%)	122 6% (5%)	2,063 (9%)
Row Townhouse	226 8% (10%)	1,384 48% (16%)	1,241 43% (13%)	60 2% (3%)	2,911 (13%)
Apartment	1,101 27% (49%)	2,080 50% (24%)	903 22% (9%)	49 1% (2%)	4,133 (18%)
Other	59 10% (3%)	237 40% (3%)	223 38% (2%)	67 11% (3%)	586 (3%)
All Household Types	2,251 10%	8,817 38%	9,991 42%	2,311 10%	23,170

Note: 5%represents the proportion of specific unit type within the specific geographic area expressed as a percentage of the total units all geographic areas. (horizontal)
(30%) represents the proportion of specific unit type expressed as a percentage of the total unit types within a specific geographic area. (vertical)

group (55 years or older) that the number of households was only 25 percent (100%-75%). Since peak hour trip making has been noted to decrease with persons reaching retirement age and beyond it is therefore likely that the higher proportion of households with household members for the Urban Area have influence on the trip rates when compared against the remaining area types.

- The number of persons in the household, also reported differences across the various geography types, however these were much more apparent for all area types with the exception of rural and suburban which followed a similar distribution. For example, single occupant households for the core area recorded the highest proportion at 37% of its households, followed by 25% for the Urban area and 13% for both Suburban and Rural areas. Similar to the variation in age across geography types, the variation in the proportion of the number of household members by area type has the potential to significantly impact on the calculation of rates for various housing categories.

Exhibit 3.12 Distribution of Household Size and Age by Area Type



3.4.3 Accounting for Survey Biases - Uniform Sampling Frames

There is a reasonable expectation that household composition factors like age and number of persons vary across housing types and therefore have a considerable impact on the reported trip rates. However, a concern as expressed in the previous section, is when reported trip rates and/or reported mode shares are organized and tabulated for various geographical areas and in some cases the independent variable i.e. geography, may be masking other variables which have a more direct influential impact on the rate. For example, in older neighbourhoods with higher levels of older residents and smaller household sizes that these specific factors themselves rather than the location i.e. "inside the greenbelt" may have a more direct influence on the resulting trip rate. Using these rates for new developments may therefore underestimate the impact of the development and the transportation requirements, assuming of course the future residents of the new development are not consistent with the surrounding demographics of the neighbourhood.

An effective means to differentiate between trip rates which may be highly influenced by existing or current household composition attributes compared against other possible influences related to geographical area types, i.e. core, urban, suburban and rural is to identify a uniform representative control sample. In this case, the uniform sample defined is based on the following attributes:

- Households with 3 members only: this was chosen to ensure that variations in household size within a specific sample size would not be responsible for unduly influencing the resulting trip rates and/or reported mode shares.
- Placing an age cut off for oldest member of the household at 50 years of age. This ensures more homogeneity in the households for the sample drawn. The selection of households with persons no older than 50 would minimize the possibility of a specific bias in the full sample relating to retirees and/or other location factors. As a result any reported differences noted in the trip rates across the various geographic areas could then be largely attributed to location factors directly, as the sample drawn was significantly more uniform in terms of life-cycle factors. Typical life-cycle factors (i.e. household size, employment status, income, health of household members) reflect the current household's position in the overall life-cycle spectrum. Age is often used as a proxy for the position of the household in the overall life-cycle.

Trip rates were compiled based on the redefined sample as noted above. The number of households analysed was approximately 2,300 or about ten percent of the total TRANS OD survey sample of 23,000 households. The resulting trip rates were then determined for this sample of three person households with residents less than 50 years of age.

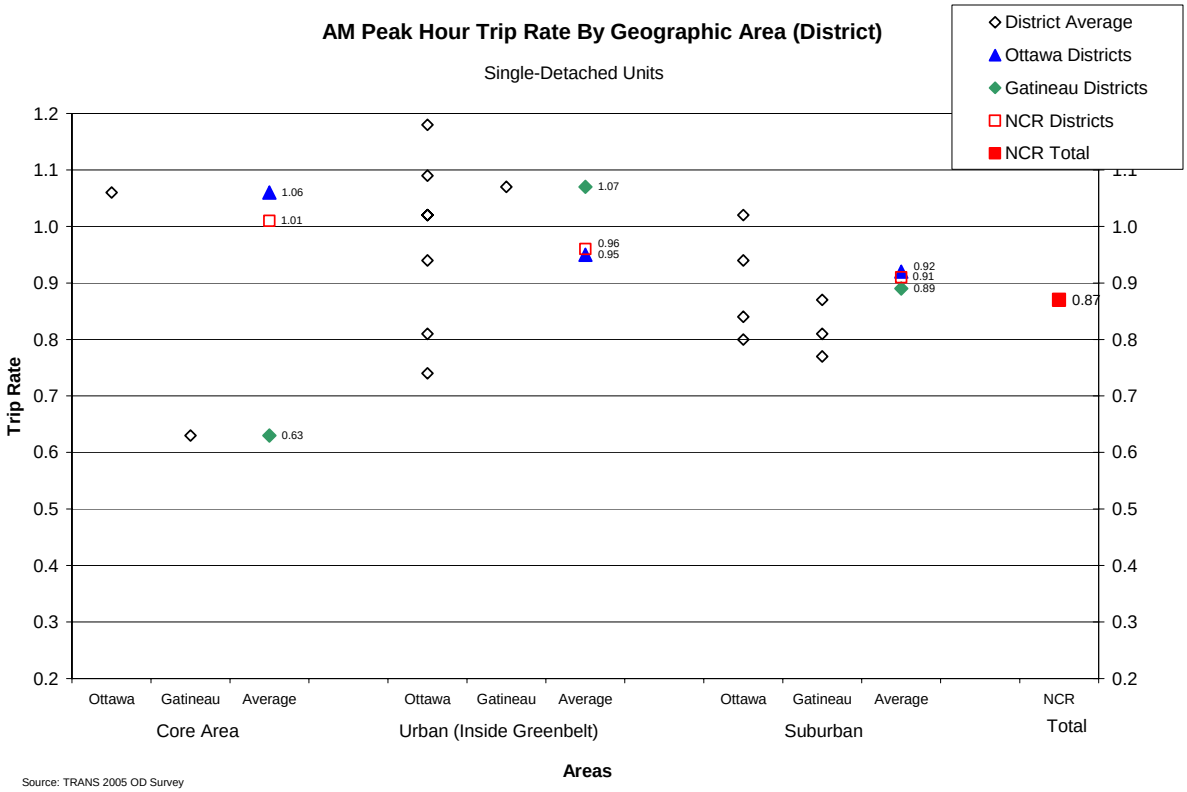
3.4.4 Reported Trip Rates & Transit Usage -Uniform Sampling Frames

As was presented in the previous section of the report, charts for the AM peak hour and for the various dwelling unit types were prepared for this newly defined sample and are presented in this section of the report while the PM peak hour charts and the tabulated data results are incorporated in Appendix B. Exhibits 3.13 through 3.16 chart the trip rates for the four dwelling unit types for the sample drawn with household size set at three persons and only households with all residents less than 50 years old.

These rates are higher than the rates determined for all household types previously analyzed. The primary reason for the increase in the trip rates for all dwelling categories is that the sample drawn is comprised of 3 person households which would typically have more trips per household than the 1 and 2 person households. This sample unlike the previous excludes households with persons aged 50 and over. This was done to exclude potential retirees for the

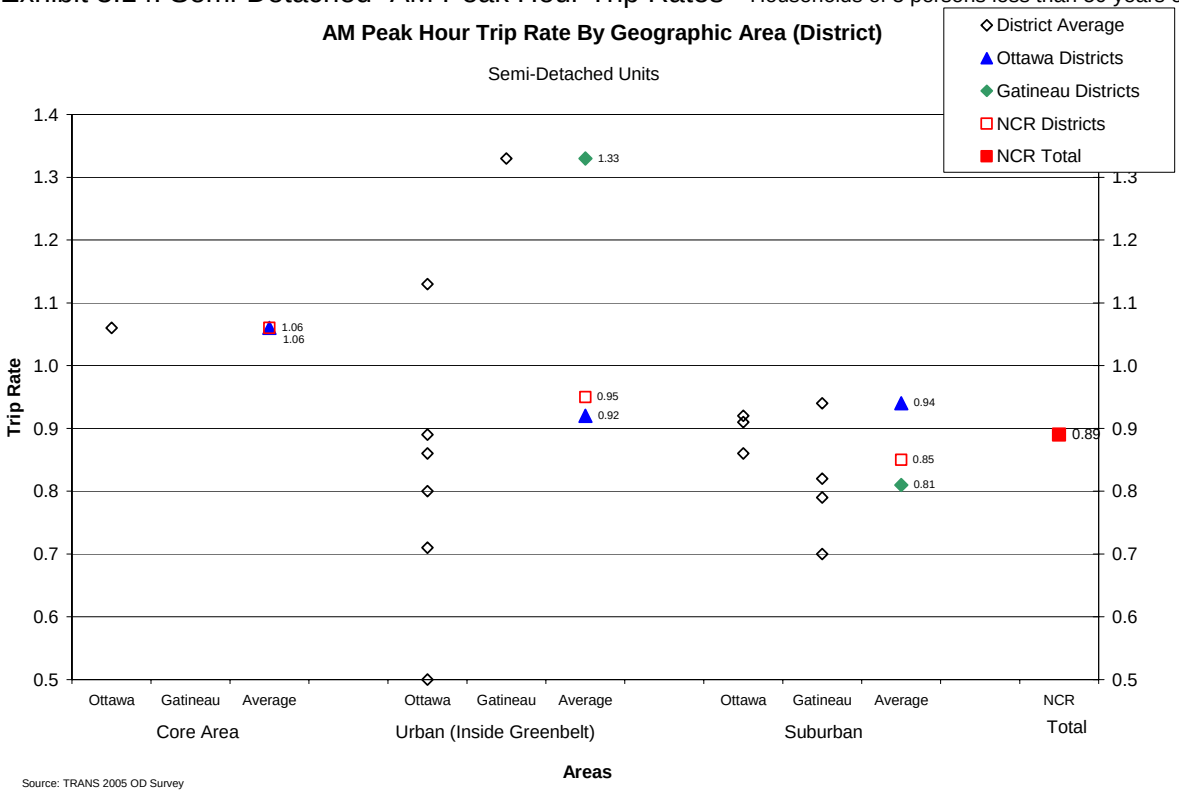
sampling frame as their distribution across the geography types may also have had an influence on the trip rates.

Exhibit 3.13: Single-Detached -AM Peak Hour Trip Rates – Households of 3 persons less than 50 years old.



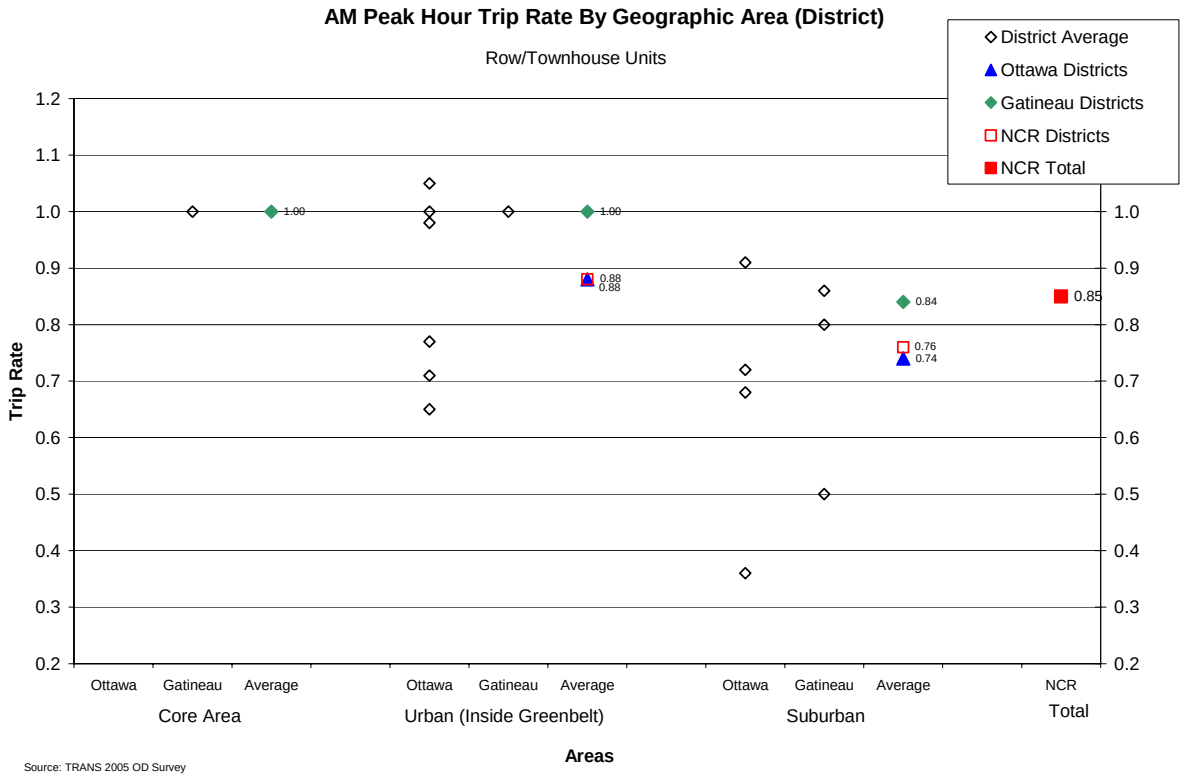
Source: TRANS 2005 OD Survey

Exhibit 3.14: Semi-Detached -AM Peak Hour Trip Rates – Households of 3 persons less than 50 years old.



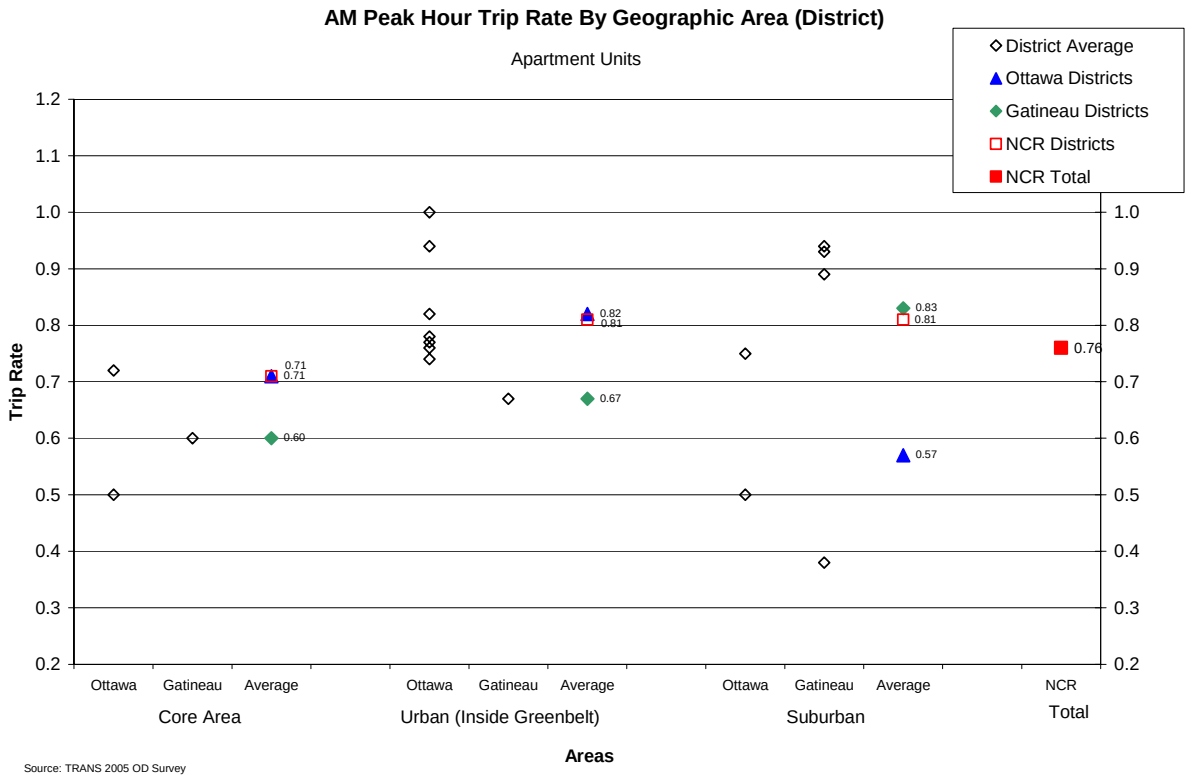
Source: TRANS 2005 OD Survey

Exhibit 3.15: Row/Townhouses -AM Peak Hour Trip Rates– Households of 3 persons less than 50 years old.



Source: TRANS 2005 OD Survey

Exhibit 3.16: Apartment Units -AM Peak Hour Trip Rates – Households of 3 persons less than 50 years old.



Source: TRANS 2005 OD Survey

The trip rates for each of the geographies studied differed from the previous rates associated with the full TRANS OD Survey. These rates are highlighted in Table 3.8: Person Trip Generation Rates - (3 person households with residents less than 50 years old). A comparison of trip rates for each of the dwelling unit types across the various geographies indicate that person trip rates identified for the Core Area are among the highest reported. In addition, the reported mode shares were also tabulated and Table 3.9: Mode Shares - 3 person households with residents less than 50 years old presents these mode shares for each of the various geographies and both the AM and PM peak hours.

In general, the comparison of a more uniform sample (3 person households with residents less than 50 years old) revealed the following:

- The variation of the trip rate for each of the geographies indicated that those identified for the various dwelling units located within the core area were highest when compared against other geographic areas, in terms of total person trips by household type. Given the location costs and the proximity to destinations, it may be reasonable to rationalize that this area would generate the highest person trips on a per household basis. It is noted that the proportion of travel by vehicle (i.e. vehicle drivers) as highlighted in Table Table 3.9 for the Core Area is the lowest when compared against all other geographic areas. As a result, the Core Area vehicle trip rate may be below that reported for other geographic areas, highlighting the role of other modes of transportation namely walking and public transit.
- A comparison of person trip rates for the Urban Areas located within the greenbelt versus those areas outside the greenbelt (Suburban Areas) indicate the trip rates are extremely similar in magnitude within each of the four dwelling unit types. Overall the person trip rates for the Urban Areas were slightly higher (~5%) than the Suburban, however off setting this trend was the lower vehicle dependency (~10% lower vehicle use) associated with the Urban Area. This would suggest that the net vehicle trip rates for the Urban Area would be lower than comparable Suburban Area rates despite higher person trip rates. This suggests lower vehicle dependency or conversely higher transit and non-motorised trip rates for the Urban Area when compared against the Suburban Areas.
- The Rural areas, based on the uniform sample evaluated, reported person trip rates which are significantly less than the average of all geographic areas. For single-detached housing types, which are the primary housing type available in rural areas, the person trip rates were 25% less than the average recorded across all geographies and approximately 35% when compared directly against the Urban Areas for example. As would be anticipated the Rural Areas reported the highest vehicle usage among the remaining geographic areas analyzed.
- The selection of a more uniform sample (i.e. 3 person households with residents 50 years of age or less) also highlighted that the person trip rates across various housing types reported similar person trip rates. The AM peak hour for example, reported single-detached person trip rates of approximately 0.89 per household compared with 0.89 and 0.85 for semi-detached and row/townhouse, respectively. However, while the person trip rate variation among the housing types was less, the mode shares across the housing types did highlight differences in transit usage by housing type. Transit use increased progressively and conversely vehicle use decreased for the following housing types; namely single-detached, semi-detached, row/townhouses and apartments. As a result the vehicle trip rates would also follow a similar trend of decreasing vehicle trips for each of housing types.

Table 3.8: Person Trip Generation Rates - (3 person households with residents less than 50 years old)

Person Trip Generation Rates

All Households of three persons 50 years of age or less
AM and PM Peak Hours

Dwelling Unit Types / Geographic Areas		Core Area Person Trip Rate	Core Area %▽	Urban Area (Inside the greenbelt) Person Trip Rate	Urban Area (Inside the greenbelt) %▽	Suburban (Outside the greenbelt) Person Trip Rate	Suburban (Outside the greenbelt) %▽	Rural Person Trip Rate	Rural %▽	All Areas Person Trip Rate
Single detached:	AM	1.01	+ 16%	0.96	+ 10%	0.91	+ 5%	0.65	- 25%	0.87
	PM	0.61	- 13%	0.76	+ 9%	0.72	+ 3%	0.59	- 16%	0.70
Semi-detached:	AM	1.06	+ 19%	0.95	+ 7%	0.85	- 4%	0.85	- 4%	0.89
	PM	0.83	+ 28%	0.56	- 14%	0.69	+ 6%	0.50	- 23%	0.65
Row Townhouse:	AM	1.42	+ 67%	0.88	+ 4%	0.76	- 11%	1.12	+ 32%	0.85
	PM	1.00	+ 37%	0.74	- 1%	0.73	0%	0.47	- 36%	0.73
Apartment:	AM	0.71	- 7%	0.81	+ 7%	0.81	+ 7%	0.33	- 57%	0.76
	PM	0.71	+ 20%	0.55	- 7%	0.62	+ 5%	0.33	- 44%	0.59
All Types:	AM	0.92	+ 8%	0.91	+ 7%	0.86	+ 1%	0.68	- 20%	0.85
	PM	0.70	+ 3%	0.69	+ 1%	0.71	+ 4%	0.58	- 15%	0.68

Note: 5 % (+ or -) represents the percentage delta change in trip rate when compared against the average trip rate across all geographic areas

Table 3.9: Mode Shares – (3 person households with residents less than 50 years old)

Reported Modes Shares

All Households of three persons 50 years of age or less
AM and PM Peak Hours

Dwelling Unit Types / Geographic Areas		Core Area Vehicle Trips	Core Area Transit Share	Core Area Non-Motorised	Urban Area (Inside the greenbelt) Vehicle Trips	Urban Area (Inside the greenbelt) Transit Share	Urban Area (Inside the greenbelt) Non-Motorised	Suburban (Outside the greenbelt) Vehicle Trips	Suburban (Outside the greenbelt) Transit Share	Suburban (Outside the greenbelt) Non-Motorised	Rural Vehicle Trips	Rural Transit Share	Rural Non-Motorised	All Areas Vehicle Trips	All Areas Transit Share	All Areas Non-Motorised
Single - Detached:	AM	35%	24%	35%	54%	20%	12%	63%	20%	7%	65%	22%	6%	59%	21%	10%
	PM	35%	14%	47%	60%	15%	15%	65%	18%	6%	79%	3%	3%	65%	14%	9%
Semi-Detached:	AM	37%	40%	11%	49%	32%	12%	58%	21%	10%	83%	14%	2%	56%	25%	10%
	PM	32%	29%	25%	62%	25%	8%	58%	13%	10%	95%	5%	-	59%	16%	10%
Row / Townhouse:	AM	29%	32%	39%	43%	33%	13%	57%	30%	4%	60%	20%	7%	50%	31%	10%
	PM	47%	-	53%	48%	26%	9%	62%	22%	6%	92%	8%	-	56%	23%	9%
Apartment:	AM	23%	32%	41%	31%	44%	16%	32%	36%	23%	71%	-	29%	30%	39%	23%
	PM	18%	29%	49%	44%	28%	22%	62%	28%	4%	75%	-	13%	43%	27%	24%
All Types:	AM	31%	29%	34%	47%	29%	13%	60%	23%	8%	66%	21%	6%	54%	25%	12%
	PM	30%	21%	45%	55%	20%	14%	63%	18%	6%	80%	4%	2%	61%	17%	11%

Note: Percentages do not necessarily sum to 100% as the proportion of automobile passengers have not been tabulated. Vehicle trips reflect the percentage of vehicle drivers.

3.4.5 Uniform Sampling Frame – Influence on Vehicle Trip Rates

The focus of the assessment of person trip rates has been to understand more fully the influence of transit use and non-motorised use across various housing types as well as geographic areas. However, there is a need to quantify the vehicle rate as it is ultimately applied, to identify the increase in vehicular traffic on the adjacent road network as a result of the proposed development. Again, the importance of encouraging travel by modes other than vehicles in contributing to a more sustainable transportation system is understood, however the need to identify the appropriate vehicle trip rates by household category remains an important aspect in undertaking any future assessment of future development proposals.

Table 3.8 and 3.9 highlighted the variation of person trip generation rates as well as the influence of mode use on trip making across the various household types and geographic areas. Information contained in these two tables of person trip rates and mode use can then be applied to identify the vehicle trip rates. Table 3.10: Vehicle Trip Generation Rates - (3 person households with residents less than 50 years old) was therefore prepared based on the manipulation of data contained in Table 3.8 and Table 3.9.

Table 3.10: Vehicle Trip Generation Rates - (3 person households with residents less than 50 years old)

Vehicle Trip Generation Rates
All Households of three persons 50 years of age or less
AM and PM Peak Hours

Dwelling Unit Types \ Geographic Areas		Core Area		Urban Area (Inside the greenbelt)		Suburban (Outside the greenbelt)		Rural		All Areas
		Vehicle Trip Rate	%▽	Vehicle Trip Rate	%▽	Vehicle Trip Rate	%▽	Vehicle Trip Rate	%▽	Vehicle Trip Rate
Single detached:	AM	0.35	- 32%	0.52	+ 1%	0.58	+ 12%	0.42	- 18%	0.52
	PM	0.21	- 53%	0.46	+ 1%	0.47	+ 3%	0.47	+ 2%	0.46
Semi-detached:	AM	0.39	- 21%	0.46	- 8%	0.49	- 2%	0.71	+ 42%	0.50
	PM	0.27	- 30%	0.35	- 9%	0.40	+ 5%	0.48	+ 24%	0.38
Row Townhouse:	AM	0.41	- 2%	0.38	- 9%	0.43	+ 3%	0.67	+ 59%	0.42
	PM	0.47	+ 15%	0.36	- 14%	0.45	+ 10%	0.43	+ 5%	0.41
Apartment:	AM	0.16	- 29%	0.25	+ 9%	0.26	+ 14%	0.24	+ 2%	0.23
	PM	0.13	- 48%	0.24	- 4%	0.38	+ 51%	0.25	- 2%	0.25
All Types:	AM	0.28	- 38%	0.43	- 6%	0.51	+ 12 %	0.45	- 2 %	0.46
	PM	0.21	- 50%	0.38	- 8%	0.45	+ 9 %	0.47	+ 13 %	0.41

Note: 5 % (+ or -) represents the percentage delta change in trip rate when compared against the average trip rate across all geographic areas

The vehicle trip rates as presented in Table 3.10, while associated with 3 person households with all residents 50 years old or younger does highlight that Suburban Areas are on average approximately 10% higher than comparable vehicle trip rates associated with the Urban or Core Areas. The analysis undertaken of trip rates supports the following findings:

- Despite the higher person trip rates identified for the Core Area, the vehicle trip rates are among the lowest for all dwelling unit types. This is largely attributed to the high usage of non-motorised modes as well as support for transit as a viable alternative to auto use.

- in general, the Urban Area despite having reported higher person trip rates than the Suburban Areas, have reported lower vehicle trip rates which can also be attributed to slightly higher use of transit as well as the non-motorised modes than were reported for the Suburban Areas.
- The sample of the Rural Areas is relatively small and consequently for unit types other than single-detached, the differences noted are not considered representative.

3.4.6 Identifying Sampling Frames for New Residential Developments

The analysis of trip rates in the previous section revealed the influence of demographic characteristics and life-cycle variables including household size and employment status on peak hour trip making. In addition, the number of trips on a household basis increased dramatically when specific segments of the population were excluded. As a result care needs to be exercised in the identification of specific segments of the population which ought to be included in determining trip rates for various development applications.

As noted previously, most residential development applications are defined in terms of their location and the number of dwelling units by type. Additional background knowledge with respect to key household life-cycle variables are not generally widely available. Nevertheless in the identification of an appropriate sampling frame which could be applied to develop trip generation rates for new residential developments which may be considered both reasonable and realistic based on the forgoing analysis, the following elements were noted:

- Include all household size categories, including for example single person households. Excluding specific household size categories for specific housing types was not considered appropriate.
- Place an age cut off at 55 years for the sample as a means to exclude the impact of households comprised of older residents and retirees. The influence of age on travel behaviour, particularly for those in retirement, can significantly impact on the derived household trip rates. There is an unlikely expectation that new residential developments will capture proportionally the same numbers of retirees that exist in the broader full OD survey sampling frame. Consequently the removal of these households from the sample would provide trip generation rates particularly for the peak hours which can be considered more reflective of most planned residential developments. In addition the following was noted:
    - Approximately 30% of the OD Survey sample was made up of households with persons older than 55 years.
    - The households with persons older than 55 years were skewed toward smaller household sizes with 27% being single person households and approximately 75% housed in 1 and 2 person households. For comparison, the remaining sample (i.e. comprised of household with persons aged 55 years and less) indicated that only 20% of these formed single person households while the proportion had increased to only 50% for 2 or less person households.

The distribution of households based on this revised sampling frame is highlighted in Table 3.11: Distribution of Household Types by Geographic Area – Sampling Frame which excludes households with residents older than 55 years of age. Generally, when compared against the distribution of households for the full OD Survey Sample (Table 3.7), the exclusion of households with persons older than 55 years of age did not materially change the overall household distribution pattern. While the proportion of households within the full OD Survey sample may be representative of the community as a whole it would be unreasonable to assume that resident development proposals would include similar proportions of older

residents. In other words, the demographics associated with new residential neighbourhoods would typically not reflect the broader city wide demographics, and in particular the demographic influences on older existing neighbourhoods. As a result, a revised sampling frame was adopted which encompassed approximately 70% of the household surveys collected in the TRANS OD Survey.

Table 3.11: Distribution of Household Types by Geographic Area – Sampling Frame

Sample Size of Number of Households All Households with persons 55 years of age or less					
Geographic Areas / Dwelling Unit Types	Urban Core	Urban (Inside the greenbelt)	Suburban (Outside the greenbelt)	Rural	All Areas
Single detached	491 5% (29%)	2,690 28% (48%)	4,994 51% (65%)	1,556 16% (88%)	9,731 (58%)
Semi-detached	142 9% (8%)	444 29% (8%)	852 55% (11%)	108 7% (6%)	1,546 (9%)
Row Townhouse	159 7% (9%)	1,012 46% (18%)	1,008 45% (13%)	38 2% (2%)	2,217 (13%)
Apartment	861 30% (51%)	1,351 47% (24%)	659 23% (9%)	34 1% (2%)	2,905 (17%)
Other	33 10% (2%)	111 35% (2%)	138 43% (2%)	37 12% (2%)	319 (2%)
All Household Types	1,686 10%	5,608 34%	7,651 46%	1,773 11%	16,718

Note: 5% represents the proportion of specific unit type within the specific geographic area expressed as a percentage of the total units all geographic areas. (horizontal)
(30%) represents the proportion of specific unit type expressed as a percentage of the total unit types within a specific geographic area. (vertical)

3.4.7 Reported Trip Rates & Transit Usage

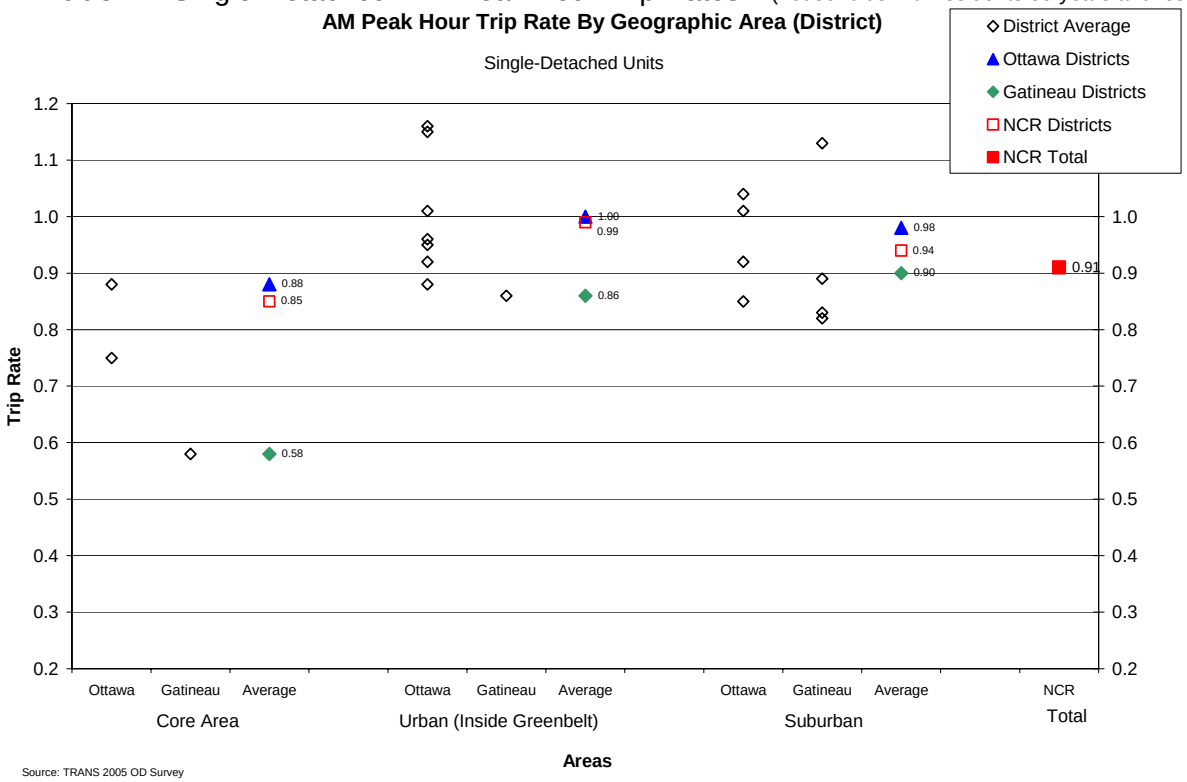
The development of trip generation rates based on the application of a more targeted sample through the exclusion of households with persons older than 55 years of age is highlighted in Exhibits 3.17 through to Exhibit 3.20. The person trip generation rates were prepared for the AM peak and provide specific trip rates for each of the four dwelling unit types as well as highlighting graphically the variation of rates by planning areas. In addition, detailed tabulations of the rates derived as well as the charts of the PM peak hour are provided in Appendix D.

Overall the person trip generation rates presented in the following charts indicate that the average person trip rate (region wide: NCR) for each of the housing types were single-detached; 0.91, semi-detached; 0.88, row/townhouses; 0.73 and apartments; 0.50 for the AM peak hour. A comparison with the previous set of trip rates developed from the uniform sampling frame indicate the rates are similar in magnitude with the exception of the apartment dwelling unit category, where <55 years of age sample is 50% less than that reported for the uniform sample (0.50 versus 0.76). The reduction in trip rates for apartment units reflects the influence of a higher proportion of smaller households.

The charts also highlight the variation in reported person trip rates across the geographic areas. The person trip variation across the four primary dwelling unit types as well as for the various geographic areas is also summarised in Table 3.12: Person Trip Generation Rates – (all households with residents not older than 55 years of age). Table 3.12 also presents trip rates reported for both the AM and PM peak hours. As observed previously the AM peak hour trip rates tend to be higher than their counterparts for the PM. The person trip rates in Table 3.12 are in general similar across the various geographies with the suburban areas slightly higher than the rates reported for inside the greenbelt. The rates reported for the rural areas are on

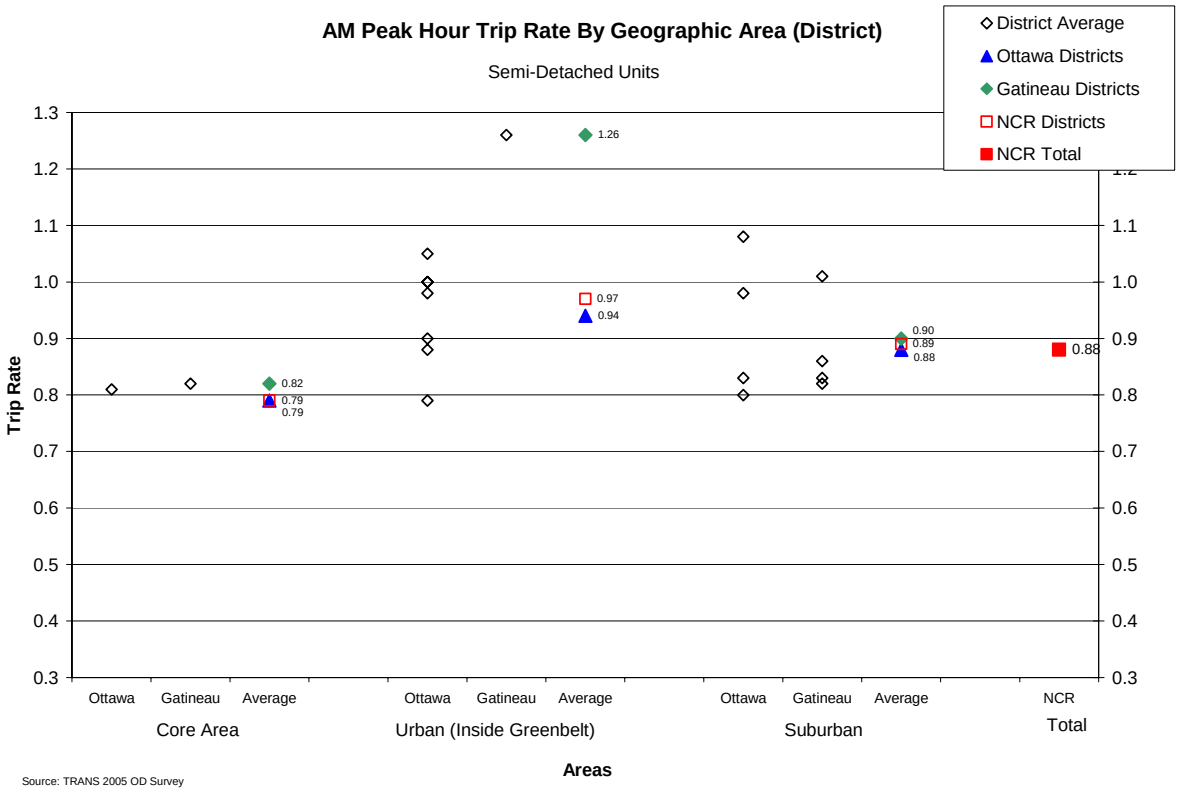
average higher than the urban rates. The reported mode shares are also summarised in Table 3.13: Mode Shares - (all households with residents not older than 55 years of age).

Exhibit 3.17: Single-Detached -AM Peak Hour Trip Rates – (households with residents 55 years and less)



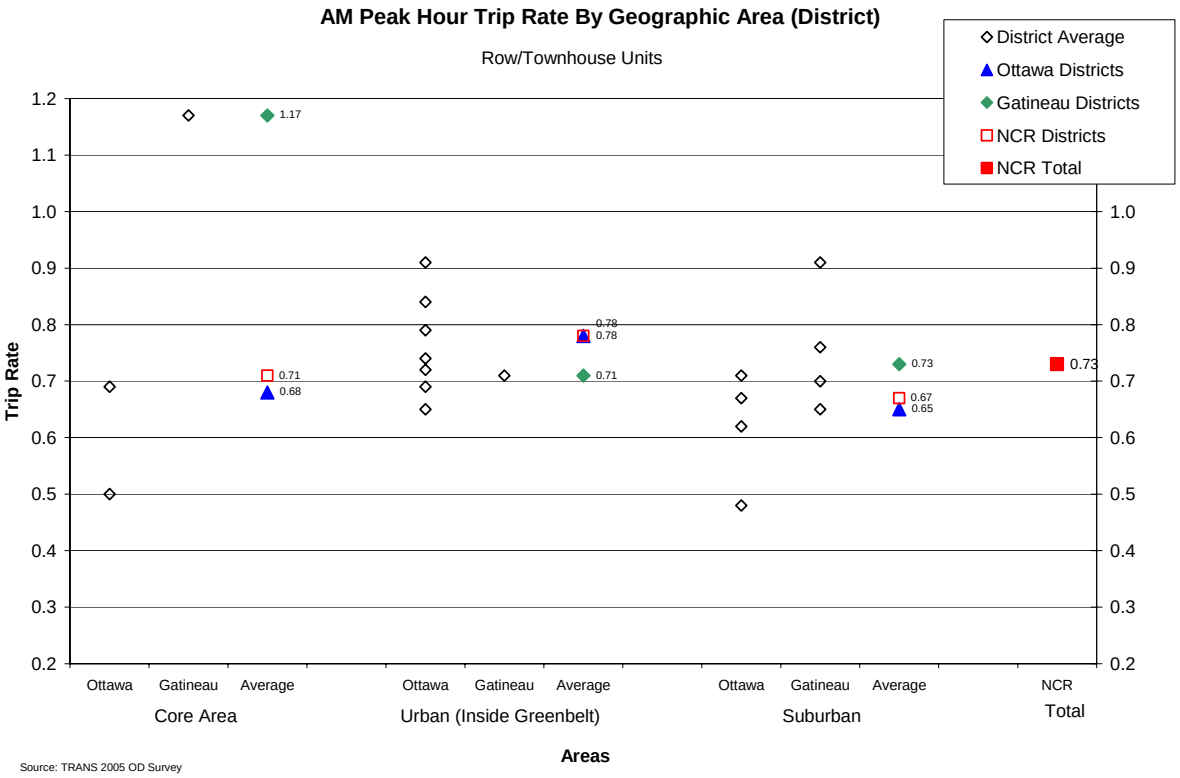
Source: TRANS 2005 OD Survey

Exhibit 3.18: Semi-Detached -AM Peak Hour Trip Rates – (households with residents 55 years and less)



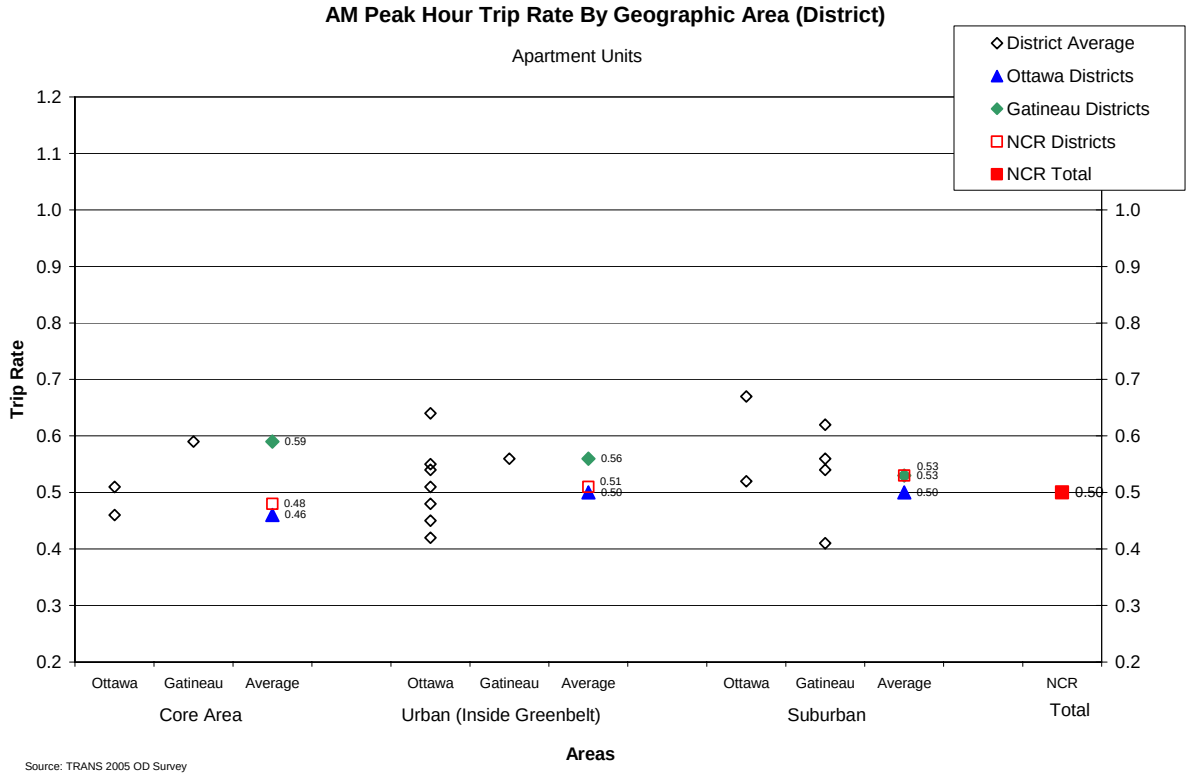
Source: TRANS 2005 OD Survey

Exhibit 3.19: Row/Townhouses -AM Peak Hour Trip Rates – (households with residents 55 years and less)



Source: TRANS 2005 OD Survey

Exhibit 3.20: Apartment Units -AM Peak Hour Trip Rates– (households with residents 55 years and less)



Source: TRANS 2005 OD Survey

Table 3.12: Person Trip Generation Rates – (all households with residents not older than 55 years of age)

Person Trip Generation Rates

All Households with persons 55 years of age or less
AM and PM Peak Hours

Dwelling Unit Types / Geographic Areas		Core Area Person Trip Rate	Core Area %▽	Urban Area (Inside the greenbelt) Person Trip Rate	Urban Area %▽	Suburban (Outside the greenbelt) Person Trip Rate	Suburban %▽	Rural Person Trip Rate	Rural %▽	All Areas Person Trip Rate
Single detached:	AM	0.85	- 7%	0.99	+ 9%	0.94	+ 3%	0.78	- 14%	0.91
	PM	0.74	- 3%	0.75	- 1%	0.79	+ 4%	0.71	- 7%	0.76
Semi-detached:	AM	0.79	- 10%	0.97	10%	0.89	+ 1%	0.64	- 27%	0.88
	PM	0.74	- 1%	0.68	- 9%	0.82	+ 9%	0.60	- 20%	0.75
Row Townhouse:	AM	0.71	- 3%	0.78	+ 7%	0.67	- 8%	0.74	+ 1%	0.73
	PM	0.62	- 3%	0.60	- 6%	0.69	+ 8%	0.56	- 13%	0.64
Apartment:	AM	0.48	- 4%	0.51	+ 2%	0.53	+ 6%	0.36	- 28%	0.50
	PM	0.45	0%	0.42	- 7%	0.52	+ 16%	0.52	+ 16%	0.45
All Types:	AM	0.62	- 23%	0.82	+ 2%	0.86	+ 8%	0.76	- 5%	0.80
	PM	0.57	- 16%	0.63	- 7%	0.75	+ 10%	0.69	+ 1%	0.68

Note: 5 % (+ or -) represents the percentage delta change in trip rate when compared against the average trip rate across all geographic areas

Table 3.13: Mode Shares - (all households with residents not older than 55 years of age)

Reported Mode Shares

All Households with persons 55 years of age or less
AM and PM Peak Hours

Dwelling Unit Types / Geographic Areas		Core Area Vehicle Trips	Core Area Transit Share	Core Area Non-Motorised	Urban Area (Inside the greenbelt) Vehicle Trips	Urban Area Transit Share	Urban Area Non-Motorised	Suburban (Outside the greenbelt) Vehicle Trips	Suburban Transit Share	Suburban Non-Motorised	Rural * Vehicle Trips	Rural * Transit Share	Rural * Non-Motorised	All Areas Vehicle Trips	All Areas Transit Share	All Areas Non-Motorised
Single - Detached:	AM	35%	20%	33%	51%	26%	11%	55%	25%	9%	60%	27%	4%	54%	25%	10%
	PM	45%	11%	32%	58%	19%	13%	64%	19%	6%	73%	13%	2%	63%	17%	8%
Semi-Detached:	AM	38%	30%	26%	44%	35%	10%	52%	24%	12%	64%	27%	5%	49%	28%	12%
	PM	36%	20%	34%	51%	27%	13%	62%	17%	7%	77%	12%	1%	58%	20%	10%
Row / Townhouse:	AM	33%	22%	40%	45%	34%	10%	55%	27%	8%	73%	15%	3%	49%	30%	11%
	PM	39%	15%	42%	53%	28%	8%	61%	22%	6%	74%	15%	1%	57%	24%	9%
Apartment:	AM	27%	27%	43%	37%	41%	14%	44%	34%	13%	76%	8%	16%	36%	35%	23%
	PM	23%	29%	42%	40%	37%	14%	44%	33%	9%	48%	4%	17%	35%	33%	23%
All Types:	AM	32%	24%	38%	47%	31%	11%	54%	26%	9%	61%	26%	4%	51%	27%	11%
	PM	34%	21%	38%	53%	24%	12%	62%	20%	6%	73%	13%	2%	59%	20%	10%

Note: Percentages do not necessarily sum to 100% as the proportion of automobile passengers have not been tabulated. Vehicle trips reflect the percentage of vehicle drivers.
* - Rural area sample size is extremely low and mode shares are highly influenced by school types where public transportation levels are high during the AM versus the PM peaks.

A review of the reported person trip rates and mode shares revealed the following general observations for the household sample comprised of all households with persons 55 years of age or younger:

- The person trip rates identified in Table 3.12 are higher than those reported across the full OD Survey sample due to the exclusion of households with persons older than 55 years. The exclusion of households with persons older the 55 years provides a means to reduce the influence of these households in the determination of the person trip rates for new residential developments. The proportion of these households within the full OD Survey was reported as approximately 30 percent and the life cycle factors associated with new residential developments would not generally support or reflect this high proportion of older residents.
- As reported previously, the Suburban person trip rates for households with persons aged 55 years and less are slightly higher than the averages reported for all areas combined. However, it is also noted that the Urban Area person trip rates are equally higher than the average rates particularly for the AM peak hour and for all dwelling unit categories of single-detached, semi-detached and Row/Townhouse units.
- Both reported transit use as well as person trip rates are highest during the AM peak hour which when taken together have an overall impact of reducing vehicle usage rates during the morning peak when compared against the afternoon peak travel behaviour.
- The reported mode shares for each of the OD Survey samples analysed follow similar patterns across both the dwelling unit types as well as the various geographies studied. As noted previously, the Core Area has the highest non-motorised shares and as a result the transit mode shares while strong were less than those reported for the Urban and Suburban areas. The Urban and Suburban areas reported similar transit mode shares with the Urban areas reporting slightly higher transit mode shares. As may be expected the reported transit mode shares reported for the apartment dwelling unit types were the highest compared against other unit dwelling types within the urbanized areas. Caution should be exercised with respect to the reported mode shares summarized for the rural areas. As highlighted in the Technical Appendices the reported number of trips for the rural areas are heavily influenced by school trips where high levels of public transport have been reported.

3.4.8 Recommended Residential OD Person Trip Rates

A review of each of the three survey samples drawn and analysed indicate that the reported person trip rates and transit mode shares highlight the significance of demographics, or life cycle factors on reported travel behaviour. Unfortunately, typical assessments of future development proposals do not generally provide any real insight into life cycle factors associated with the future resident populations of the proposed developments. In many cases, the use of reported travel behaviour as outlined in previous sections does include a number of survey biases, which among others, indicate that as communities age changes in travel behaviour occur. In general, the underlying concern is that whether residents attracted to new residential developments exhibit travel behaviours which would differ substantially from adjacent neighbourhoods. For most new residential development proposals it would be reasonable to assume that the average age of household residents would be less than the city wide averages, and considerably less for new developments located in older neighbourhoods. As a result, the selection of the OD sample which excluded the households with persons older than 55 years of age is a direct means to recognize these differences and to consequently reduce the impact of these older households with lower than average trip rates on the recommended trip rate.

In addition, as noted previously the person trip rates identified in Table 3.12 have been determined based on residential household surveys. Residential trip rates obtained through

household based interview surveys do not include non-resident based travel which can represent additional 10 to 15 percent of the total travel attributed to residential developments. Since these trips are not taken by household residents they are not reported within the context of the broader context of the household travel behaviour. This issue is dealt with further in 3.4.10 Non-Resident Trip Factor.

3.4.9 Recommended Residential OD Vehicle Trip Rates

The reported person trip rates and transit mode shares as summarised in the previous sections are used to determine the resulting vehicle trip rates by dwelling unit and geographic areas. These rates are summarized in Table 3.14: Recommended Vehicle Trip Generation Rates. General observations of the recommended vehicle rates are highlighted as follows:

- The Core Area reported the lowest vehicle trip rates due to the influence of both the high proportion of non-motorised travel as well as transit mode shares. The Core Area vehicle trip rates for each of the dwelling unit types varied between 30 to 40% lower than average rates for all geographic areas.

Table 3.14: Recommended Vehicle Trip Generation Rates

Vehicle Trip Generation Rates
All Households of persons 55 years of age or less
AM and PM Peak Hours

Dwelling Unit Types \ Geographic Areas		Core Area		Urban Area (Inside the greenbelt)		Suburban (Outside the greenbelt)		Rural		All Areas
		Vehicle Trip Rate	%▽	Vehicle Trip Rate	%▽	Vehicle Trip Rate	%▽	Vehicle Trip Rate	%▽	Vehicle Trip Rate
Single detached:	AM	0.30	- 39 %	0.50	+ 3 %	0.52	+ 6 %	0.46	- 5 %	0.49
	PM	0.34	- 30 %	0.43	- 10 %	0.51	+ 5 %	0.52	+ 7 %	0.46
Semi-detached:	AM	0.30	- 30 %	0.43	- 1 %	0.46	+ 6 %	0.41	- 5 %	0.44
	PM	0.27	- 38 %	0.35	- 21 %	0.51	+ 16 %	0.46	+ 6 %	0.44
Row/Townhouse:	AM	0.23	- 36 %	0.35	- 2 %	0.37	+ 2 %	0.54	+ 50 %	0.36
	PM	0.24	- 33 %	0.32	- 12 %	0.42	+ 17 %	0.42	+ 15 %	0.36
Apartment:	AM	0.13	- 29 %	0.19	+ 6 %	0.23	+ 30 %	0.27	+ 53 %	0.18
	PM	0.10	- 36 %	0.17	+ 7 %	0.23	+ 45 %	0.25	+ 57 %	0.16
All Types:	AM	0.20	- 52 %	0.39	- 5 %	0.47	+ 14 %	0.46	+ 13 %	0.41
	PM	0.19	- 52 %	0.34	- 16 %	0.47	+ 17 %	0.50	+ 25 %	0.40

Note: 5 % (+ or -) represents the percentage delta change in trip rate when compared against the average trip rate across all geographic areas

- While person trip rates were reported higher during the AM peak hour when compared with the PM peak hour, the resulting vehicle trip rates indicate much higher levels of similarity in terms of the vehicle trip generation rates across each of the AM and PM peak hours. This is largely attributed to lower vehicle usage during the AM peak hour or conversely higher transit usage during the PM peak hour.
- The reported vehicle trip rates reported for the Suburban Area are generally the highest across all geographic areas which highlights the higher vehicle dependency levels for the Suburban Areas.

- These trip rates are lower than those generally presented in the ITE *Trip Generation* publication which highlights the impact and influence of local vehicle use during peak hours or conversely the relatively high use of both non-motorised modes in the Core Area as well as transit usage across the Ottawa-Gatineau region.

3.4.10 Non-Resident Trip Factor

As noted previously residential trip rates developed from the OD Survey database do not adequately account for a component of travel typically referred as commercial and/or non resident travel. The procedures applied in developing the residential trip rates using OD survey results ensured that all reported travel by household occupants are captured however trips made by non-residents are not identified. These may include service related trips including but not limited to the following travel elements:

- Service calls such as utility companies, meter reading, cable, phone and/or internet repair and installations;
- maintenance including household building and appliance repairs, renovation and lawn care;
- household deliveries including couriers and mail, etc
- visitors, friends and relatives
- child care activities i.e. child drop offs (note also that travel associated with persons less than 10 years of age is not recorded in the travel survey)

The proportion of travel associated with these activities has been estimated within the TRANS Travel Demand modeling framework at approximately 15% for the AM peak hour (traffic forecasts prepared by the TRANS model are typically factored by 1.16 to reflect these trips). As a result the trip rates previously identified have been factored and are presented in Table 3.15: Recommended OD Survey Vehicle Trip Generation Rates.

Table 3.15: Recommended OD Survey Vehicle Trip Generation Rates

Vehicle Trip Generation Rates including Non-Resident Travel All Households of persons 55 years of age or less AM and PM Peak Hours					
Geographic Areas / Dwelling Unit Types	Core Area Vehicle Trip Rate	Urban Area (Inside the greenbelt) Vehicle Trip Rate	Suburban (Outside the greenbelt) Vehicle Trip Rate	Rural Vehicle Trip Rate	All Areas Vehicle Trip Rate
Single detached: AM	0.35	0.58	0.60	0.53	0.56
PM	0.39	0.49	0.59	0.60	0.53
Semi-detached: AM	0.35	0.49	0.53	0.47	0.51
PM	0.31	0.40	0.59	0.53	0.51
Row/Townhouse: AM	0.26	0.35	0.43	0.62	0.41
PM	0.28	0.32	0.48	0.48	0.41
Apartment: AM	0.15	0.22	0.26	0.31	0.21
PM	0.12	0.20	0.26	0.29	0.18
All Types: AM	0.23	0.45	0.47	0.53	0.47
PM	0.22	0.39	0.47	0.58	0.46

3.5 Blended Vehicle Trip Rate

The recommended vehicle trip rates have been derived by averaging the 2008 count data rates, the ITE rates and the OD Survey rates. Similarly the directional splits were identified by averaging the directional splits observed in the 2008 local trip generation studies with the published ITE splits for residential developments. The OD Survey rates and the 2008 count data rates were both calculated with different categories of dwelling unit types to the ITE rates. To compare to the ITE rates, the dwelling unit types and rates were adjusted as follows:

Semi-Detached dwellings, townhouses, rowhouses:

- The 2008 count data rates for townhouses were assumed to reflect land use 224.
- The OD Survey rates for semi-detached and townhouses were averaged to represent land use code 224.

Apartments and Condominiums:

- The 2008 Count data provided separate rates for condominiums and apartments which were applied to all applicable ITE land use codes regardless of the number of floors.
- The OD survey vehicle rates for apartments were assumed to reflect all condominiums and apartments.

As more trip generation studies are completed in the future, more emphasis could be placed on the locally developed vehicle trip rates for most land use code or categories and therefore reducing the reliance on a blended vehicle trip rate approach. The blended vehicle trip generation rates are presented in Table 3.16: Blended Vehicle Trip Generation Rates. Table 3.17: Blended Vehicle Trip Rate Directional Splits summarizes the directional splits for the various residential uses for the AM and PM peak hours.

Table 3.16: Blended Vehicle Trip Generation Rates

Vehicle Trip Generation Rates AM and PM Peak Hours						
ITE Land Use Code	Dwelling Unit Type / Data Source		Vehicle Trip Rate			
			2008 Count Data	ITE	OD Survey	Blended Rate
210	Single-detached dwellings	AM	0.66	0.75	0.56	0.66
		PM	0.89	1.01	0.53	0.81
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.40	0.70	0.46	0.52
		PM	0.64	0.72	0.46	0.61
231	Low-rise condominiums (1 or 2 floors)	AM	0.53	0.67	0.21	0.47
		PM	0.41	0.78	0.18	0.46
232	High-rise condominiums (3+ floors)	AM	0.53	0.34	0.21	0.36
		PM	0.41	0.38	0.18	0.32
233	Luxury condominiums	AM	0.53	0.56	0.21	0.43
		PM	0.41	0.55	0.18	0.38
221	Low-rise apartments (2 floors)	AM	0.19	0.46	0.21	0.29
		PM	0.21	0.58	0.18	0.32
223	Mid-rise apartments (3-10 floors)	AM	0.19	0.30	0.21	0.23
		PM	0.21	0.39	0.18	0.26
222	High-rise apartments (10+ floors)	AM	0.19	0.30	0.21	0.23
		PM	0.21	0.35	0.18	0.25

Table 3.17: Blended Vehicle Trip Rate Directional Splits

Comparison of Directional Splits (Inbound/Outbound) AM and PM Peak Hours								
ITE Land Use Code	Area Dwelling Unit Type / Data Source		2008 Count Data		ITE		Blended Rate	
			Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
210	Single-detached dwellings	AM	33%	67%	25%	75%	29%	71%
		PM	60%	40%	63%	37%	62%	39%
224	Semi-detached dwellings, townhouses, rowhouses	AM	40%	60%	33%	67%	37%	64%
		PM	55%	45%	51%	49%	53%	47%
231	Low-rise condominiums (1 or 2 floors)	AM	36%	64%	25%	75%	31%	70%
		PM	54%	46%	58%	42%	56%	44%
232	High-rise condominiums (3+ floors)	AM	36%	64%	19%	81%	28%	73%
		PM	54%	46%	62%	38%	58%	42%
233	Luxury condominiums	AM	36%	64%	23%	77%	30%	71%
		PM	54%	46%	63%	37%	59%	42%
221	Low-rise apartments (2 floors)	AM	22%	78%	21%	79%	22%	79%
		PM	62%	38%	65%	35%	64%	37%
223	Mid-rise apartments (3-10 floors)	AM	22%	78%	25%	75%	24%	77%
		PM	62%	38%	61%	39%	62%	39%
222	High-rise apartments (10+ floors)	AM	22%	78%	25%	75%	24%	77%
		PM	62%	38%	61%	39%	62%	39%

The analysis of the OD Survey results confirmed that lower vehicle trip rates were reported in the core areas and higher vehicle trip rates in the suburban and rural areas. To account for the change in vehicle trip rates between geographic areas, the blended rates have been adjusted using information contained in Table 3.14. The resulting vehicle trip rates are highlighted in Table 3.18: Recommended Vehicle Trip Generation Rates without Transit Bonus.

Table 3.18: Recommended Vehicle Trip Generation Rates without Transit Bonus

Recommended Vehicle Trip Generation Rates AM and PM Peak Hours							
ITE Land Use Code	Dwelling Unit Type / Geographic Area		Vehicle Trip Rates				
			Core	Urban (Inside the Greenbelt)	Suburban (Outside the Greenbelt)	Rural	All Areas
210	Single-detached dwellings	AM	0.40	0.67	0.70	0.62	0.66
		PM	0.60	0.76	0.90	0.92	0.81
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.34	0.51	0.54	0.62	0.52
		PM	0.39	0.51	0.71	0.67	0.61
231	Low-rise condominiums (1 or 2 floors)	AM	0.34	0.50	0.60	0.71	0.47
		PM	0.29	0.49	0.66	0.72	0.46
232	High-rise condominiums (3+ floors)	AM	0.26	0.38	0.46	0.54	0.36
		PM	0.20	0.34	0.46	0.50	0.32
233	Luxury condominiums	AM	0.31	0.45	0.55	0.65	0.43
		PM	0.24	0.40	0.55	0.59	0.38
221	Low-rise apartments (2 floors)	AM	0.21	0.31	0.37	0.44	0.29
		PM	0.20	0.34	0.46	0.50	0.32
223	Mid-rise apartments (3-10 floors)	AM	0.17	0.24	0.29	0.35	0.23
		PM	0.16	0.28	0.37	0.41	0.26
222	High-rise apartments (10+ floors)	AM	0.17	0.24	0.29	0.35	0.23
		PM	0.16	0.27	0.36	0.39	0.25

Note: See Table 6.3 for recommended vehicle trip rates with transit bonus

4.0 Trip Rate Adjustment Factor for Proximity to Transit

Ottawa-Gatineau enjoys a high transit mode usage as reported in the comprehensive TRANS OD Survey. The construction of dedicated transit facilities in the early 1980's, primarily in Ottawa, such as the Transitway have been credited with increasing transit usage particularly for land uses adjacent to these linear corridors with rapid transit services to the downtown. These separate dedicated Transitways have also provided enhanced service reliability by offering more consistent travel times between major origins and destinations as transit service is less impacted by roadway congestion.

In addition, the City of Gatineau (STO) has plans for the development and expansion of its rapid transit system with plans to introduce BRT services along a number of corridors in the future. As a result, they too, are interested in understanding the impact, in terms of increased ridership, dedicated transit facilities generate particularly for potential developments located adjacent to or near the future planned infrastructure.

With enhanced travel time reliability provided by the Transitways and/or rail services, ridership growth has occurred and consequently opportunities to measure transit mode shares as a function of distance to/from access points to these dedicated facilities is possible based on the travel behaviour reported in the TRANS OD Survey.

4.1 Transit Mode Splits – Home Trip Ends (Residential Land Uses)

The distance to the nearest rapid transit station based on the orientation of the home trip end (i.e. for AM peak -trip origins and for the PM –trip destinations) was determined and related directly to both the household and the reported trip data. This analysis was carried out for both the morning peak and evening peak periods. Exhibit 4.1: Proximity to Rapid Transit Stations - AM Trip Origins and Exhibit 4.2: Proximity to Rapid Transit Stations -PM Trip Destinations highlight the proportion of travel accommodated by transit based on an assessment of trip origins for the AM and trip destinations for the PM peaks. A set of trend lines were also fitted to the data points for both the transit splits reported for the AM and PM peak hours and peak periods. The use of these home-based (residential) trip ends, i.e. trip origins for the AM peak and trip destinations for the PM peak, allows for the influence of household location to/from rapid transit stations to be related to the proportion of trips attracted to transit as a function of distance to/from transit stations. In addition, Table 4.1: Transit Mode Splits – Home Trip-ends Proximity to Rapid Transit Stations tabulates the reported transit mode splits for each of the time periods analysed and provides an indication of the proportion of trip origins or destinations starting or ending within predefined distances to/from the rapid transit stations. A review of the charts and the table revealed the following:

- As expected, the AM peak hour when compared against other time periods reflects the highest transit mode splits. It is also noted that for trip origins with less than 400 meters to the nearest rapid transit station, transit remains a competitive alternative throughout the AM peak period. As noted in Table 4.1 the number of trip origins/destinations which fall within the 400 m radius of a rapid transit station varies from 3 to 6 % of the total number of trips within each time period analysed. The trend line of the transit mode splits as a function of access distance from rapid transit stations indicates that transit mode shares fall as a function of increasing distance across all time periods analysed.

- Similar to the analysis of transit mode shares in the previous sections of this report the PM transit mode splits are lower when compared against the AM peak splits. A number of factors including more diverse trip purposes (AM Peak Hour is highly oriented toward inclusion of work and school trips and tend to exhibit higher transit usage when

compared against the PM) and peaking characteristics each have an influence on the overall reported transit mode splits.

Exhibit 4.1: Home Trip-ends Proximity to Rapid Transit Stations - AM Trip Origins

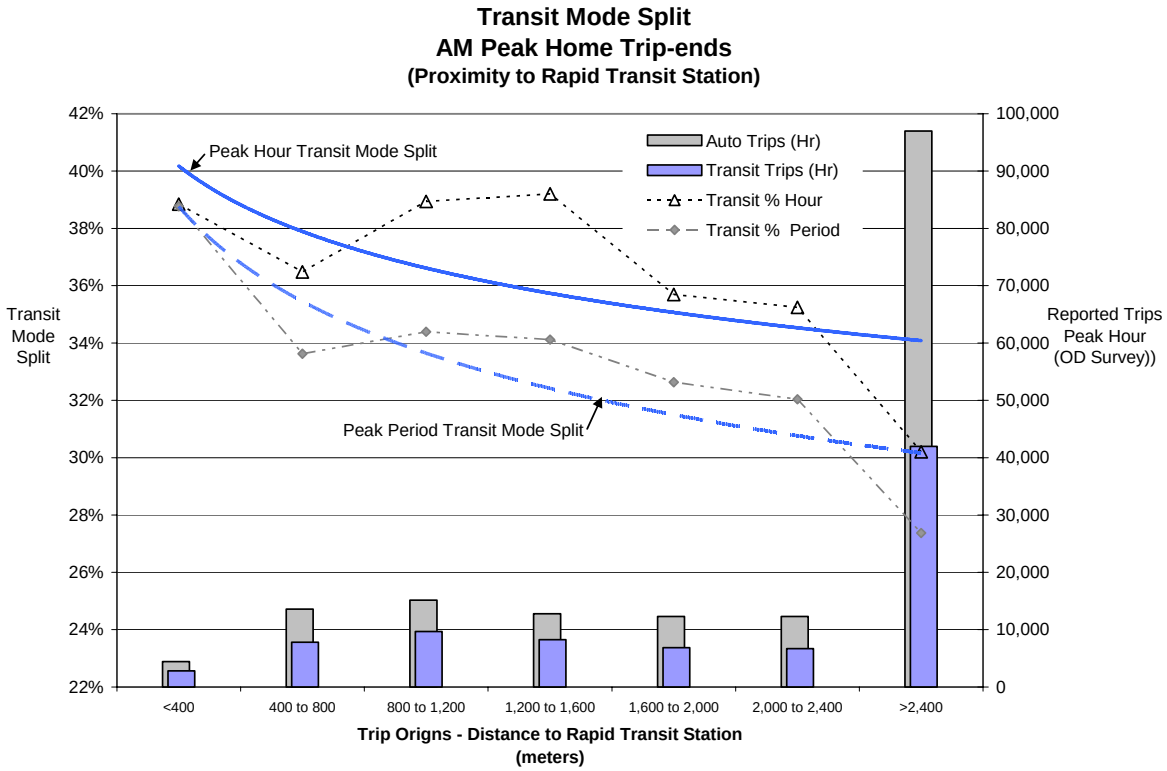


Exhibit 4.2: Home Trip-ends Proximity to Rapid Transit Stations - PM Transit Mode Spits

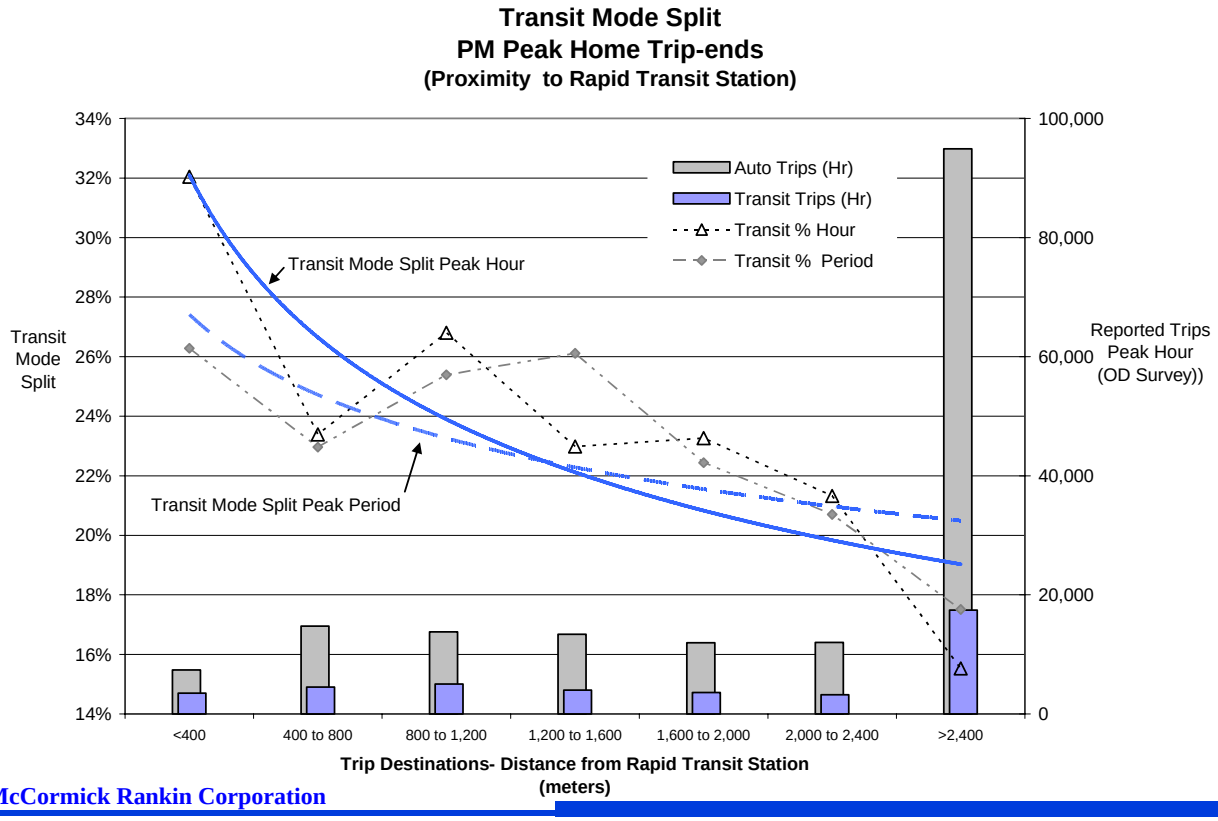


Table 4.1: Transit Mode Splits – Home Trip-ends Proximity to Rapid Transit Stations

Transit Mode Splits: Home Trip-ends					
Distance to/from Rapid Transit Station (meters)	Percent of All Trips	AM Transit Mode Splits (Trip Origins)		PM Transit Mode Splits (Trip Destinations)	
		Peak Hour	Peak Period	Peak Hour	Peak Period
<400	3 to 6%	39%	39%	32%	26%
400 to <800	9 to 10%	36%	34%	23%	23%
800 to <1,200	9 to 10%	39%	34%	27%	25%
1,200 to <1,600	8%	39%	34%	23%	26%
1,600 to <2,000	7 to 8%	36%	33%	23%	22%
2,000 to 2,400	7 to 8%	35%	32%	21%	21%
>2,400	52 to 55%	30%	27%	16%	18%

The trend lines prepared for each of the AM and PM peak period and hour provide an appropriate means to apply adjustment factors for residential developments located for example within 2.4 kilometres of access to a rapid transit station. It is also noted that the selection of a trip distance interval of approximately 400 meters results in each of the intervals capturing similar proportions of origins or destinations between 6 to 10% of the total for the time period analysed.

4.2 Transit Mode Splits – Non-Home Trip Ends (Commercial Land Uses)

The analysis of the non-home trip ends was undertaken to assess the impact of rapid transit station location and transit mode splits reported for i) trip destinations for the AM peaks and ii) trip origins for the PM peaks. Similar to the previous section, trip data was organized to assess the proportion of travel attracted to transit based on the distance to the trip end location (for predominately work/school trip ends) from access to rapid transit (i.e. station location). Overall the methodology used in assembling the trip data from the TRANS OD Survey is the same however the other trip end – trip destinations in the AM and trip origins in the PM were used in determining the distance for access to the rapid transit system. Exhibit 4.3: Proximity to Rapid Transit Stations - AM Trip Destinations and Exhibit 4.4: Proximity to Rapid Transit Stations - PM Trip Origins highlight the proportion of travel accommodated by transit based on an assessment of trip destinations for the AM and trip origins for the PM peaks.

Exhibit 4.3: Non-home Trip-Ends Proximity to Rapid Transit Stations – AM Trip Destinations

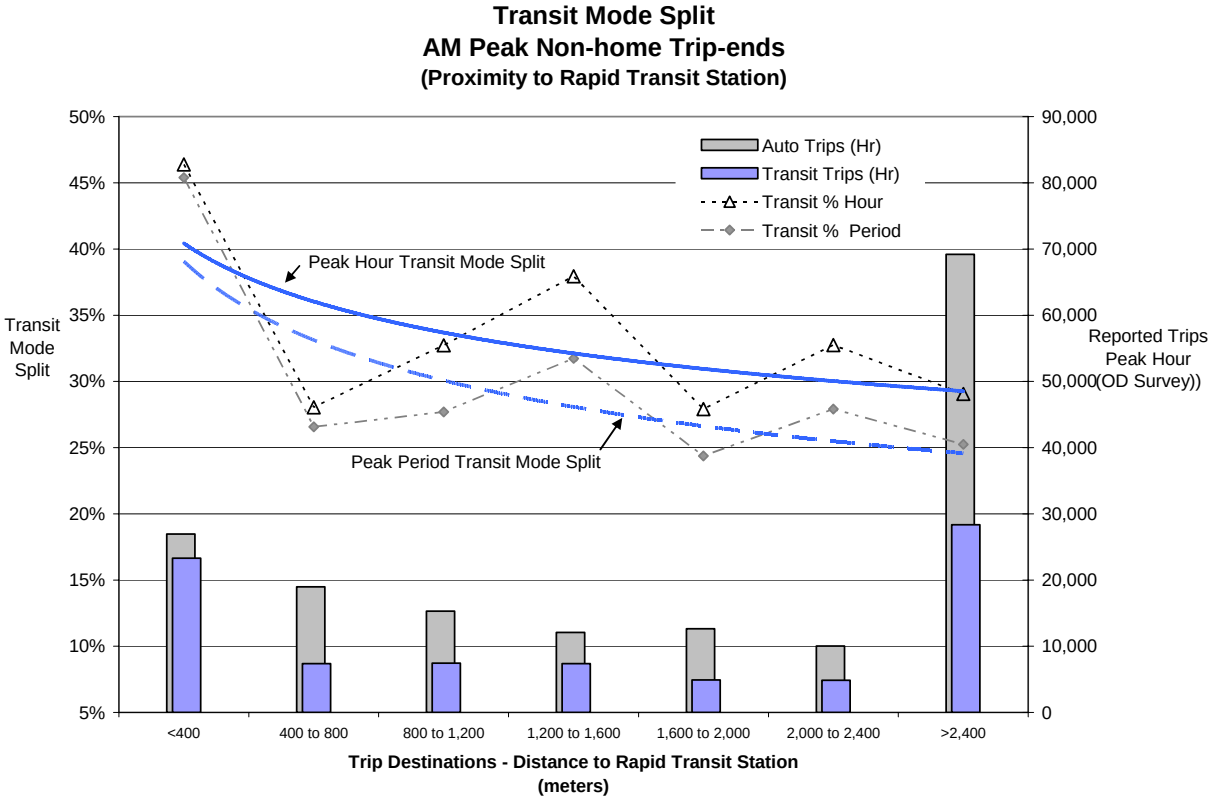
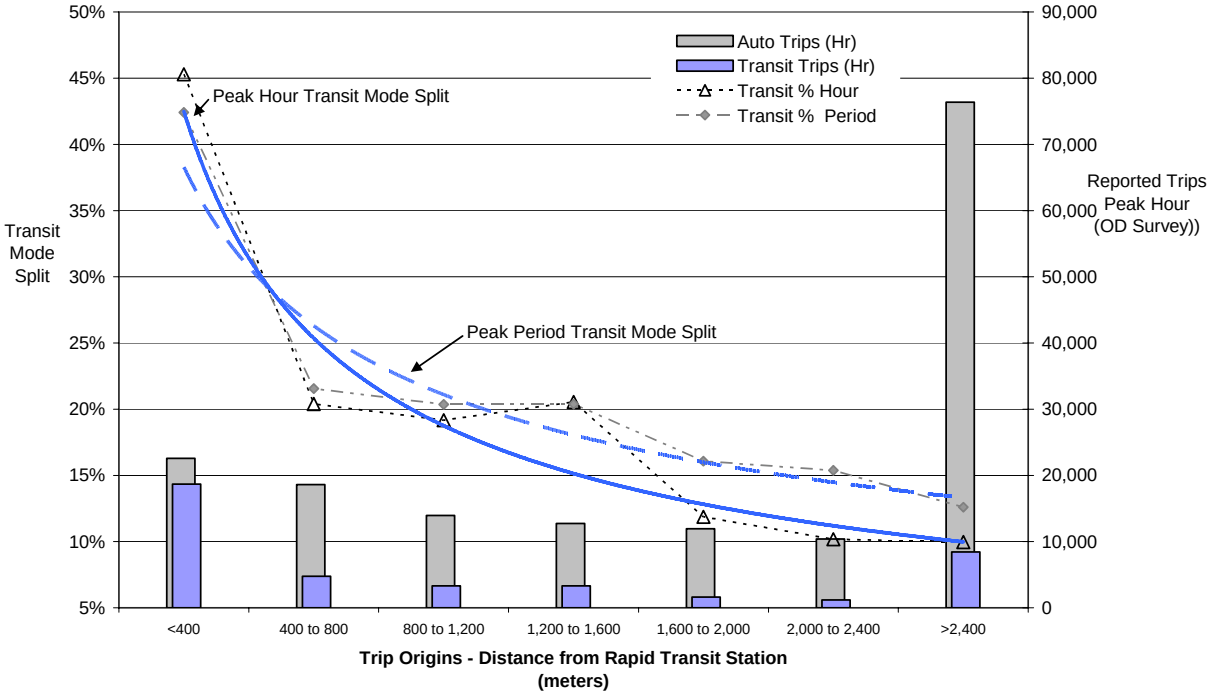


Exhibit 4.4: Non-home Trip-ends Proximity to Rapid Transit Stations - PM Trip Origins



Similar to the home trip end analysis, the non-home trip ends were evaluated with respect to the proportion of trips occurring within various 400 meters increments of access distance to the rapid transit system. These trip proportions and transit mode splits are tabulated in Table 4.2: Transit Mode Splits – Non-Home Trip-ends Proximity to Rapid Transit Stations. For the non-home trip ends, as would be anticipated, a much higher proportion of trip ends were located within 400 meters of a rapid transit station which reflects the high proportion of employment distributed in close proximity of rapid transit stations, particularly in Ottawa's CBD.

Table 4.2: Transit Mode Splits – Non-Home Trip-ends Proximity to Rapid Transit Stations

Transit Mode Splits: Non-Home Trip-ends					
Distance to/from Rapid Transit Station (meters)	Percent of All Trips	AM Transit Mode Splits (Trip Destinations)		PM Transit Mode Splits (Trip Origins)	
		Peak Hour	Peak Period	Peak Hour	Peak Period
<400	18 to 21%	46%	45%	45%	42%
400 to <800	11%	28%	27%	20%	22%
800 to <1,200	9 to 10%	33%	28%	19%	20%
1,200 to <1,600	8 to 9%	38%	32%	21%	20%
1,600 to <2,000	6%	28%	24%	12%	16%
2,000 to 2,400	7 to 8%	33%	28%	10%	15%
>2,400	38 to 39%	29%	25%	10%	13%
Source: TRANS 2005 OD Survey					

A review of the Non-Home trip ends revealed the following:

- Significant transit mode splits for trips (reported between 42 to 46%) within the 400 meter radius of rapid transit stations. As indicated this largely reflects the importance of the employment trip end being located within close proximity of rapid transit stations, particularly in the downtown area.
- The PM peak trips highlight the sharp decline in reported transit mode splits for trip origins as the distance from the nearest rapid transit station increases. In general, a doubling of the distance from 400 m to 800 m results in the reported transit mode splits being reduced to half. (i.e. more than 40% transit split to approximately 20%)
- The variability in reported transit mode split as a function of the access distance to the nearest rapid transit station is largely influenced by strong transit mode splits achieved along transit services operating independent of the rapid transit system.

4.3 Transit Mode Split as a Function of the Distance to Rapid Transit Station Access

The impact of the promity of residential location to the nearest rapid transit station and the transit mode split of residents was analysed in section 4.1. The analysis of OD Survey results as presented in Exhibits 4.1 and 4.2 highlight the level of transit usage as a function of the proximity to a rapid transit station (using 400m increments) for residential trip-ends. The trend lines (Exhibit 4.1 and 4.2) indicate that the reported percentage mode split increased inversely

proportional to distance of the household location from the rapid transit station. An evalutation of the trend lines in concert with appropriate walk distances indicated that the establishment of a transit bonus for development located within an 600m of rapid transit stations would be most appropriate means to account for increased transit shares for development located in close promity of rapid transit access. The resulting transit mode splits identified based on this approach are highlighted in Table 4.3: Transit Mode Splits – Residential Land Use to Proximity to Rapid Transit Stations.

Table 4.3: Transit Mode Splits – Residential Land Use to Proximity to Rapid Transit Stations

Residential Land Uses		
Distance to/from Rapid Transit Station (meters)	AM Transit Mode Splits	PM Transit Mode Splits
<600	39%	29%

5.0 Ongoing Data Collection Programs

5.1 Need and Justification

The Institute of Transportation Engineers *Trip Generation*, an Informational Report, was first published in 1976 and contained data collected between 1965 and 1973. The current ITE Trip Generation Manual is the 8th Edition and houses over 4,800 data points collected from around the US and Canada. The data within the ITE *Trip Generation* publication is collected on a voluntary basis from a number of sources including: governmental agencies, consulting firms, individual transportation professionals, universities and colleges, developers and associations.

As is the practice in the development of the rates presented in the ITE publication, the Cities of Ottawa and Gatineau could draw data from a number of sources; namely, the municipally administered annual traffic count programs and traffic generation studies completed as part of developer studies and/or traffic impact assessment studies. These are further described in the sections that follow.

As previously noted, data in the ITE *Trip Generation* publication is comprised of trip generation studies which incidentally are noted as primarily suburban locations having little or no transit service, nearby pedestrian amenities, or travel demand management programs. For this reason, the City of Ottawa and Gatineau often require traffic impact assessment studies to modify/adjust trip generation rates which may be based on ITE published data to better represent local transit services and other amenities close to a development site. To properly support these adjustments to trip generation rates borrowed from studies undertaken across North America, there is a need for an ongoing data collection program of local data to identify in more detail the scale of the adjustments. In general terms, the identification of local trip generation rates provide insight with respect to the local travel behaviours, transit usage as well as the use of non-motorized modes, and other factors and/or site amenities that may influence the person/vehicle trip rates. Some methods of collecting this data are described below.

5.2 Key Sources of Data

5.2.1 Annual Traffic Data Collection Program

Primarily carried out in the summer months by students, the City of Ottawa conducts an annual city-wide traffic data collection program. The traffic count needs are identified by City Staff typically in the winter preceding the counting season and includes an internal and external circulation aimed at identifying traffic count requirements from local transportation consulting firms and developers based on upcoming projects and development applications.

In the late 70's and through the 80's the City of Ottawa included counts of special generator sites in their annual traffic data collection program. A reorganization within the City and limited available resources for the number of count demands resulted in the generator counts being discontinued. In order to develop and monitor local trip generation rates TRANS should consider re-instating trip generation studies as part of their broader in-house count program. As in past years, the addition of 8 to 10 sites for both the Cities of Gatineau and Ottawa on an annual basis would provide detailed local data from which local trip rates could be developed for various land use categories of particular interest to area planners.

When considering which trip generation sites to add to the annual count program, a consultation approach ensures that a good understanding of the nature of current development applications is well understood such that particular land use developments that may be more prominent than

others and/or those with a specific level of uniqueness to the Ottawa-Gatineau area are provided the priority that they deserve.

Once the type of trip generator is selected, a number of key criteria should be considered when selecting the specific site location to conduct the trip generation studies. Adequate attention to site selection parameters ensure that appropriate sites are identified. Poor site selection can lead to inaccurate rates which may cause over-estimation or under-estimation of trips generated by the proposed development. The following criteria should be considered when selecting trip generation study sites for traffic counts:

- Data should be transferable; both trip data and development characteristics should be representative of land uses to be analyzed.
- The development should be at least two years old and travel patterns established.
- The development should have a reasonably full capacity and appear to be economically healthy.
- The data needed for the independent variables should be readily available (i.e. square footage, number of employees, number of seats, etc.)
- The site should have a limited number of drive-ways; and counts should be carried out at all entrances on the same day.
- The site should consist of a single land use activity where possible.
- There should be minimal or no on-site construction or adjacent roadway construction.
- It should be possible to isolate the site for counting (i.e. no shared parking, no shared driveways, limited ability for pedestrians to walk into site from nearby parcels, no through traffic, mass transit easy to count).
- Through traffic should be minimized

Sources of variation such as different lengths of traffic count duration, the time of year of the count, the impact of weather conditions, and daily or seasonal variations for some land uses could lead to a discrepancy in the calculated trip rates. In all cases, the traffic counts across the shared jurisdictions of Ottawa-Gatineau should be carried out in a consistent manner. Traffic generation studies carried out as part of the 2008 program followed the format and count methodology employed for Annual Classification and Occupancy Count Program. This approach ensured all types of vehicles and vehicle occupancies were recorded on a 15 minute basis for each of the access points/driveways identified for the site. The traffic counts conducted by the City of Ottawa were on a continuous basis across the 12-hour typical day (700 to 1900), while Ville de Gatineau concentrated on the peak and mid-day periods only (700 to 1000; 1130 to 1330; and 1500 to 1800) or an eight hour period.

5.2.2 Traffic Impact Assessments

As mentioned above, the data in the ITE Manual has been collected primarily at suburban locations having little or no transit service, nearby pedestrian amenities, or travel demand management programs. For Traffic Impact Assessments (TIA) prepared as part of a development application, engineers often use the ITE rates as a starting point and modify them to better represent transit and other amenities close to the development site. The modifications are based on experiences gained from similar already established land uses, input from City staff of past trends and/or local experience of the transportation consultants.

Consideration should be given with TRANS agencies reviewing the development site plan applications to consolidate any new trip rate calculations obtained as part of the development review process. These trip rates could then be used in future trip analysis as well as provide a

comparison for the reviewer of the traffic impact assessment to determine if the assumed trip rates are within range of other similar developments where TIA's were completed.

5.2.3 Other Data Sources

Other methods exist for data collection: personal interviews (at a generator site), telephone interviews or mail-back questionnaires. For commercial and office developments, where there are multiple destinations within developments or multiple access points these sources of data collection may provide a more accurate modal split for trip generation. TRANS could consider carrying out a generator specific questionnaire, 1-2 key developments per year.

5.3 Data Collection Needs to Identify the Pass-by Traffic Proportions

For a select group of land uses, the number of "new" trips generated by the specific development may actually be quite small, as some land uses such as service stations, fast food restaurants or convenience markets are more likely to attract trips from existing background traffic volumes already on the adjacent road and/or transit networks. For these cases, while the trip generation rates for the land use categories may be appropriately identified, it is equally important to also identify the proportion of trips that are not being attracted from within the existing adjacent roadway traffic volumes. The proportion of trips that is drawn from existing adjacent roadway traffic volumes is referred to as 'pass-by' traffic. It should also be noted that the proportion of "pass-by trips" are trips that are not diverted from another roadway but rather currently are traveling past the subject development. Current traffic count methodologies used for typical trip generation studies are not generally able to identify the proportion of the site generated traffic that may be considered 'pass-by' traffic.

In general terms, more detailed intercept interviews are the primary means used to identify the proportion of site generated traffic that may be associated with a given land use category. Intercept interviews, whereby surveyors carry out interviews by intercepting patrons either entering or leaving the development to ascertain the proportion of patrons that were "passing-by" the site rather than the site being the primary destination of the trip. These types of surveys require significant resources to identify for specific land use categories the proportion of trips that can be considered to be already included in the background traffic, passing by the site. In addition, the proportion of trips attracted from the existing traffic stream on the adjacent roadway also likely varies by time of day. Short of conducting a comprehensive data collection program for specific land uses, the most effective means to identify the proportion of traffic that can be attributed to the existing background traffic volume is to rely on the surveys and research carried out by ITE and Others. ITE has published its *Trip Generation Handbook* (second edition) which is a recommended practice, unlike the ITE *Trip Generation* which is an informational report including typical trip generation studies and vehicle trip rates but is not a recommended practice. ITE's *Trip Generation Handbook* has allocated a full chapter to issues surrounding pass-by trip proportions and highlights one of the most comprehensive datasets of pass-by rates encompassing a large number of land use categories.

The local collection of additional data to identify local rates for the proportion of pass-by trips needs to be undertaken within the broader data collection and research efforts undertaken by ITE and outlined in its *Trip Generation Manual.*

6.0 Summary of Findings

6.1 Data Sources

The vehicle trip rates developed for use in residential development applications in the Ottawa-Gatineau region are based primarily on three data sources: locally observed trip generation studies (traffic counts), reported travel for the TRANS OD Survey data and the ITE trip generation survey reports (ITE Trip Generation). Vehicle trip rates were developed by combining each of the independent data sources to produce the recommended vehicle trip rates for Ottawa-Gatineau.

6.1.1 Local Trip Generation Studies

Local trip generation studies for existing developments provides the most accurate local source of trip generation data for specific land use categories. An annual data collection program targeting specific land use categories offers the most reasonable approach to compiling sufficient sample to develop trip rates reflective of local travel behaviour and trip patterns. However, the past practice of undertaking traditional trip generation studies by TRANS member agencies has not been carried forward since the development of the previous TRANS Trip Generation Study. With the initiation of this study, seventeen (17) trip generation studies were undertaken in 2008 however given the variation in land use categories targeted they by themselves were not considered extensive enough to generate reliable rates.

6.1.2 ITE Trip Generation Rates

To supplement the local traffic data, the ITE trip generation data was reviewed for a number of residential land uses. The vehicle trip rates published by the ITE reflect a wide range of trip generation studies largely carried out in the United States and in some cases Canada. The development sites reported provide good coverage of the various land use categories and consequently the vehicle trip rates presented are reliable and a valuable source of trip generation data. However in many cases the background underlying travel behaviour in terms of transit usage or support for sustainable transportation varies considerably from that experienced in Ottawa-Gatineau.

6.1.3 2005 TRANS OD Travel Survey

The OD Survey datasets offer an alternative data source to the more traditional detailed trip generation surveys which have been designed to identify trip rates for specific land use categories. Planning agencies in Ottawa-Gatineau recently completed its TRANS 2005 OD Travel Survey. While comprehensive OD surveys are more typically used to provide a city-wide view of travel patterns, traveler choice of mode and general trip making characteristics across a larger geographic area, their use in the development of trip rates for specific land use categories has been limited, locally.

As a result considerable review and detailed analysis of the TRANS OD Survey was undertaken to best identify the suitability of the trip data for the development of residential trip rates. Part of the review focused on the underlying demographic profiles associated with the persons making the trips and resulting rates to ensure rates identified best represent the land use categories associated with future residential developments. Background data summaries and the various rates obtained for stratified samples within the OD survey database have been summarised in detail in the Appendices and highlighted in previous sections of the report.

Consideration was given to potential sampling biases that may exist due to household composition factors, particularly when comparing demographic elements of the residents surveyed as part of the OD Survey with those of the future residents of new residential developments. The comparative analysis undertaken focused on the trip generation rates developed for households of 3 persons where the oldest member is less than 50 years of age. The trip rates were predictably higher when excluding households of 1 or 2 residents and retirees. It was concluded based on the application of the trip rates to new developments that households with household members older than 55 years of age should not be included in the sample while households of all size categories should be included in the development of trip rates. This was primarily based on the high proportion of older residents within the OD survey sample when compared with planned new developments in general.

Trip rate adjustment factors were also developed to account for non-resident trips. OD surveys report on travel based on household interviews and consequently the rates developed are associated with the residents of the households. The methodology applied in the development of trip generation rates from the OD survey database therefore does not include trips to and from residential uses by non residents. Non-resident trips (i.e. service calls, deliveries, daycares) were estimated to account for 15% of the peak hour traffic volumes. The inclusion of these non-resident trips in determining trip generation rates are important since unlike typical trip generation surveys these non-resident trips are not captured or tracked in the context of city-wide OD surveys. The individual household trip rates were factored (increased) accordingly to ensure the rates developed include all travel associated with residential land uses. Section 3.3.9 of the Trip Generation Study outlines in more detail the nature and magnitude of non-resident based trip making.

6.2 Blended Vehicle Trip Generation Rates

Once vehicle trip rates had been developed using all three data sources, they were compared for consistency and averaged to produce a blended vehicle trip generation rate for the Ottawa-Gatineau region. The trip generation rates are presented in Table 6.1: Vehicle Trip Generation Rates.

The directional split (percentage of trips inbound versus outbound to the development) has been identified for both the AM and PM peak hours by dwelling unit type and is presented in Table 6.2: Recommended Vehicle Trip Directional Splits.

Table 6.1: Vehicle Trip Generation Rates

Vehicle Trip Generation Rates AM and PM Peak Hours						
ITE Land Use Code	Dwelling Unit Type / Data Source		Vehicle Trip Generation Rate			
			2008 Count Data	ITE	OD Survey	Blended Rate
210	Single-detached dwellings	AM	0.66	0.75	0.56	0.66
		PM	0.89	1.01	0.53	0.81
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.40	0.70	0.46	0.52
		PM	0.64	0.72	0.46	0.61
231	Low-rise condominiums (1 or 2 floors)	AM	0.53	0.67	0.21	0.47
		PM	0.41	0.78	0.18	0.46
232	High-rise condominiums (3+ floors)	AM	0.53	0.34	0.21	0.36
		PM	0.41	0.38	0.18	0.32
233	Luxury condominiums	AM	0.53	0.56	0.21	0.43
		PM	0.41	0.55	0.18	0.38
221	Low-rise apartments (2 floors)	AM	0.19	0.46	0.21	0.29
		PM	0.21	0.58	0.18	0.32
223	Mid-rise apartments (3-10 floors)	AM	0.19	0.30	0.21	0.23
		PM	0.21	0.39	0.18	0.26
222	High-rise apartments (10+ floors)	AM	0.19	0.30	0.21	0.23
		PM	0.21	0.35	0.18	0.25

Table 6.2: Recommended Vehicle Trip Directional Splits

Comparison of Directional Splits (Inbound/Outbound) AM and PM Peak Hours								
ITE Land Use Code	Area Dwelling Unit Type / Data Source		2008 Count Data		ITE		Blended Rate	
			Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
210	Single-detached dwellings	AM	33%	67%	25%	75%	29%	71%
		PM	60%	40%	63%	37%	62%	39%
224	Semi-detached dwellings, townhouses, rowhouses	AM	40%	60%	33%	67%	37%	64%
		PM	55%	45%	51%	49%	53%	47%
231	Low-rise condominiums (1 or 2 floors)	AM	36%	64%	25%	75%	31%	70%
		PM	54%	46%	58%	42%	56%	44%
232	High-rise condominiums (3+ floors)	AM	36%	64%	19%	81%	28%	73%
		PM	54%	46%	62%	38%	58%	42%
233	Luxury condominiums	AM	36%	64%	23%	77%	30%	71%
		PM	54%	46%	63%	37%	59%	42%
221	Low-rise apartments (2 floors)	AM	22%	78%	21%	79%	22%	79%
		PM	62%	38%	65%	35%	64%	37%
223	Mid-rise apartments (3-10 floors)	AM	22%	78%	25%	75%	24%	77%
		PM	62%	38%	61%	39%	62%	39%
222	High-rise apartments (10+ floors)	AM	22%	78%	25%	75%	24%	77%
		PM	62%	38%	61%	39%	62%	39%

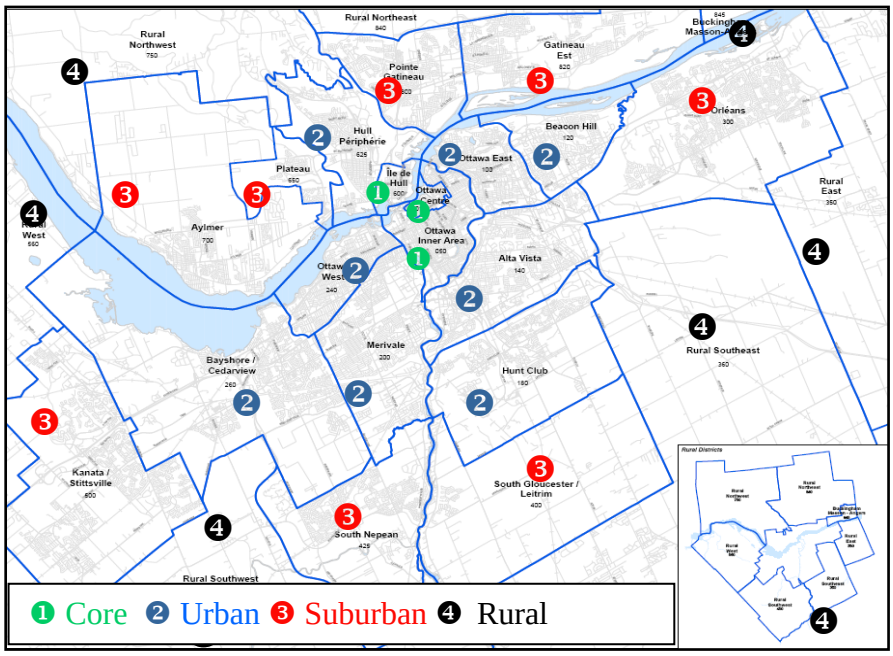
6.3 Trip Rate Adjustment Factors

6.3.1 Trip Rate Adjustment Factor by Region

The OD Survey Data confirmed differences in vehicle trip rates for four broad planning areas as depicted below and shown in Exhibit 6.1:

1. core areas which include both Ottawa-Gatineau's downtown areas;
2. the Urban area which is largely the area remaining "inside the Greenbelt";
3. the Suburban Area which is located further from both Ottawa-Gatineau's downtown areas or the urban areas located "outside the greenbelt"; and
4. rural areas located beyond Ottawa and Gatineau's urbanized development.

Exhibit 6.1: Geographic Regions of the National Capital Area



The differences in the OD Survey vehicle trip rates for various geographic regions were used to develop the vehicle trip rates based on the application of the blended vehicle trip rates as shown in Table 6.1.

6.3.2 Trip Rate Adjustment Factor by Proximity to Transit

The influence of transit use on vehicle trip rates was considered using the OD Survey and analyzing transit usage as a function of distance from Transitway access points (Transitway stations were used as surrogates for access to rapid transit services) using distances of 400m increments. As expected, transit usage or transit mode shares (the proportion of total travel attracted to transit) decreased with increasing distance from a rapid transit station. The analysis carried out and documented in Section 4.0 of the Trip Generation Study supported a reduction in the residential vehicle trip rates as a function of the distance the residential development is located from access to rapid transit services (Transitway station). As a result the vehicle trip rates have been established as a function of the distance to a rapid transit station. In other

words, a bonus was therefore applied (reduction) to the base residential vehicle trip rate to reflect the increased use of transit based on a distance of less than 600m to a rapid transit station.

The analysis suggests that the transit mode splits presented in Table 4.3 (39% during the AM peak hour and 29% during the PM peak hour) can be achieved for residences within a 600m walking distance to a rapid transit station. As shown in Table 3.13, some geographic areas and dwelling unit types have higher transit mode shares than 39% and 29% during the AM and PM peak hours, respectively. The transit bonus was only applied to dwelling units in geographic areas with lower transit mode shares than those presented in Table 4.3.

6.4 Recommended Vehicle Trip Generation Rates

The recommended Ottawa-Gatineau vehicle trip generation rates developed for residential land uses have therefore considered each of the foregoing elements of geographic location and transit usage. Each of these factors has a varying impact on each of the residential unit types analyzed and are presented in Table 6.3: Recommended Vehicle Trip Generation Rates for Residential Land Uses with Transit Bonus. As highlighted in Table 6.3 vehicle trip rates have been developed for both AM and PM peak hours.

The rates presented reflect existing travel behaviour by dwelling type and geographic area as well as an adjustment to reflect increased transit usage for developments in close proximity to rapid transit stations. For example, single detached units located within the core area have the lowest vehicle trip rates of all single detached units when compared against other geographic locations. This reflects the high proportion of walk trips as well as good access to transit services in the core area. In addition for single detached units the variation in the vehicle trip rates based on the distance to rapid transit is also highlighted within each of the geographic areas. The reduction in the vehicle trip rate based on distance from rapid transit can be substantial. For example, for single detached units in the core area the PM peak hour vehicle trip rate can be reduced by as much as 45% (0.60 vehicle trips per unit to 0.33 vehicle trips per unit). Where a single trip generation rate is shown for all distances (i.e. Low-rise condominiums located in the core area ~0.34 vehicle trips per unit) it indicates that the current rate reported in the survey for this category of unit type was higher than that identified as the adjusted mode split rate. Consequently no reduction has been applied and the same vehicle trip rate is used independent of the distance to rapid transit.

Table 6.3: Recommended Vehicle Trip Generation Rates for Residential Land Uses with Transit Bonus

Recommended Vehicle Trip Generation Rates with Transit Bonus AM and PM Peak Hours									
ITE Land Use Code	Dwelling Unit Type / Geographic Area		Vehicle Trip Rate						
			Core		Urban (Inside the Greenbelt)		Suburban (Outside the Greenbelt)		Rural
			Base Rate	< 600m to Rapid Transit	Base Rate	< 600m to Rapid Transit	Base Rate	< 600m to Rapid Transit	Base Rate
210	Single-detached dwellings	AM	0.40	0.31	0.67	0.50	0.70	0.49	0.62
		PM	0.60	0.33	0.76	0.57	0.90	0.63	0.92
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.34	0.34	0.51	0.50	0.54	0.39	0.62
		PM	0.39	0.38	0.51	0.51	0.71	0.51	0.67
231	Low-rise condominiums (1 or 2 floors)	AM	0.34	0.34	0.50	0.50	0.60	0.60	0.71
		PM	0.29	0.29	0.49	0.49	0.66	0.66	0.72
232	High-rise condominiums (3+ floors)	AM	0.26	0.26	0.38	0.38	0.46	0.46	0.54
		PM	0.20	0.20	0.34	0.34	0.46	0.46	0.50
233	Luxury condominiums	AM	0.31	0.31	0.45	0.45	0.55	0.55	0.65
		PM	0.24	0.24	0.40	0.40	0.55	0.55	0.59
221	Low-rise apartments (2 floors)	AM	0.21	0.21	0.31	0.31	0.37	0.37	0.44
		PM	0.20	0.20	0.34	0.34	0.46	0.46	0.50
223	Mid-rise apartments (3-10 floors)	AM	0.17	0.17	0.24	0.24	0.29	0.29	0.35
		PM	0.16	0.16	0.28	0.28	0.37	0.37	0.41
222	High-rise apartments (10+ floors)	AM	0.17	0.17	0.24	0.24	0.29	0.29	0.35
		PM	0.16	0.16	0.27	0.27	0.36	0.36	0.39

Note: The transit bonus was only applied to geographic areas and dwelling unit types where the reported transit mode shares were less than the transit mode share reported for residential development located within the 600m proximity to a rapid transit station. It is noted that condominium and apartment housing categories reported similar levels of transit mode shares independent of location to rapid transit stations.

6.5 Future Data Collection

While the rates presented in were prepared by blending the vehicle trip rates from ITE, the OD Survey and the 2008 local trip generation studies, it is important to stress the importance and need for ongoing local trip generation surveys to monitor changes in travel behaviour. The 2008 trip generation studies undertaken to support this study provide insight into local travel patterns and a well organized ongoing annual data collection program aimed at trip generation surveys of key land uses or requirement for data collection by local developers will continue to provide recent and accurate local trip generation rates. For example the high-rise apartment category of dwelling units reported the lowest peak hour vehicle trip rates.

These rates were supported with the most recent counts undertaken of apartment housing types in the 2008 trip generation surveys. Nevertheless, detailed review of the OD Survey data indicated significant variation exists in the rates obtained for broad categories of unit types and consequently there can be a wide range of rates for each of the current categories of residential unit types identified by the OD Survey. Ongoing targeted trip generation surveys for specific development proposals continue to offer the most realistic means to ensure trip rates remain current and reflect changing travel behaviour across the planning area.