EVALUATING PUBLIC TRANSIT ACCESSIBILITY TO EMPLOYMENT: THE CASE OF OTTAWA, CANADA

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ABSTRACT

The purpose of this study was to address the need for a straightforward and practical tool for evaluating public transit accessibility to places of employment. The need for such a study stems from the widespread adoption of planning policies by Canadian municipalities seeking to promote public transit commuting as part of their broader efforts to develop environmentally and socially sustainable transportation systems. To date, planners have not had any practical methods for identifying barriers to public transit commuting nor for evaluating the extent to which stated goals and objectives are being achieved.

The study was conducted in three stages. First, a "Comprehensive Definition of Public Transit Commuter Needs" was developed by means of a literature review, a survey questionnaire, and consultations with sustainable transportation advocacy groups. In the second stage, the "Comprehensive Definition of Public Transit Commuter Needs" was used as a framework for creating the "Public Transit Commuter Accessibility Audit." Through a six-step process that involves the collection of both qualitative and quantitative data, this tool provides planners with a means of identifying any potential obstacles or deterrents to public transit travel within the context of actual spatio-temporal commuter flows. The practical utility of the "Public Transit Commuter Accessibility Audit" was tested in the third stage by means of two case studies conducted in the City of Ottawa, Canada.

This study has shown that commuters require a broad array of infrastructure, facilities and services in order for public transit to represent a viable travel option. It has also revealed that responsibility for promoting public transit commuting rests not only with transit agencies, but also with land use and transportation planners, private developers and employers. Furthermore, the case studies successfully demonstrated that application of the "Public Transit Commuter Accessibility Audit" can provide a preliminary indication of problem areas where direct planning interventions may be required, where municipal planning policies may need revision or more aggressive implementation, or where new policies may be necessary in order to increase the viability of public transit commuting.

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DEDICATION

To my beautiful, wonderful daughter,

Grace Lily Fullerton,

born November 15, 2002.

TABLE OF CONTENTS

CHAPTER TWO: LITERATURE REVIEW (continued)

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

CHAPTER FOUR: TOWARDS A COMPREHENSIVE DEFINITION OF PUBLIC TRANSIT COMMUTER NEEDS

CHAPTER FIVE: THE *PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT*

CHAPTER SIX: STUDY AREA

CHAPTER SEVEN: CASE STUDY #1 – ORLEANS TOWN CENTRE

CHAPTER SEVEN: CASE STUDY #1 – ORLEANS TOWN CENTRE (continued)

CHAPTER EIGHT: CASE STUDY #2 – LINCOLN FIELDS SHOPPING CENTRE

CHAPTER EIGHT: CASE STUDY #2 – LINCOLN FIELDS SHOPPING CENTRE (continued)

List of Tables

List of Tables (continued)

List of Figures

List of Figures (continued)

List of Figures (continued)

List of Boxes

CHAPTER ONE: RESEARCH PROBLEM

1.1 Background

Throughout the 1990s and into the 21st century, planners and policymakers across Canada and throughout the industrialized world have embraced the notion of sustainable transportation as a potential framework for alleviating the myriad environmental, economic and social consequences of automobile-oriented urban development. Community planning informed by the notion of sustainable transportation recognizes that, although individuals require physical access to a variety of facilities and services on a day-to-day basis, the automobile represents only one of several possible means by which access needs may be addressed. Whether or not a particular mode represents a viable means of addressing one's access needs depends in large part on the level of *accessibility*, or "the ease of reaching needed or desired activities" (Handy and Clifton 2001: 67), provided by that mode.

The level of accessibility offered by a given mode of transportation is influenced considerably by characteristics of the urban built environment, which consists of buildings and other built structures, utilities and transportation infrastructure (Stone 1989). Over the past several decades, cities have not been planned to provide easy pedestrian, bicycle and public transit accessibility, but instead have been allowed to grow in ways that lead to heavy demands for automobile transportation. The formerly compact urban built environment that once allowed individuals to travel quickly and easily between trip origins and destinations has given way to a sprawling pattern of development in which land uses are strictly segregated (Perl and Pucher 1995). Concurrently, pedestrian-, cycling- and transit-friendly streetscapes have given way to automobile-oriented transportation networks that often hinder, or eliminate completely, individuals' ability to travel by non-automobile modes. These trends in turn have induced continually growing demands for automobile transportation, and it is the servicing of this *derived demand* that has been the primary focus of urban transportation planning.

The demand-led and automobile-oriented approach to urban transportation planning is now widely recognized as the source of many negative environmental, economic and social ills. For example, excessive reliance on automobile transportation is responsible for the rapid consumption of non-renewable fuel resources, the widespread emission of air, water and noise pollution (Anderson *et al.* 1995; Replogle 1990; Wakeford 1994) and aesthetic degradation of the urban environment (Edwards 1982). In economic terms, the demand-led approach to urban transportation has burdened taxpayers with the enormous cost of constructing and maintaining roads and highways (Delucchi 1997; Litman 1998; Maddison *et al.* 1996), as well as health care and policing expenses associated with automobile accidents (Miller 1991). Furthermore, the emergence of automobile transportation as the primary means of addressing access needs has imposed a financial burden on households due to the costs associated with car ownership, vehicle maintenance (Hook 1995; Skaburskis 1989) and parking (Hare 1993; Litman 1995).

The development of automobile-oriented cities is also recognized as having numerous social consequences. These include, for example, the disruption of neighbourhood cohesion in high-traffic areas (Appleyard 1981; Engwicht 1993), deaths and injuries resulting from motor vehicle collisions (Richardson 1997), and the negative impacts of automobile dependency on public health and physical fitness (Dora 1999; Hillman 1993; Kreyling 2001; World Health Organization 1999). Moreover, automobile-oriented development has also been widely cited as a cause of social exclusion, the situation in which people are prevented from participating adequately in society due to a lack of access to education, employment, public services, and other activities (Litman 2003: 1). Indeed, researchers have identified a wide range of accessibility constraints that have been imposed upon various sub-groups of the urban population – such as children, youth, women, low-income households, and persons with disabilities – who often do not have automobile access to employment, shopping, child care and other necessary facilities and services (Greed 1994; Hamilton and Jenkins 1989; Moore Milroy 1991; Zielinski 1995).

The concept of sustainable transportation has been widely embraced by municipalities because, in contrast to the automobile-oriented and demand-led approach to urban transportation planning, this approach entails the servicing of access needs in ways that are at once environmentally benign, economically efficient *and* socially equitable (CST 1998a). Accordingly, it provides an opportunity to *simultaneously* address many of the negative consequences of automobile dependence. Community planning rooted in the notion of sustainable transportation planning does not aim to prevent people *entirely* from using private automobiles, however, as this would be viewed as somewhat of a draconian measure in a democratic society (Gordon and Richardson 1999; Wakeford 1994), not to mention politically unpalatable (Kitamura *et al.* 1999; Mitlin and Satterthwaite 1997). Instead, it first aims to reduce the demand for transportation as much as possible by locating required facilities and services in close proximity to one another through the integration of land uses. Because it would be impossible to eliminate the need for travel entirely, however, the development of sustainable transportation systems also involves enhancing the degree of transportation choice available to urban dwellers. *Transportation choice* refers to "the quantity and quality of transportation options available to an individual or group, taking into account their differing needs and abilities" (Litman 2001: 2). In this regard, ensuring that the infrastructure, facilities and services required by pedestrians, cyclists and public transit users are in place is the primary concern. The enhancement of transportation choice would serve two purposes: first, it may encourage more sustainable travel behaviour on the part of those who currently travel by automobile; and secondly, it will result in a greater degree of accessibility than currently provided for those who do not have the use of an automobile.

Over the past decade a growing number of Canadian municipalities have incorporated the concept of sustainable transportation within their long-term community plans. These include, for example: the Greater Vancouver Regional District's *Livable Region Strategic Plan* (GVRD 1996); the City of Calgary's *Transportation Plan* (City of Calgary 1995); the City of Hamilton's *Vision 2020* (RMHW 1992); the City of Winnipeg's *Plan Winnipeg 2020 Vision* (City of Winnipeg 2001); and the City of Ottawa's *Official Plan* (City of Ottawa 2003). In each of these initiatives explicit goals and objectives have been established seeking to improve the degree of transportation choice available to local residents. Not surprisingly, a key target of urban sustainable transportation initiatives has been commuting, or the journey-to-work. Commuting is the physical manifestation of individuals' need for access to places of employment and has long been considered an area in which automobile travel within cities must be reduced (Banister and Gallent 1999). In the measurement of commuting patterns, the concept of modal split is used to convey the percentage distribution of travel by various modes. The different standard categories of modal split are: car driver, car passenger, public transit, cycling and walking. The automobile-dominated nature of contemporary commuting patterns is outlined in Table 1.1, which shows the journey to work modal split for Canada's 25 Census Metropolitan Areas (CMAs) in 1996. During that year, the automobile made up by far the largest proportion of the modal split in each CMA. Conversely, travel on foot, by bicycle, or by public transit made up significantly smaller shares of the overall modal split.

The dominance of automobile-based commuting can be linked not only to the development of automobile-oriented urban built environments over the past several decades, but also to several spatial, sociodemographic and economic trends that have dramatically altered the nature of employment within the Canadian metropolis throughout the same period. The spatial characteristics of metropolitan commuting have changed considerably in conjunction with the increasing territorial separation between places of residence and places of employment (Filion and Rutherford 2001; Gad 1985; Mensah and Ironside 1993; Villeneuve and Rose 1988). The trend toward low-density residential development that began in the post-World War II era has been followed more recently by a similar decentralization and dispersal of employment away from the central business district (CBD) (Filion, Bunting, and Warriner 1999). As a result, commuting flows now include travel between suburban residences and employment locations in the CBD, between central city residences and suburban workplaces, and between suburban residences and suburban workplaces (Cervero *et al.* 1999; Mensah and Ironside 1993; Preston and McLafferty 1994).

Table 1.1
Mode of Travel to Work, Canadian Census Metropolitan Areas, 1996

Census Metropolitan Area (CMA)	Number of Commuters	Mode of Travel to Work				
		Car Driver	Car Passenger	Public Transit	Walking	Cycling
Trois-Rivieres	55,535	84.1	4.7	2.3	7.0	1.9
Chicoutimi - Jonquiere	61,120	83.3	6.5	2.2	6.5	1.5
St. Catharines - Niagara	153,790	83.0	7.8	2.0	5.4	1.7
Windsor	122,325	82.5	7.2	3.4	5.1	1.9
Oshawa	119,995	81.2	8.1	5.6	4.1	1.1
Thunder Bay	54,990	81.0	7.8	3.4	5.8	1.9
Sherbrooke	62,675	80.2	5.7	5.3	7.5	1.2
Kitchener	180,100	79.8	8.8	3.9	5.7	1.8
Regina	89,965	79.2	8.0	5.0	5.8	1.9
Hamilton	276,815	78.1	7.2	8.0	5.2	1.4
Saskatoon	98,770	77.8	7.3	5.1	6.4	3.4
Sudbury	67,165	77.8	9.3	5.0	6.4	1.5
London	176,425	77.3	7.8	6.1	6.6	2.2
Edmonton	403,370	76.9	6.9	9.0	5.0	2.1
St. John's	71,375	76.5	12.7	2.4	6.7	1.7
Quebec City	298,905	76.2	5.8	9.3	7.2	1.5
Saint John	50,550	75.4	11.3	4.6	6.8	1.9
Calgary	409,520	72.8	7.2	12.6	5.4	2.0
Vancouver	831,275	70.6	6.6	14.3	5.8	2.6
Winnipeg	306,420	68.1	9.0	14.4	6.2	2.3
Victoria	135,445	67.1	6.8	9.9	9.8	6.4
Montreal	1,417,195	66.6	5.5	20.3	5.9	1.7
Halifax	153,710	66.6	10.4	10.9	9.9	2.2
Toronto	1,929,780	65.3	6.7	22.0	4.6	1.5
Ottawa – Hull	466,705	64.3	8.8	17.1	7.0	2.8

Source: Statistics Canada 1999a.

The sociodemographic characteristics of the metropolitan commuter population have also been transformed, in this case primarily due to changing gender roles and household structures. Over the course of the 20th century, and especially during more recent decades, an increasing number of women have assumed active roles in the paid labour force. Indeed, the proportion of female labour force participants in Canada has risen to a level equal almost to that of men (Gold 1994; Griffin-Cohen 1994; Michelson 1988; Preston and McLafferty 1994). Coincident with this trend has been an important societal change related to the structure of metropolitan households. There has been a significant increase in the proportion of households composed of two-income earners or one single-parent. The traditional household, consisting of a single income earner (usually male) and a homemaker (usually female), has in turn become far less common (Rose and Wexler 1993; Strong-Boag *et al.* 1999). As a result, an increasing number of employed persons must deal with time constraints that involve balancing employment outside the home with household responsibilities including, for example, shopping and the transport of children to and from daycare or school. Commuting has in many cases therefore become part of a larger trip-chain that includes stops at various facilities and services between home and work, such as grocery stores, daycare centres and schools (Blomberg *et al.* 2000; Clark 2000; Michelson 1988; Rose and Wexler 1993). Journey-to-work patterns have also been altered by economic restructuring processes, a primary component of which has been employers' more frequent reliance on part-time labour (Dicken and Lloyd 1981; Mensah and Ironside 1993; Rose and Villeneuve 1993). As these positions entail working fewer than 35 hours per week, part-time employees are less likely to commute during traditional Monday-to-Friday morning and afternoon peak periods (Rose and Villeneuve 1993).

As these numerous trends have unfolded, it has become increasingly difficult for many individuals to address their access needs by any mode of transportation other than the automobile. A growing proportion of commuter trips now begin or end within low-density suburban areas, yet it is within these settings that infrastructure, facilities and services required by pedestrians, cyclists and public transit users are most inadequate, if even available (Perl and Pucher 1995). Furthermore, commuters wishing to make stops between home and work face the problem of travelling between facilities and services that are often situated far apart from one another, thus reducing the ease with which they can be reached in a timely fashion without using an automobile. Moreover, individuals working part-time are also frequently unwilling or unable to commute by public transit because, in many cities, services are geared primarily to serving peak hour travellers moving between suburban residences and downtown work locations. On the other hand, public transit service during off-peak hours, when part-time workers often commute, is often infrequent or altogether unavailable. For many individuals in the Canadian metropolis, the journey to work has therefore out of necessity become synonymous with transportation by automobile.

These problems are further compounded for individuals who do not have access to an automobile for commuting purposes. In their cases, the lack of pedestrian, cycling and public transit facilities and services has been found to impose a variety of employment constraints (Mensah and Ironside 1993; Rutherford and Wekerle 1988; Zielinski 1995). For example, a reliance on inadequate public transit services in many cases limits the number of areas in which employment can be obtained and/or the hours in which individuals are able to travel to and from workplaces.

The adoption of sustainable transportation policies in Canadian municipalities clearly provides an opportunity to counteract many commuting-related transportation problems. In order to address both environmental protection *and* social equity concerns, however, it is essential that municipal planning initiatives address two key objectives. First, in the interest of reducing the negative environmental impacts of automobile dependence in journey to work patterns, it is necessary to improve the attractiveness of walking, cycling and public transit *vis-à-vis* the automobile so that persons who have become accustomed to commuting by car can be encouraged to change their travel behaviour. Second, the spatio-temporal constraints affecting persons without automobile access to places of employment must be eliminated in the interest of promoting social equity. In summary, the success of any sustainable urban transportation initiative related to commuting will depend largely on the ability of planners and policymakers to ensure that walking, cycling and/or public transit represent viable transportation options for *all* members of the metropolitan labour force.

1.2 Research Problem and Questions

As part of their efforts to reduce levels of automobile-based commuting, municipalities across Canada have adopted a number of policies that seek to improve public transit accessibility to employment. The success of these policies will depend largely upon the ability of land use, transportation and public transit planners to serve the increasingly complex and wide-ranging needs of the contemporary commuter population, as briefly presented in the previous section. This brings to light two important issues that have yet to be thoroughly addressed in urban transportation research. First, if planners are to ensure that public transit represents a viable means of transportation to and from work for *all* individuals, thus reflecting the social equity principles of sustainable transportation, *they require a systematic and consistent means of identifying any weaknesses or deficiencies in the infrastructure, facilities and services currently in place, so that barriers or deterrents to commuting by public transit may be identified and eliminated*. Up to now, however, evaluations of urban transportation system performance have relied primarily upon the use of variables that measure how well *demands for automobile transportation* have been served, such as traffic speeds, roadway capacities, and congestion levels. On the other hand, planners and policymakers have devoted far less attention to examining public transit accessibility.

A great deal of research *has* been conducted in recent years that has sought to address this concern, primarily through the development of practical tools for evaluating the quality of public transit infrastructure, facilities and services (e.g. Evans *et al.* 1999; Hamilton, Ryley and Jenkins 1999; Kittelson and Associates 1999; Rood 1998). A continuing problem, however, is that none of these tools on its own is adequately suited to the evaluation of public transit accessibility to employment. This is primarily because none of these fully considers the broad range of factors that influence the viability of public transit commuting for *all* members of the metropolitan labour force. A second and ensuing implication, therefore, is that, before public transit accessibility can be evaluated within the context of the journey-to-work, planners must first know what to look for. In other words, *planners require a clear understanding of what infrastructure,* *facilities and services are required by public transit commuters.* A formal definition of public transit commuter needs, however, has never been formally created.

In an attempt to fill these gaps, this research employs a normative approach that is rooted in the notion of social equity to address two key questions related to 1) the conceptualization of public transit commuter needs and 2) the evaluation of how well public transit commuter needs are served. The first research question asks*: What infrastructure, facilities and services should ideally be in place in order for public transit to represent a viable transportation choice for all members of the contemporary commuter population?* While the needs of public transit commuters have not yet been comprehensively defined, researchers *have* devoted a great deal of attention to identifying factors that hinder and/or promote travel by modes of sustainable transportation, with much of this attention focused on two areas. For example, numerous studies have identified the accessibility needs of urban dwellers as they pertain to the provision of specific transportation facilities and infrastructure (e.g. Cervero and Seskin 1995; Hardin *et al.* 2001; Loukaitou-Sideris 1999), while others have highlighted various spatial and temporal considerations that influence the viability of travelling by different modes of transportation (e.g. Rosenbloom and Burns 1995; Sanchez 1999). Furthermore, many studies have focused primarily on examining the infrastructure, facilities and services required by particular sub-groups of the metropolitan population, such as women (Grieco *et al.* 1989; Hamilton and Jenkins 1989, 2000; Hanson and Pratt 1988b; Holloway 1999; Johnston-Anumonwo 1988; Preston and McLafferty 1994; Rutherford and Wekerle 1988; Villeneuve and Rose 1988), low-income earners (Broadway 1992; Helling 1998; Mensah and Ironside 1993; Sanchez 1999; Van Hengel

1999), and persons with disabilities (Axelson, Wong and Kirschbaum 1999; Hine and Mitchell 2001). A logical next step in the research would therefore be to examine and synthesize those research findings relevant to public transit and commuting in order to formulate a definition of public transit commuter needs that fully reflects social equity principles – that is, one that mirrors to as great an extent as possible both the sociodemographic heterogeneity of the contemporary commuter population *and* its diverse spatio-temporal travel patterns.

Accordingly, the first research question is addressed primarily by means of a systematic review and synthesis of previous research conducted in seven topical areas. This includes studies that have examined:

1) factors influencing public transit accessibility *in general*;
2) factors influencing public transit accessibility *to places of employment;*
3) factors influencing public transit accessibility *from the perspective of particular population subgroups (e.g. women and low income earners)*;
4) factors influencing *pedestrian accessibility*;
5) factors influencing *wheelchair accessibility*;
6) factors influencing *bicycle accessibility*; and
7) factors influencing *accessibility to public transit by automobile*.

In order to add more robustness to the literature review findings, two further approaches are also used to address the first research question. First, the results of a survey questionnaire distributed to employees of a well-known travel club in the organization's three suburban Ottawa offices are analyzed in order to determine workers' levels of, and concerns related to, public transit commuting. Secondly, comments concerning the needs of public transit users elicited during informal meetings with members of three sustainable transportation advocacy groups are also used.

After the needs of public transit commuters have been comprehensively defined, the second and ensuing research question addressed in this study is: *Can a simple and* *practical tool be devised that, when applied, will provide some indication of how well the needs of public transit commuters are served by the infrastructure, facilities and services currently in place?* The development of such a tool must address two key concerns if the final product is to be useful to practising planners. First, because a commuter's ability or willingness to travel by public transit is often determined by micro-scale considerations – such as, for example, the infrastructure in place between *his/her* home and *his/her* transit stop, or the amenities available once he/she arrives there – it is important that the tool can be applied at the small-area level so that conditions such as these can be effectively evaluated. Second, because commuting now takes place *at virtually all hours of the day* and because commuter flows involve travel *in various directions* and *throughout the metropolis*, it is also critical that a spatio-temporal dimension is incorporated in the tool for evaluating public transit accessibility to employment. The evaluation framework should ultimately assist in answering questions such as: How easily, if at all, can commuters residing within a particular metropolitan subarea travel to a particular place of employment by public transit? For example, is public transit service provided between the metropolitan subarea and the place of employment when it is needed? Do transit routes connect directly the two points? Is pedestrian access to stops adequate? Are transit stops located in safe areas?

Such a tool would serve at least three purposes. First, it would provide planners with a means of ensuring that all areas to be examined in a particular study are evaluated using a consistent, standardized set of criteria. Second, initial applications of the tool would provide an opportunity to obtain baseline data regarding current conditions and assist in identifying obstacles or barriers to public transit commuting that can then potentially be eliminated by means of appropriate planning interventions or other means. Third, subsequent applications of the tool could then be used to gauge whether there has been movement towards, or away from, community planning goals and objectives related to public transit commuting.

To address the notion of need in public transit, it is important to distinguish between the concepts of *latent need* and *manifest need*. As put forth by Merton (1968), latent needs are those inherent to all members of a target population, regardless of whether or not those needs are currently being met. When an individual or group's needs are not adequately met, on the other hand, they are also said to be in manifest need. Generally, most discussions of need are framed within the context of manifest need, whereby some individual or group suffers from the lack of a necessary item or service (Akkerman 1992). In this study, however, the first stage of the research involves the identification of public transit commuters' *latent* needs – in other words, those applicable to the overall public transit commuter population regardless of whether or not they are currently being adequately served. The second stage entails the development of an accessibility evaluation tool that seeks to determine whether particular groups of public transit commuters are in *manifest* need, as regard any of the infrastructure, facilities or services they generally require.

1.3 Study Area

In order to test the evaluation tool, two case studies will be applied to subareas within the City of Ottawa. Thanks primarily to planning policies that have granted precedence to public transit over the private automobile for the past three decades, Ottawa has frequently been praised as one of North America's most transit-friendly cities (e.g. Cervero 1986, 1998; Hooper 1995; Rathwell and Schjins 2002). Despite these accolades, however, civic officials in Ottawa have been forced in recent years to confront problems associated with growing automobile dependence and declining public transit ridership that are not dissimilar to those experienced elsewhere.

The challenges facing public transit in Ottawa are well reflected within the context of the journey-to-work. The promotion of pubic transit commuting in Ottawa has been firmly entrenched as an important local government priority since the early 1970s, but market forces have not always corresponded to municipal planning goals (Cervero 1998). As in most North American cities, the dominance of Ottawa's central business district has declined over the past several decades as an increasing proportion of employment growth has occurred in suburban settings. This process began in earnest during the late 1950s when the Government of Canada, Ottawa's largest employer throughout much of the city's history, embarked on a massive office decentralization project that was conceived primarily as an effort to reduce rush hour traffic congestion in the downtown core. More recently, however, it has been private sector employment that has grown significantly in suburban Ottawa. While this has especially been the case in the high-technology sector, which for a short period in the late 1990s usurped the federal government as the city's leading employer, job growth has also been strong in various service industries, such as retailing and tourism (RMOC 1997a). Despite the existence of planning policies seeking to encourage the concentration of employment in a small number settings located along major transit corridors, employers have generally resisted and have instead expressed preferences for suburban locations that are not easily served by public transit, such as office and industrial parks.

The decentralization and dispersal of employment has had an enormous influence on commuting patterns in Ottawa, in terms of both directions of travel *and* modes of travel used. With approximately one-fifth of the city's total employment base, the CBD remains the single most important commuting destination; however, with a growing proportion of suburban employment a larger share of workers now engages in cross-commuting or reverse commuting. This in turn has had a significant impact on levels of public transit commuting, because Ottawa's public transit infrastructure and services have traditionally focused primarily on serving the downtown core. As a result, public transit has maintained a remarkably large share of the journey-to-work modal split for travel to workplaces in Ottawa's CBD, but is used far less frequently in the case of suburban employment destinations, where the predominant mode of commuting is by far the private automobile (JACPAT 1997).

It was with concerns such as the growth of automobile-based commuting and the concurrent decline in public transit-based journeys to work that the City of Ottawa adopted a new official plan in May 2003. While, as noted earlier, the inclusion of policies related to public transit commuting is nothing new to municipal planning legislation in Ottawa, the most recent plan indicates the City's intention to promote travel by public transit in a much more aggressive and proactive fashion that has been followed in the past (City of Ottawa 2003: Section 2.3.1). This is perhaps best indicated by its ambitious objective of increasing peak-period public transit ridership from 17% of total motorized trips (those made by transit or automobile), its share in 2001, to a much higher 30% of total motorized trips by 2021. In discussing the prospects for achieving this objective, Ottawa's planners and policymakers have explicitly acknowledged that public transit currently does not represent a viable means of travel to work for many commuters and, as a consequence, that achievement of the plan's modal share objective or any other objective related to public transit commuting is unlikely to occur without extensive planning intervention. As a result, the City's new official plan contains a vast array of policies related to land use, transportation and public transit planning that support its public transit commuting goals.

Within each of the two case studies, public transit accessibility to a major employment area from two metropolitan subareas will be examined. In each case, the selected subareas will be among those that house a large proportion of individuals working within that employment area. The case studies will provide a means of determining whether the tool can provide planners and policymakers with a straightforward and practical means of evaluating public transit accessibility to places of employment, or whether the framework requires further modification.

1.4 Organization of the Dissertation

The purpose of this research is to improve our understanding of the factors that influence the viability of commuting by public transit and, furthermore, to provide land use, transportation and public transit planners with a tool they might use to ensure that they are adequately serving the needs of public transit commuters. Chapter One has presented a brief outline of the research problem, the research questions to be addressed, and the study area within which the research will be conducted. Chapter Two consists of a literature review in which the following topics are examined: the concept of sustainable development; aspects of inconsistencies between sustainable development and urban transportation; the evolution of public transit in Canadian cities; the notion of sustainable transportation; the role of public transit in sustainable transportation planning; the ways in which Canadian municipalities are seeking to encourage increased public transit ridership for commuting purposes; and the remaining problems that must be addressed in order to assist Canadian municipalities in achieving their sustainable transportation goals and objectives related to public transit commuting. Chapter Three elaborates upon the research design, including the research strategy and the methods utilized to address the two primary research questions.

Chapter Four presents the results of the systematic literature review, survey questionnaires, and consultations with transportation advocacy groups, as well as the subsequent conceptualization of "public transit commuter needs." In Chapter Five I discuss the development of the *Public Transit Commuter Accessibility Audit*, a tool for evaluating the servicing of public transit commuter needs. Chapter Six introduces the study area in which trial applications of the *Public Transit Commuter Accessibility Audit* were conducted. This consists of a historical overview of public transit commuting in Ottawa, followed by a review of recently adopted planning policies that seek to improve the viability of travelling to work by public transit in that city. Chapters Seven and Eight document the case study results, while Chapter Nine reviews the implications of the research results as they pertain both to the community planning profession and to urban transportation researchers, and also presents concluding statements.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The concept of sustainable development and its implications for industrialized nations have become important matters of concern in academic and governmental circles. Urban transportation is a particular case in point. Although the "urban transportation problem" – the catch-all term often used to characterize the myriad negative consequences associated with automobile-oriented urban development patterns – and its proposed solutions have been discussed for several decades, the volume of literature in these areas has become especially abundant following the release of *Our Common Future* by the World Commission on Environment and Development (WCED 1987). It has also generally been within the context of sustainable development or, more frequently, the derivative concept of sustainable transportation, that discussions concerning the future role of public transit within the context of metropolitan commuting have been put forth.

In order to establish an imperative for this research effort, which aims to develop a practical tool for evaluating public transit accessibility to employment, the purpose of this chapter is to present an overview of previous research. This will include the examination of literature in the following topical areas:

- the conceptual distinction between need, want and demand;
- the notion of sustainable development, as put forth by the WCED;
- the implications of sustainable development for urban transportation planning;
- the notion of sustainable transportation;

- the role of sustainable transportation in municipal planning policies; and
- the evaluation of accessibility, as it pertains to urban transportation.

This is followed by a brief review of various geographical, sociodemographic and economic employment trends that have served to alter considerably the spatio-temporal nature of metropolitan commuting in Canada. Finally, the chapter concludes with an overview of the remaining problems associated with the evaluation of public transit accessibility to employment that this research project seeks to address.

2.2 Need, Want and Demand

The concept of *need* is used extensively in our everyday language. However, confusion between *need* and *demand* frequently arises when reference is made to an item or service that is *wanted* or *desired*, but that may not necessarily be needed. Researchers in disciplines as far apart as urban planning, philosophy and political science have considered the conceptual relationship between need and want (e.g. Akkerman 1982, 1992; Bay 1968; Brock 1998; Fitzgerald 1977). In one effort to define need, the Finnish philosopher von Wright wrote:

> If not-X is harmful, then X will be called needed. The needed is that, the lack or loss of which is a bad thing, an evil. The needed and the harmful are opposed as contradictories, in the sense that the contradictory of the needed is harmful, and vice versa. The beneficial and the harmful are opposed as contraries. To provide a being with that which is beneficial for it is to promote its welfare. To provide it with that which it needs is to protect its welfare (von Wright 1963: 108).

Thomson provided further elucidation of the difference between need and want in stating:

> It is logically impossible for a person to lack what he needs without being seriously harmed. On the other hand, it is possible for a person to lack what he desires without being harmed (Thomson 1987: 99).

Thus, the conclusion can be drawn that human *need* is a welfare concept that is distinguishable from the economic notion of *demand*, whereby the *need* for an item or service exists when a person will suffer harm without obtaining it (Akkerman 1992). Despite this conceptual difference, people frequently attribute needs to themselves and to others in order to lend support to wants. By conveying the demand for an item or service as a need, an individual's statement takes on a greater significance and a higher state of urgency. It is for this reason that Frankfurt has pointed out: "Care must be taken […] to avoid exaggerating the inherent superiority of claims grounded in needs over claims grounded in desires" (Frankfurt 1998: 19).

2.3 *Our Common Future* and the Concept of Sustainable Development

Frankfurt's observation regarding the distinction between need and want within the context of demand represents far more than an issue of semantics. It has particular significance in relation to the notion of carrying capacity, defined as the maximal population size of a given species that a local or global ecosystem can support without reducing its ability to support the same species in the future (Daily and Ehrlich 1992: 762). Carrying capacity is the key concept in the continuing debate concerning *sustainable development,* as put forth in the report entitled *Our Common Future* by the World Commission on Environment and Development (WCED 1987). Written and submitted to the United Nations after several years of worldwide public and governmental consultation, *Our Common Future* put forth numerous observations and concerns regarding the importance of planetary resources for the long-term satisfaction of human needs. In its report, the WCED noted that high levels of economic development have ensured that most (but not all) inhabitants' needs are well met in the world's industrialized nations. However, its primary concern was that economic development therein has occurred largely through the wasteful and inequitable consumption of Earth's natural resources and through the subsequent emission of various pollutants, both of which have placed considerable strain upon the carrying capacities of local and global ecosystems. Although the WCED realized that resource consumption is a necessary component of economic growth and development, it argued that the demands for resources expressed by industrialized nations appeared to be far in excess of their actual needs.

At the same time, the WCED pointed out that developing countries were also imposing strain upon local and global ecosystems. In this case, however, this was due primarily to a *lack* of development. The WCED argued that poverty in developing countries has forced residents to harness natural resources in ways that cause further environmental degradation beyond that induced by industrialized nations, such as through the clearing of forested land for agriculture and the burning of wood for heating and cooking. The crux of its argument was that, until sustainable economic development could be fostered within developing countries, environmental protection would remain a far less important priority for their citizens than their more pressing struggles for day-to-day survival.

Following these observations, *Our Common Future* painted an ominous picture of the implications that might ensue if unfettered economic growth in industrialized nations and the problem of underdevelopment elsewhere were not adequately addressed. The WCED warned that rampant consumption of planetary resources and the continued emission of pollutants could ultimately compromise the carrying capacity of local and global ecosystems. It therefore urged industrialized nations to assist developing countries in their pursuit of economic development not only through financial means, such as the provision of monetary aid and technical assistance, but also by reducing levels of resource consumption *within their own jurisdictions*. The WCED argued that, because current levels of resource consumption were already placing considerable strain on environmental carrying capacities, it would not be feasible for developing countries to follow a path to economic development similar to that which industrialized nations have taken over the past century. Instead, the WCED argued that industrialized nations must reduce their levels of resource consumption to better reflect actual needs, in order that developing countries have room to grow without placing further strain on the natural environment.

It was at this juncture that the WCED implored the worldwide pursuit of *sustainable development*, defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987: 43). In this regard, sustainable development represents a more holistic and equitable approach to human development – that is, the satisfaction of human needs and aspirations – in which *economic development* is no longer pursued without due consideration for the concurrent objectives of *environmental sustainability* and *social equity*. The WCED argued that sustainable development would assist in achieving two important challenges. First, it would ensure that the needs and aspirations of individuals *everywhere* could be addressed in a more environmentally sustainable manner. A second and ensuing outcome would be the long-term sustainability of local and global ecosystems, thus ensuring future human survival and development.

Implicit in the WCED's conceptualization of sustainable development was the assertion that resource consumption should be restricted solely to that which is *needed*, at least initially. The WCED fully realized, however, that it would be unreasonable not to expect individuals to aspire for quality-of-life that extends beyond the simple meeting of basic needs. But, according to the WCED, it is also only after the basic needs of individuals *everywhere* are addressed that further resource consumption – that which satisfies aspirations extending beyond the level of basic needs – should take place. In this regard, an important statement made in *Our Common Future,* and one no doubt aimed at industrialized nations in particular, was the following:

> Sustainable development requires meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better life. Living standards that go beyond the basic minimum are sustainable only if consumption standards everywhere have regard for long-term sustainability (WCED 1987: 44).

Furthermore, consumption beyond the level of basic needs should only take place if it does not impose undue strain on the long-term carrying capacities of local and global ecosystems. The future of human communities, undoubtedly, emerges as a concern here. An ensuing implication is that a more conscious distinction between *needs* and *wants* within the context of demand for resources will be required if sustainable development is to be effectively pursued by industrialized nations. This challenge was well recognized by the Canadian Environmental Advisory Council in a report published shortly after the release of *Our Common Future*, in which it stated: "If [sustainable development] does not call for a serious reflection on limits to wants, it at least requires a concerted effort to use […] effectively whatever resources we must consume" (CEAC 1987: 5).

The task of distinguishing between needs and wants within the context of resource consumption is complicated by the fact that, as noted earlier in this chapter, needs and wants are frequently confused with one another. In industrialized countries, high levels of economic and infrastructural development over the past several decades have ensured that the basic needs of a majority of individuals are met, and as a result most residents' standard-of-living is much higher than the "basic minimum" alluded to by the WCED (Roseland 2000). Indeed, our standard-of-living is so comfortable that the line between things people *need* and things people *want* has become blurred. An observation put forth some 25 years ago by the Canadian political scientist William Leiss seems to have foreshadowed the quandary that sustainable development presents. Leiss proposed that the frequent misrepresentation of demands as needs could be partly attributed to the commercialization of society. Leiss argued that, because industrial and financial interests have "programmed" individuals to believe that every need requires a commodity for its satisfaction, individuals perceive these commodities as *needs* as well. However,

> [the] overall result, apart from greasing the wheels of industry and business, turns out to be seriously disappointing in at least three ways: needs are not satisfied in any complete or lasting ways by the commodities purchased; human relationships tend to become impoverished when commodity fetishism gets in the way of spontaneous, simple togetherness; and our planet's non-renewable resources are fast being wasted in the affluent countries, with potentially catastrophic consequences for the Third World, and for our own descendants as well (Leiss 1976: 64, cited in Bay 1977).

It appears that the WCED expected the dilemma of distinguishing between real and perceived needs to arise as the implications of its report were considered. Accordingly, *Our Common Future* offered the following advice:

> Perceived needs are socially and culturally determined, and sustainable development requires the promotion of values that encourage consumption standards that are within the bounds of the ecological possible and to which all can reasonably aspire (WCED 1987: 44).

It is clear that the pursuit of sustainable development therefore necessitates serious consideration not only for the difference between *needs* and *wants* within the context of demand for resources, but also the difference between *real* and *perceived needs*.

2.4 Access Need vs. Transportation Demand

It is now widely agreed that the pursuit of sustainable development by industrialized nations warrants greater consideration for the fundamental distinction between real needs, perceived needs, and wants, within the context of urban transportation planning (Chapman and Donovan 1996; Dittmar 1995; Marshall 1999; Wakeford 1994). Throughout the past several decades urban transportation planners and policymakers have focused primarily on accommodating demands associated with the automobile to a point where this mode of transportation is now in itself perceived by much of the population as a need (Zielinski 1995). In so doing, the notions of *access need* and *transportation demand* appear to have been confused with one another.

Since the end of World War II urban transportation planning has generally followed what has been labelled a “predict and provide” approach, whereby “demands are projected, equated with need and met by infrastructure provision at least as far as the public purse will allow” (Owens 1995: 44). The fallacy of such an interpretation was well elucidated by the British sociologist Wiggins in the early 1980s, when he observed that transportation in itself

> does not figure as a […] specific standing need […] What underlies the demand for [transportation] is indeed a need, perhaps a basic need. But this need is for something far less specific. At most it is the need for access or for the mutual accessibility of dwellings, work-places, and everyday facilities […] the need as such for access also leaves open the mode of such communications […] (Wiggins 1981: 210).

Thus, it can be said that transportation is not a *need*, but rather only one potential means of addressing more fundamental *access needs*. Nutley elaborated further in this regard in stating:

> Transport is not consumed for its own sake, but is merely a means to an end (a derived demand). Hence residents in location A seek access to location B in order to acquire goods and services or partake in activities that are not available at A. If A and B are not walking distance apart, then transportation is required to overcome the distance barrier that separates them (Nutley 1992: 137).

As both Wiggins and Nutley implied, all urban dwellers have access needs and, furthermore, there are several means by which these needs might be addressed. Access needs generally include the ability to reach dwellings, places of employment, shopping and medical facilities, educational institutions, and social and recreational activities (Chapman and Donovan 1994; Litman 2001; Zielinski 1995). The means by which urban dwellers are able to address their access needs depends largely upon the form and structure of the urban built environment. When land uses are well integrated and activity sites are located in close proximity to one another, the demand for travel is minimized and the potential to make necessary trips by means of walking or cycling is maximized. Furthermore, when facilities and services are located farther apart, planners and policymakers also have the option of offering automobile transportation infrastructure and/or public transit facilities and services to provide the access that people require (Litman 2001).

Despite the multiplicity of means by which access needs might be addressed, urban built environments over the past half-century have been allowed to grow in ways that derive heavy demands for automobile transportation. Since World War II high- and medium-density, mixed-use urban development has been superseded by the creation of low-density, monofunctional zones, in which necessary facilities and services that were once conveniently located in close proximity to one another have become spatially segregated (Perl and Pucher 1995; Pucher 1998). Concurrently, pedestrian-, cycling- and public transit-friendly streetscapes have given way to automobile-oriented transportation networks. In many cases, particularly within suburban areas, these trends have significantly decreased the viability of fulfilling access needs by any means other than the automobile. Accommodating the subsequent, derived demand for automobile transportation has been the priority of planners and policymakers, while potential means of serving access needs other than the automobile have generally been given much lower priority, if not ignored completely (Miller 2001). It is due to this frequent lack of other options for addressing access needs that automobile transportation in itself has frequently come to be perceived as a *need* by much of the urban population (Zielinski 1995).

2.5 Negative Consequences of the Demand-Led Approach to Urban Transportation

Although, as noted in Chapter One, the “predict and provide” approach to urban transportation planning has brought with it numerous negative environmental, economic and social consequences, perhaps the greatest conflicts with principles of sustainable development fall within three main areas: firstly, in terms of resource consumption; secondly, in terms of the emission of harmful pollutants; and thirdly, in terms of social inequality.

Resource Consumption:

A primary reason for which sustainable development requires formal distinction between access needs and transportation demands is the fact that transportation is currently responsible for a large share of non-renewable energy resource consumption within industrialized nations. As noted earlier, a prominent concern of the WCED had been the wasteful consumption of energy resources by industrialized nations. Within the context of urban transportation, this problem is manifest in the inefficient use of non-renewable energy resources, namely fossil fuels. Approximately 55% of oil consumption within industrialized nations occurs in the transportation sector and, furthermore, 85% of this is consumed by *road* transportation (Rodrigue 2002).

The wasteful consumption of fossil fuels by transportation has been a concern to researchers and governments for several decades. For example, the energy crisis of the early 1970s brought into the public purview the finite nature of the world's fossil fuel stocks. Since that time, governments have encouraged and supported research and development activities that seek to increase the efficiency of the internal combustion engine. They have also put forth various promotional campaigns that encourage urban dwellers to purchase more fuel efficient vehicles and/or to use alternative and renewable transportation fuels – such as electricity, natural gas, hydrogen, propane or solar power. Despite these efforts, however, the consumption of non-renewable energy resources by industrialized nations continues to rise, primarily as a consequence of increasing numbers of cars on the road (CST 1998b). In Canada, for example, the burning of fossil fuels for transportation purposes was responsible for 32.5% of total energy consumption in 1998, but had increased to 35% of the total in 1999 (Transport Canada 2000).

Emission of Pollutants:

The consumption of energy resources is not the only way in which urban transportation conflicts with the environmental objectives of sustainable development. Current patterns of urban transportation also place considerable strain upon ecosystem carrying capacities because the automobile is a primary contributor to air, water and noise pollution. Of these, the air pollution impact of automobile transportation is perhaps most problematic, as its effects range from local to regional to global in nature. The airborne emissions from automobile transportation include a wide range of environmentally harmful chemicals and compounds, such as: carbon monoxide, particulates, nitrogen oxides, volatile organic compounds, sulfur oxides, carbon dioxide, methane, road dust and toxic gases such as benzene (Litman 1999a).

While many of these pollutants may degrade relatively quickly, others have been found to penetrate and remain within the atmosphere for hundreds of years, thus presenting long-term environmental threats. It is within this context that growing concern has emerged about the negative long-term *global* impact of automobile emissions. One of the greatest emissions from fossil fuel combustion in road vehicles is carbon dioxide (CO_2) and, while CO_2 itself is not a pollutant, it has been identified as the primary contributor to recent global warming trends (Miller 2001). This in turn has been recognized as an important cause of climate change around the world. Given that emissions from transportation activities constitute 40% of the total Canadian contribution to climate change (TAC 1998), the importance of reducing CO_2 emissions cannot be understated.

Automobile transportation has also been identified as a major contributor to water pollution. Automobile-oriented cities devote large proportions of their land to road transportation infrastructure, such as highways and parking lots. In the cities of industrialized nations, it is not uncommon for road transportation infrastructure to take up 30% to 60% of developed land. (In the extreme case of Los Angeles, this figure is closer to 75%.) This infrastructure prevents rainwater from reaching the subsoil and the resulting runoff carries various surface pollutants, such as motor oil, other automotive fluids and litter, into nearby streams and rivers. This results in a greater volume of stormwater pollution than would be found in higher-density areas, where less land is paved and more land remains in its natural state (Arnold and Gibbons 1996; Roseland 1992).

Noise pollution is yet another negative environmental consequence of excessive automobile transportation. The Organisation for Economic Cooperation and Development has stated that "transport is by far the major source of noise, ahead of building or industry, with road traffic the chief offender" (OECD 1990). Furthermore, the OECD noted in 1997 that 66% of the population in its member countries, including Canada, was exposed to unsatisfactory noise levels from transportation. This is problematic because noise pollution has been shown to have a variety of negative impacts including reduced residential property values (especially near urban expressways), contributions to hearing loss, and increased stress imposed by lack of sleep (Edwards 1982; Stutz 1995; WHO 1999).

Issues of Social Equity:

While the apparent confusion between access need and transportation demand has led to environmental conflicts with the notion of sustainable development, it is important to note that this issue also has a very large social equity dimension. As noted earlier, sustainable development seeks to ensure that the needs and aspirations of *all* individuals, in both current and future generations, are adequately addressed. Current methods of urban transportation planning, however, do not meet this goal. Indeed, for several decades researchers have lamented the accessibility constraints that automobile-oriented development has imposed upon the many urban dwellers who do not have automobile access to employment, shopping, child care and other required facilities and services – such as persons with disabilities and low-income earners (e.g. Ellis 1981; Grieco *et al.* 1989; Greed 1994; Hamilton and Jenkins 1989; Johnston-Anumonwo 1988; Mensah and Ironside 1993; Moore Milroy 1991; OECD 1977; Schaeffer and Sclar 1980). The inequitable nature of this approach was well elucidated by Ellis over 20 years ago, although his statement appears to be equally applicable today:

> Clearly if a person does not own an automobile, whether he is young, old, underprivileged, or handicapped, his "travel demand", as defined in terms of automobile trips, will be relatively small. However, this does not imply that this person does not have legitimate transportation requirements for access to a variety of facilities and services (Ellis 1981: 263).

By seeking primarily to accommodate demands for automobile transportation, transportation planners and policymakers have in essence neglected to address not only environmental issues, but they have also failed to adequately serve the access needs of individuals who do not have the use of an automobile.

2.6 The Challenge of Reconciling Sustainable Development and Urban Transportation

Despite the clear conflict between the notion of sustainable development and the demand-led approach to transportation planning, arguments have frequently been put forth that attempts to modify urban built environments in the interest of reducing automobile travel are sure to meet with great resistance on the part of the public, or outright failure (e.g. Filion *et al.* 1999; Gordon and Richardson 1999). These assertions are rooted primarily in the belief that consumer preferences for low-density living and automobile transportation are so firmly entrenched in contemporary society that individuals are likely to resist any and all attempts to promote more sustainable patterns of urban development and mobility. This has particularly been argued with reference to wealthier segments of society.

> Reductions in the use of non-renewable resources will impinge more on richer groups' lifestyles. Richer groups are unlikely willing to forsake the comfort and mobility that they currently enjoy. […] There are various trends […] driven by increased individual wealth which are incompatible with sustainable development (Mitlin and Satterthwaite 1997: 24).

In a Canadian context, Grant (1999: 17) has made the following observation:

> In a society that defines privacy in spatial terms, that spells out success in square feet and number of bathrooms and that links automobile use with personal identity, it is no trivial matter to propose significant changes to the urban landscape. Many of the "planning problems" of contemporary Canadian cities result from significant lifestyle choices that Canadians have made: they cannot be "solved" without dramatic cultural transformation which seems unlikely to come anytime soon.

Although these are strong arguments that clearly demonstrate the immense challenges facing community planners and policymakers who wish to reduce levels of automobile dependence, two separate bodies of literature present opposing views. First, several authors have noted that a large share of urban dwellers – including many who have traditionally represented the key market for low-density, automobile-oriented suburban living – would welcome, rather than shun, the creation of more sustainable urban built environments (e.g. Bourne 1992; Chamberland 1992; Litman *et al.* 2000; White 1996). In this case, it has been asserted that the current urban form no longer meets the needs or suits the lifestyles of many contemporary urban dwellers and that, accordingly, there is a strong latent demand for living environments in which land use activities are more widely integrated, diverse forms of housing are available, and a greater variety of viable transportation options is provided.

According to Bourne (1992: 511),

> With the rapid increase over the last few decades in the number of small and non-traditional urban households, the traditional suburban residential design may be an increasingly inappropriate option for many. […] For this demand to be realized, we must assume that there are reasonable housing alternatives available elsewhere in the suburbs or in older established neighbourhoods.

White (1996: 16), in a discussion of sustainable community planning initiatives in Calgary, has expressed a similar point-of-view:

> What is required is a choice of housing sizes and prices, as well as a range of community services conveniently located to minimize the number and length of trips. Even households with children, traditionally the main market for suburban developers, face a transportation crunch as stressed-out parents try to dovetail all the trips related to child care, household management and employment.

A second argument in favour of reduced automobile dependency comes from researchers who have posited that change is necessary in the interest of promoting social equity (e.g. Greed 1994; Hamilton and Jenkins 1989; Litman 2003; Mitlin and Satterthwaite 1997). Not only is it important to attract people out of their cars in order to reduce their negative environmental impacts, they argue, but it is also necessary to improve the viability of non-automobile transportation options in order to more effectively serve those who do not have automobile access.

Based on the various arguments in favour of, or against, the creation of urban built environments in which automobiles play a less prominent role, Mitlin and Satterthwaite have made the following observation:

> Perhaps one of the greatest political challenges is to devise the means by which not only richer groups but also poorer groups can enjoy the advantages of high mobility, easy access to goods and services and high degrees of comfort but within transport and communication systems and homes and workplaces which demand far less resource use (Mitlin and Satterthwaite 1997: 24).

Efforts to promote more sustainable urban travel behaviour therefore must consider both how to overcome potential barriers to positive change and also how to ensure that the access needs of those more willing to accept change are adequately served. The resulting task at hand has been clearly expressed by Chamberland (1994: 137) as follows:

> The challenge is therefore to improve the environmental, economic, and social sustainability of new and existing Canadian communities while at the same time responding to the quality of life aspirations of Canadian consumers (Chamberland 1994: 137).

It is in response to this challenge that the notion of *sustainable transportation* has emerged (e.g. CST 1998a; Litman 1999; Replogle 1990; Wakeford 1994).

2.7 The Concept of Sustainable Transportation

Just as the pursuit of sustainable development requires distinction between need and demand for resources, sustainable transportation makes the distinction between access need and transportation demand. Furthermore, while sustainable development involves the integration of environmental, economic and social objectives, sustainable transportation entails the pursuit of environmentally benign, economically efficient and socially equitable means of addressing access needs (CST 1998a; D'Amour 1991; Litman 1999a; Replogle 1990; Wakeford 1994).

The essence of sustainable transportation is captured in a comprehensive definition and vision statement put forth by the Centre for Sustainable Transportation (CST) (Box 2.1), a publicly funded research body based in Toronto. The CST's definition of sustainable transportation is significant for two reasons. Firstly, it recognizes the notion of *access needs* and the oft-overlooked fact that transportation is only one potential means of serving those needs. Secondly, the CST has followed the WCED's lead by advocating a holistic approach to transportation planning in which attention is simultaneously devoted to meeting environmental, economic and social objectives. Thus, a transportation system that is deficient in one or more of these three areas – that is, if it is not environmentally benign, economically efficient *and* socially equitable – cannot be considered *sustainable*.

Box 2.1
Definition and Vision of Sustainable Transportation, Centre for Sustainable Transportation

Definition of Sustainable Transportation

A sustainable transportation system is one that:

- allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations.
- is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy.
- limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, reuses and recycles its components, and minimizes the use of land and the production of noise.

A vision for sustainable transportation in 2030

Access rather than mobility
In a society in which transportation is sustainable, people have at least as much access to goods, services, and social opportunities as they have today, particularly people who are economically disadvantaged or who face unusual physical challenges. But the ways in which this access is achieved may be quite different.

Non-motorized transportation
Much more of the access depends on widespread use of non-motorized means of transport. This is possible because living and working arrangements have become much more compact. Walking, bicycling, rollerblading, and other non-motorized modes have become much more acceptable and agreeable.

Motorized transportation by familiar means
Some access depends on motorized transportation systems that are similar to those of the 1990s but use very much less energy and pollute much less. There is more public transport, because it is encouraged by the layout and design of urban regions and because owning and using a car costs much more.

Motorized transportation by unfamiliar means
Some access depends on the use of quite different technologies from those in common use today. They might include fuel cells using renewable resources such as hydrogen produced with solar energy, automated highways, maglev rail services, and airship technologies. Together they provide cleaner, more conserving, and safer movement of people and goods.

Less need for movement of people and goods
Whatever the mode, journeys made by motorized transport are mostly much shorter than in the 1990s, for the movement of both people and goods, in part because urban areas are more compact and have a good mix of uses. More access is achieved through telecommunications, with less movement of people or goods.

Little or no impact on the environment and on human health
The net result is dramatically lower local and global impacts of transportation on the environment. The impacts are so low they no longer provide reason for concern about people's health or any part of the natural environment, in the present or the future. In particular, emissions of carbon dioxide and other greenhouse gases from transportation are less than one fifth of the total of such emissions in the 1990s.

Source: CST 1998a.

While the CST's definition and vision provide a theoretical foundation for the notion of sustainable transportation, further research has been conducted with regard to practical means by which sustainable transportation systems can be created. The elements necessary for a sustainable urban transportation system are extensively outlined in the Transportation Association of Canada's *New Vision for Urban Transportation* (*NVUT*) (TAC 1998), which has been widely cited as an innovative, comprehensive and thought-provoking agenda for the future role of transportation in cities (Box 2.2). For example, the *NVUT* has been cited by the Organization for Economic Cooperation and Development as an example of "best thinking on environmentally sustainable transportation in Canada," while Canada's National Round Table on the Environment and the Economy has called it "perhaps the most influential [sustainable transportation] vision statement currently in Canada" (TAC 1998: 1).

The purpose of the *NVUT* is to provide a template upon which urban areas can develop their own unique and locally relevant sustainable transportation visions, plans and policies. Especially notable about the *NVUT* is that it has also made explicit the necessity of distinguishing between *needs* and *demands* in transportation planning. For example, its preamble states:

> Each specific transportation vision should be developed within the context of an overall urban area vision – defined by an urban development plan with complementary design objectives. That plan should be rooted in reality while offering adequate lifestyle choices; *it should distinguish between real needs and less essential "wants" when allocating resources* (TAC 1998: 2, emphasis mine).

Box 2.2
Transportation Association of Canada
New Vision for Urban Transportation

In the year 2023:

• A long-term urban development plan has been approved. It emphasizes multi use town centres and high density, mixed use along connecting corridors. Transit has funding and operating priority in those corridors.

• Short-medium term community/neighbourhood plans have been approved. They emphasize compact, mixed-use communities based on pedestrian, cycling and transit friendly design.

• Transit, highways, arterials, parking and truck routes are planned and coordinated across the urban area.

• The percentages of trips made by walking, cycling, transit and high occupancy automobiles are all increasing; the percentage of trips made by single occupant automobiles is decreasing.

• The average distance and time for peak hour commuter travel is decreasing.

• An area wide parking strategy is in place and enforced.

• There are very few places which still require on-street goods transfer.

• The physically challenged enjoy universal access to public transport facilities and services.

• Roads and bridges are in a good state of repair.

• Air pollution from motor vehicle sources is declining.

• Urban transportation infrastructure and services are adequately funded from stable and sustainable revenue sources.

• Political leaders have the support of a well-informed public when making decisions on urban development and transportation systems to serve the area.

Source: TAC 1998.

As does the CST, the *NVUT* provides a vision of what urban transportation systems might look like in Canadian cities, in this case at the year 2023. The long-range nature of this vision (which extends thirty years from when it was first developed) can be explained by the fact that large-scale changes to urban transportation, and to urban form and structure in general, cannot come overnight. Instead, as Richardson noted in discussing the implications of sustainable development for the cities of industrialized nations,

> The sustainable community does not seek wholesale or radical overnight disruption of the built environment […] It only seeks to ensure that as change takes place, it is assessed against sustainability objectives and criteria and is carried out in a sustainable way (Richardson 1994).

2.8 Sustainable Transportation in Canada

The promise for mitigating the negative environmental and social consequences of automobile-oriented cities that sustainable transportation represents has prompted a growing number of Canadian municipalities to incorporate this concept within their long-range community plans and policies. Among the documents that have incorporated the notion of sustainable transportation, many of which have been built around the TAC's *NVUT* framework, are:

- the City of Hamilton's *Vision 2020* (RMHW 1992) and *Official Plan* (RMHW 1998)[1];
- the City of Calgary's *Transportation Plan* (City of Calgary 1995);
- the City of Winnipeg's *Plan Winnipeg 2020 Vision* (City of Winnipeg 2001);
- the City of Edmonton's *Plan Edmonton* (City of Edmonton 1998) and *Transportation Master Plan* (City of Edmonton 1999);
- the Greater Vancouver Regional District's *Livable Region Strategic Plan* (GVRD 1996); and
- the City of Ottawa's *Official Plan* (City of Ottawa 2003).

[1] The current City of Hamilton was created on January 1, 2001, following the dissolution of the Regional Municipality of Hamilton-Wentworth (RMHW) and the amalgamation of all its member municipalities (the Towns of Ancaster, Dundas, and Flamborough, the Township of Glanbrook, and the Cities of Hamilton and Stoney Creek). Although adopted by the RHW these planning documents continue to guide development in the amalgamated City of Hamilton (City of Hamilton 2003).

Each of these plans indicates a desire to reduce levels of automobile use – and thus to promote the creation of sustainable transportation systems – through a variety of land use and transportation planning initiatives.

The City of Hamilton's transportation vision for the year 2020 provides an illustrative example of the future urban built environment desired by many Canadian municipalities:

> An integrated public transportation system serves the entire region in an affordable, efficient, and accessible way. Clean forms of transportation predominate. Public streets are designed and managed (including signals and regulations) to accommodate comfortably and safely, public transit, cyclists, pedestrians and automobiles as complementary forms of transportation. The integrated transportation system gives access to all basic needs. Public transit provides all citizens with easy access to activity areas, as well as to neighbouring communities and cities via convenient and frequent inter-urban transit. Most people can walk or cycle to work because jobs and housing are near one another. Major roads have minimal noise and pollution impacts on adjacent lands, and follow routes that cause little damage to the natural and human environment (RMHW 1992: 3).

In order to achieve this vision, the City of Hamilton has enacted policies that seek to "[reduce] reliance on the automobile by promoting alternative modes of transportation, such as public transit, walking, and cycling to all urbanized areas of the Region" (RMHW 1998: C-36). The anticipated outcome of reaching this goal is further elaborated as follows: "With improved access to viable alternative forms of travel, the residents of this Region will be able to access work, school, and recreation facilities in a more efficient, environmentally sensitive, and eventually more economical manner" (RMHW 1998: C-39).

The Greater Vancouver Regional District (GVRD) provides another example of a municipality that seeks to promote the development of a sustainable transportation system. For example, its *Livable Region Strategic Plan* states that the GVRD "will […] seek through partnerships on increasing transportation choice […] to plan and implement a transit-oriented and automobile-restrained transportation system [and] to enhance and/or retrofit local streets and infrastructure to favour transit, bicycle and pedestrian uses" (GVRD 1996: 23).

2.9 Evaluating Accessibility by Modes of Sustainable Transportation

As planners and policymakers seek to implement sustainable transportation policies, they require practical tools for examining the level of transportation choice currently available to urban dwellers so that they may gauge how easily individuals are presently able to address their access needs by modes of sustainable transportation. As Parfect and Power (1997: 203) have stated:

> Before attempting to rectify, improve or translate an unsatisfactory urban situation into one that will serve people well […], we must first identify where not only the weaknesses and deficiencies but also any inherent strengths and advantages lie.

Current methods of evaluating transportation system performance, however, are poorly suited to this task. The evaluation of transportation system quality generally entails the use of indicators, defined as "statistics or parameters that […] provide information on trends in the condition of a phenomenon and that have significance extending beyond that associated with the properties of the statistics themselves" (OECD 1994). In most cities, however, the priority accorded to the automobile over the past several decades has resulted in the creation and application of indicators that focus primarily on evaluating how well *transportation demands* have been served, especially demands for automobile transportation (Litman 2003).

As part of the traditional "predict-and-provide" approach to transportation planning discussed earlier, planners and policymakers have tended to rely on revealed behaviour, or previously observed *demand*-levels, such as the number of vehicles travelling on a road network or the number of passengers riding on a public transit route, when gauging the *need* for various transportation services (Ellis 1981; Dittmar 1995; Levine 1998; OECD 1977). This approach, however, fails to recognize that individuals may alter their travel behaviour if facilities, infrastructure or services that they require in order to address their access needs by a particular mode are inadequate or not available (Handy and Niemeier 1997; Nutley 1992; OECD 1977). This may include: travelling by automobile if other modes of transportation represent less viable or attractive options; travelling to a more easily accessible, yet less attractive, destination instead of one that is more attractive, but less accessible, by a particular mode; or simply not making a particular trip. As a result, the argument has been put forth that it is inappropriate for transportation planners and policymakers to interpret, for example, high automobile traffic volumes as a need for more road space or low ridership levels on a particular public transit route as a lack of need for that service. For example, as Handy and Niemeier (1997: 1181) have observed, "If a community does not have good pedestrian access, then residents will make few pedestrian trips, but this does not imply that they would not make such trips if pedestrian access were better." Despite long-standing arguments in this regard, efforts to evaluate the quality of infrastructure, facilities and services needed by users of non-automobile modes have yet to become routine activities in urban transportation planning practice (Hillman et al. 1990; Litman 2003).

Apart from the inherent post-World War II planning bias toward automobile transportation, this likely also has to do with *a lack of practical tools for doing so* (Handy and Niemeier 1997; Litman 2000; Murray *et al.* 1998; Rood 1997). As Handy and Clifton (2001a: 68) have noted, "Extensive academic literature on accessibility measures suggests many ways to define and measure accessibility, [but] examples of the actual use of accessibility measures in planning are relatively scarce." A variety of approaches have been employed in the development of accessibility measures over the past three decades and, as a result, the focus, format and complexity of these tools have been equally as diverse (see, for example, Dewees 1977, 1978; Hanson and Schwab 1987; Koenig 1980; McLafferty 1982; Nutley 1980; Pirie 1979; Wachs and Kumagai 1973). The fact that practical tools for evaluating accessibility generally remain unavailable, despite such intensive research activity, can be attributed to three key weaknesses and deficiencies that are associated with 1) how accessibility has been defined *and* 2) how it has been measured. These include: a lack of attention to the broad range of factors that promote accessibility, especially micro-scale considerations; complex methodological structures that go beyond the skill levels of many planning professionals; and the presentation of results in the form of a single measure, or index.

With regard to how accessibility has been defined, the foremost deficiency of past conceptualizations has been their limited scope. Generally speaking, researchers have not incorporated the broad range of factors influencing the level of accessibility provided by a particular mode of transportation *from the urban dweller's point-of-view*. This weakness is somewhat surprising given that observations of this omission have been expressed since at least the early 1980s. Over twenty years ago, for example, Lynch (1981: 187-188) wrote:

> While many of the obvious measures of accessibility are well developed, there is a gap between them and some of those felt qualities of access which citizens prize. Systematic attention to the entire range of the dimension is lacking.

More recently, Handy and Clifton (2001a: 68) have stated: "While traditional measures of accessibility focus on the distance to and size of potential destinations […] other characteristics of the local environment may have an important impact on [the use of non-automobile modes of transportation]." For example, it is now widely understood that the decision to travel by public transit is for many people based on the availability of appropriate pedestrian infrastructure that will enable them to travel to and from transit stops safely, securely, and comfortably (Hine and Mitchell 2001; Rosenbloom and Burns 1995). As such, the assessment of pedestrian accessibility to transit stops should be an important component of any evaluation of public transit quality and would require assessment of, for example, the presence and quality of sidewalks, the adequacy of street lighting, and the nature of the physical environment through which the person must walk en route to and from transit stops or stations. Perhaps one of the reasons why built environment characteristics have not been incorporated within accessibility measures is that, even if they were included, much of the necessary information would not be readily available nor easy to collect (Handy and Clifton 2001a). Not only do most planning departments not routinely compile information related to issues such as sidewalk conditions, transit stop amenities, and other features of the built environment, but a great deal of labour intensive research would be required in order to do so.

The complexity of accessibility measurement tools developed by researchers thus far represents a second factor that has hindered their practical application (Handy and Clifton 2001a). As Sawicki and Flynn (1996) have noted, academics have frequently sought to develop innovative methodologies, models, theories, and more complex indices that will stand up to the rigorous scrutiny of their peers. At the same time, however, planners generally prefer tools that are straightforward and easily understood (Akkerman 1982; Sawicki and Flynn 1996). The resulting problem, according to Handy and Clifton (2001a: 69), is that "[the] more complex the measure, the more data and analysis skill required, limiting the ability of most planning departments to develop such measures."

A third obstacle to the use of accessibility measurement tools relates to the information provided as a final product. Most tools developed thus far have tended to produce a single measure of accessibility, usually in the form of an index. As a result, this final value, or "score", provides users with an overall indication of accessibility as it relates to the variables included in the model, but at the same time conceals any *specific* weaknesses or deficiencies in the transportation system that may hinder, or prevent altogether, travel by a particular mode. This in turn has meant that traditional accessibility measurement tools do not adequately serve the information needs of planners, who are more interested in identifying specific problem areas so that they may take corrective action (Handy and Clifton 2001a).

It has been with the weaknesses and deficiencies of past approaches to evaluating accessibility and with the increasing prominence of sustainable transportation principles in municipal planning policies in mind that Handy and Niemeier (1997: 1192) have urged transportation researchers to devote greater attention to the development of innovative methodologies for evaluating accessibility in metropolitan settings. They comment: "[The] use of accessibility measures reflecting person-scale dimensions and concerns will be critical in ensuring that infrastructure improvements and land-use policies serve and speak to individual activity needs".

2.10 Evaluating Public Transit Accessibility to Places of Employment

One aspect of urban transportation in which Handy and Niemeier's comments are particularly relevant is within the context of public transit commuting. As part of their sustainable transportation initiatives, municipalities across Canada and throughout the industrialized world have adopted a variety of land use and transportation planning policies that seek to increase the proportion of commuting trips that take place by public transit *in lieu* of the private automobile, and also to address the concerns of urban dwellers who have experienced employment accessibility constraints due to weaknesses and deficiencies in public transit service. Researchers have argued, however, that planners and policymakers hoping to achieve these objectives must first attain a solid understanding of the numerous ways in which journey-to-work patterns have changed over the past several decades (Banister and Gallent 1998; Kingham *et al.* 2001; Rosenbloom 1996; Rosenbloom and Burns 1995). These changes, which have occurred primarily as a result of several spatial, sociodemographic and economic employment trends, have led not only to the creation of a demographically diverse commuter population but also to the wide-scale diversification of spatial and temporal commuting patterns. As a result, the conditions necessary to ensure that commuters are able to address their access needs by public transit have become equally complex. It has therefore been argued that the policies of Canadian cities aimed at increasing public transit commuting, and similar initiatives underway elsewhere, are doomed to failure unless the urban built environment is modified to better reflect the access needs of the contemporary commuter population. Accordingly, the importance of developing tools for evaluating public transit accessibility to employment – and thus for assessing whether public transit represents a legitimate transportation option within the context of metropolitan commuting – cannot be understated.

2.10.1 A Brief History of Public Transit Commuting in Canada

Throughout much of the 20th century public transit was a dominant mode of urban commuting in Canada, but over the past several decades has become far less frequently utilized for this trip purpose (Perl and Pucher 1995; Pucher 1998). Although this decline generally began after World War II in conjunction with the suburbanization of households and wave of road construction that characterized most major Canadian cities, the continuing dominance of downtown employment along with government subsidization of transit agencies' capital and operating costs enabled public transit to remain a viable commuting option for many workers (Pucher 1998). Commuting by public transit began to decrease in the latter two decades of the 20th century as the decentralization of households and firms accelerated and more employment came to be located in automobile-oriented suburban settings. At the same time, government funding cutbacks made it more difficult to provide cost-effective public transit service within these areas. Constraints to the use of public transit have been further exacerbated by numerous social and economic trends that have altered considerably both the sociodemographic composition of the metropolitan labour force *and* its spatio-temporal commuting patterns.

2.10.1.1 Public Transit and Commuting before World War II

Public transit was first introduced to Canadian cities in the mid-1800s. Up to this time, walking had been the primary mode of travel for most urban dwellers, while railways and waterways represented the primary means by which industrial firms acquired raw materials and shipped their finished products to market and commercial enterprises obtained the goods to be sold in their shops (Hodge 1998). As a result, the urban built environment generally consisted of a compact central area of mixed industrial, warehousing, and commercial activities located close to railyards and/or dockyards, which in turn was surrounded by densely populated residential neighbourhoods. This enabled individuals and business firms to easily reach the various activity sites to which they required physical access on a day-to-day basis (Andrey 1993).

The introduction of public transportation in the second half of the 19th century enabled many households to reside further away from the city centre. The initial impact of public transit on the form and structure of the urban built environment was somewhat minimal, however. Service up to the late 1880s was provided by the horse-drawn omnibus, a wheel-based vehicle that generally carried only about seven to ten passengers and travelled at an average speed of only about five miles per hour (Hodge 1998). Not only was this just slightly faster than the pace at which pedestrians could walk, but the use of wheel-drawn vehicles on streets composed of dirt often led to vehicles becoming stuck in mud during rainy weather and in the snow during winter months. As a result, public transportation did not initially represent an attractive mode of travel to many urban dwellers, including commuters.

The eventual conversion from wheel-based omnibuses to rail-based streetcars significantly improved the ability of horse-drawn public transportation services to travel more quickly and throughout all seasons. However, it was not long thereafter that electric-powered streetcars were introduced, and this development in turn had a significant impact on urban form and structure. When powered by electricity rather than by horses, streetcars could travel at speeds of up to twenty-five kilometres per hour, thus enabling households to reside even further from the city centre while remaining within a reasonable commuting time and distance (Hodge 1998; Ingram 1998). Middle- and upper class households were quickly drawn to the idea of residing further from the central city and its attendant problems of crowding and industrial pollution. At this time, streetcar operations were generally provided by the private sector under license of the municipal government, and these operators also tended to be involved in the business of real estate development. The ensuing impact on the local built environment was a significant horizontal expansion of the urbanized area, in some cases extended up to ten kilometres from the city centre, whereby public transit service providers would extend their lines outward from the city centre and through the residential neighbourhoods they and other developers constructed adjacent to these routes (Hodge 1998).

While the development of “streetcar suburbs” (Warner 1962) brought with it considerable urban growth on the city’s periphery, it represented a relatively efficient form of urban development. Because individuals residing in streetcar suburbs had to access public transit service on foot, and because developers wanted to maximize returns on their investments, neighbourhoods were generally built at medium-densities and with an efficient grid-pattern road layout. Moreover, many businesses selling goods and services required on a day-to-day basis were also established along the streetcar lines and within close proximity to transit stops and residences. As a result, many access needs could once again be addressed by walking, while those requiring travel to the city centre could be met by using public transportation services that operated along direct routes and at high frequencies.

By the turn of the 20th century most Canadian cities had electric streetcar services and public transit had become the dominant mode of urban transportation. It was around the same time, however, that the automobile began to make its appearance on city streets. Nonetheless, due to its high cost, the automobile remained primarily a “toy” for the wealthy through the first few decades of the century (Hodge 1998). At this point, the automobile was most commonly used for recreational purposes, such as weekend drives in the countryside, rather than for more utilitarian purposes such as day-to-day commuting. Towards the late 1920s automobile ownership would become increasingly common among wealthier segments of Canadian society, but there was little increase in this regard through the lean years of the Great Depression and World War II.

2.10.1.2 Commuting after World War II

Although the period extending from the mid-19th to the mid-20th centuries witnessed numerous technological innovations in transportation, the form and structure of urban built environments generally remained compact and efficient. A diverse land-use mix, combined with pedestrian- and transit-oriented streetscapes, allowed most urban dwellers to address their access needs by public transportation or by walking. As a result, private forms of transportation were not required. The second half of the 20th century, however, was marked by two interrelated trends – dramatic growth in automobile ownership and increasing suburbanization – that prompted considerable change not only in the spatial relationship between places of residence and places of employment, but also in terms of the priority accorded to various modes of transportation in the urban planning process. At the same time, several important sociodemographic and economic employment trends also began in earnest following World War II, including the widespread entry of women into the paid labour force, changing household structures, and the diversification of working hours. The cumulative impact of these planning and employment trends, which continue to this day, have prompted considerable change in the spatio-temporal nature of the journey-to-work. This in turn has had a significant impact on the viability of commuting by public transit.

Following the end of World War II in 1945, a number of concurrent trends served to induce a dramatic increase in private automobile ownership (Filion 2000). These included unprecedented economic prosperity (driven largely by the rebuilding effort in Europe), lower prices resulting from innovations in mass production technologies, and lower fuel costs. The cumulative impact of these trends was a significant increase in the proportion of households for whom the purchase of an automobile represented an affordable option. As a result, skyrocketing levels of automobile ownership characterized the years following World War II.

The increasing demand for automobiles after 1945 was accompanied by an unprecedented demand for housing. Much of this reflected a pent-up demand that had accumulated throughout the 1930s and early 1940s, primarily due to lean economic conditions during the Great Depression and the period of economic restraint accompanying World War II (Filion 2000). However, two other factors, namely the Baby Boom (which began in the mid-1940s and lasted until the early 1960s) and massive waves of post-war immigration to Canadian cities, increased the demand for housing even further. Because many families searching for new housing also owned automobiles, they were no longer tied to living in areas that lay within walking distance of required facilities and services, nor within areas served by public transportation. This prompted the massive outflow of households from the central city and streetcar suburbs to more distant suburban areas that were, at least initially, frequently accessible only by private automobile.

The public policies that regulated aspects of post-war development, including project location and design, for example, were considerably different from those which had previously guided urban development. Before World War II, development activities were largely governed by the market forces of supply and demand. After 1945, however, rampant population growth and a subsequent increase in demand for community services and infrastructure prompted municipal governments to become much more active players in the urban development process, and much more concerned about future patterns of growth. In many cities this marked the beginning of the entrenchment of urban planning as a legitimate government exercise. While most post-war suburban housing developments were still designed and built primarily by private developers, they were now more often required to adhere to municipal master plans and zoning by-laws that set out regulations concerning what land use activities were allowed in a given area and at what densities such development may occur. Of utmost importance to planners and politicians in formulating their policies was the desire to avoid two perceived shortcomings of the pre-war city: overcrowding, and the inappropriate mixing of incompatible land use activities such as, for example, residences and factories. In response to these concerns, post-war master plans and zoning by-laws typically sought to enforce low-density, functionally segregated land use patterns.

One important difference between pre-war and post-war urban development related to the physical design of residential communities (Hodge 1998). Following 1945, most suburban housing developments in Canada and the United States were designed in adherence to the principles embodied in the "Neighbourhood Unit" concept and the "Radburn Idea", two planning innovations first introduced in the United States during the 1920s. The "Neighbourhood Unit" (Figure 2.1) was conceived by the planner Clarence Perry as an attempt to adapt residential areas to the increasing presence of the automobile. Alarmed by the number of residents being killed or injured by motor vehicles passing through residential areas, especially young children, Perry sought to design a neighbourhood in which "the automobile menace" (Perry 1929: 31) could be reconciled with public safety objectives. A distinguishing feature of the "Neighbourhood Unit" concept was abandonment of the grid-pattern street layout typical of the pre-war city (Perry 1929: 34-35). In its place, Perry's design located major thoroughfares on the neighbourhood's perimeter, while internal roadways took the form of winding crescents and cul-de-sacs that prevented vehicles from travelling at excessive speeds. Furthermore, vehicular access into the neighbourhood was limited to only a few streets. As yet another way of promoting residential safety, Perry's model also situated public facilities, such as libraries and elementary schools, at the centre of the Neighbourhood

Unit. This was meant to ensure that no child living within the neighbourhood would have to walk more than half a kilometre to school and could do so without having to cross busy streets.

Another important and significant influence on the design of post-war suburban housing developments was the “Radburn Idea” (Figure 2.2), devised by Clarence Stein and Henry Wright (Stein 1969: 37-74). The planned community of Radburn, New Jersey, was built in a rural setting just outside of New York City between 1926 and 1929, and the initial plan for Radburn was to create a community composed of three distinct yet interconnected neighbourhoods (Stein 1969). Like its precursor, the “Neighbourhood Unit”, the intention was to accommodate the private automobile while at the same time ensuring public safety, and the end result once again represented a dramatic shift in methods of community design. The “Radburn Idea” presented three especially innovative elements: first, the incorporation of a hierarchy of roadways; secondly, the deliberate segregation of pedestrian and automobile traffic; and third, the residential “superblock”.

Figure 2.1 The “Neighbourhood Unit” Concept.
Source: Perry 1929

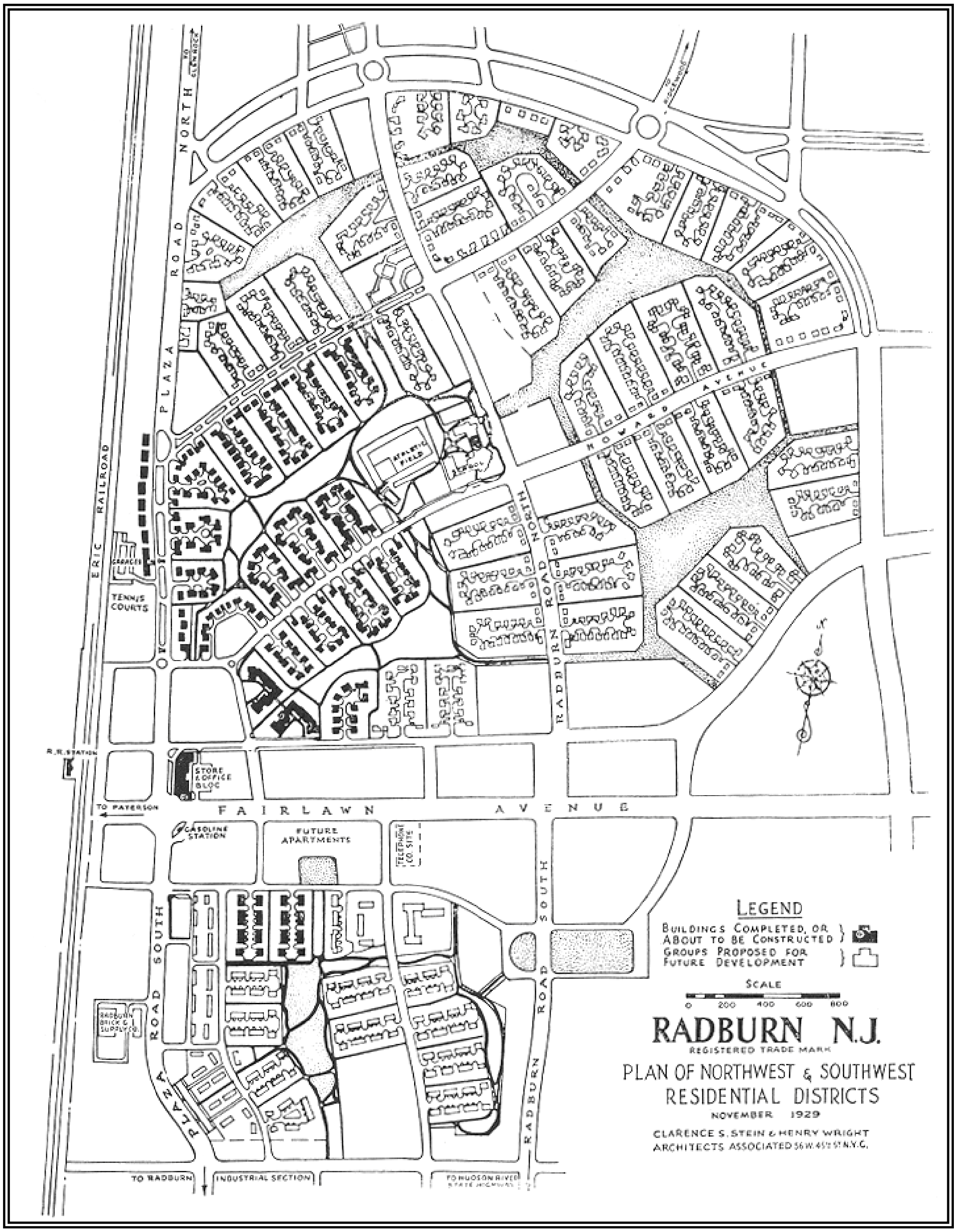


Figure 2.2 Plan of Radburn, New Jersey, 1929
Source: Stein 1969

A matter of considerable importance to Stein and Wright in conceiving the "Radburn Idea" was once again how to mitigate the negative impacts of automobile traffic on residential streets (Stein 1969). Their solution to this dilemma was to further refine Clarence Perry's ideas by physically isolating the community from the rest of the city and introducing a hierarchy of specialized roads and pathways within its boundaries. Smaller roads, including service lanes and cul-de-sacs, were built for specialized uses, such as providing automobile and delivery access to houses. As a result, the only vehicles that would pass directly in front of houses would be those destined specifically for those dwellings. The small roads would then lead to secondary collector roads, which would subsequently lead to main thoroughfares that served two purposes: linking adjoining neighbourhoods and providing access to the expressways that connected Radburn to the outside world.

As yet another means of reducing the risk of pedestrian-motor vehicle collisions, walkways and pathways were built throughout the community. Through the incorporation of overpasses and underpasses, the pedestrian network was completely segregated from the road network, thus providing residents with the ability to traverse the community on foot without once having to cross the street. A third innovation in Radburn was the introduction of the "superblock", a long, narrow and rectangular block of housing. Each superblock measured 12 to 20 hectares in size and was devoid of any through roads, except on its outside perimeter (Stein 1969: 44).

Radburn was never fully completed due to the onset of the Great Depression in 1929 (only two of the three planned neighbourhoods were built) and, instead, "had to accept the role of a suburb" (Stein 1969: 41). Nonetheless, both the "Radburn Idea" and the "Neighbourhood Unit" concept bore considerable influence on the design of post-war suburban developments throughout the United States and Canada. As Hodge has stated in the Canadian context, "Community plans [across Canada] have repeatedly used the neighbourhood unit notion in a variety of formats […] the neighbourhood unit idea became one of the strongest physical organizing principles in modern community plans" (Hodge 1988: 65). Hodge has also noted the widespread influence of the "Radburn Idea", observing that "there is hardly a metropolitan suburb planned since the end of World War II, from Fraserview in Vancouver to Churchill Park in St. John's, that does not embody the principles of Wright and Stein" (Hodge 1988: 68).

Along with the increasing suburbanization of households after 1945 came a substantial amount of road and highway building on the part of local and provincial governments (Vojnovic 2000). Although this did not take place anywhere near to the same extent as the Interstate Highway Program in the United States, expressway construction took place in many Canadian cities as a means of carrying suburban residents with central city jobs. Examples of these were the Decarie Expressway in Montreal, the Queensway in Ottawa, and the Gardiner Expressway in Toronto (Figure 2.3).

Figure 2.3 Gardiner Expressway, Toronto, Late 1950s
Source: Municipality of Metropolitan Toronto 1959: 15.

2.10.1.2.1 Spatial Trends in Employment

While suburban development in the post-war period was initially residential in nature, it was not long thereafter that the decentralization of employment also began in earnest, with retailing and manufacturing activities leading the way (Filion and Rutherford 2001). Prior to World War II, most retail firms were found in the CBD and along the streetcar lines. After 1945, however, operators of shops and services found a growing proportion of their clientele living in newer suburban neighbourhoods, and it therefore became a logical locational decision to establish operations near these developments as well. The arrival of retailing and other commercial functions in suburban areas generally began with the development of small shopping plazas in the 1950s, most of which were located at the edge of the residential neighbourhood units

(Jones 2001). As a result, employees had the opportunity to reside close to their workplaces. As suburban development accelerated in the 1960s, however, this was followed by the creation of larger, community-scale shopping centres replete with massive parking lots. An example of this is provided in the photograph of Shopper's City West (Figure 2.4), a shopping centre constructed in Nepean, Ontario (then a suburb of Ottawa) in the early 1960s. Today, retail activities in suburban areas are especially concentrated in large, regional-scale shopping malls and "big box" stores (Figure 2.5) located along major arterial roads or adjacent to highway interchanges, where accessibility by automobile is greatest (Hodge 1998; Pressman and Peters 1996).

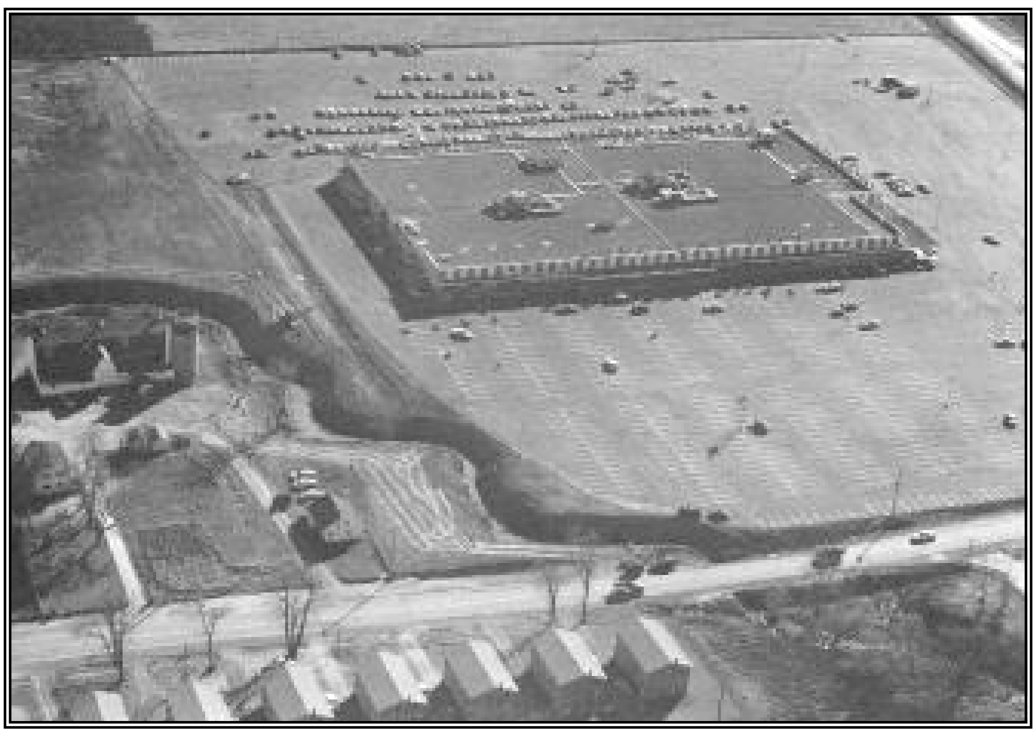


Figure 2.4 Shopper's City West, Nepean, Ontario, 1960s
Source: Elliott 1991: 281

Figure 2.5 Big-Box Retailer in Suburban Ottawa, 2001
Photo: C. Fullerton

Manufacturing firms were also increasingly attracted to suburban settings in the years following World War II (Filion and Mock 1991; Gad 1991; Hodge 1998). In this case, it was once again a combination of factors that prompted such a shift in locational decision-making, including the increasing use of transport trucks and innovations in horizontal assembly line technology. As noted earlier, manufacturing industries in the 19th and early 20th centuries relied heavily upon railways and waterways for the receipt of raw materials and the shipment of finished products. Furthermore, their workforce was primarily dependent upon walking as their mode of commuting. As a result, their location was largely determined by the distribution of railway lines, railyards and shipyards, and by the need to be located within the commuting range of their workforce. As these facilities and households tended to be located at the city centre, the pre-war urban core was characterized not only by the presence of commercial activities, but also by the presence of most urban industrial enterprises (Figure 2.6). Manufacturers' dependence on rail- and water-based modes of transportation diminished significantly, however, as the transport truck became a more prominent means of delivering raw materials and finished products. Just as the automobile had freed households from transportation-related locational constraints, the transport truck did the same for manufacturing firms (Hodge 1998). So long as a given tract of land was accessible by road and connected to the inter-urban highway network, virtually any location within or outside the city was conducive to the location of a factory.

Figure 2.6 W.E. Sanford Manufacturing Company, Hamilton, Ontario, 1890s
Source: Canadian Heritage Gallery 2001 (ID #21928).

Concurrent with growth in the truck-based delivery of freight was the increasing use of horizontal assembly line techniques in the manufacturing process. In the pre-war era many manufacturing enterprises were located in multi-storey buildings, and the adoption of the horizontal assembly line therefore frequently necessitated their relocation to a more appropriate facility. This need for horizontal space again made suburban settings more attractive to manufacturing firms, because the cost of land there tended to be far lower than in the CBD and the central city. As a result, firms were able to buy large tracts of land at relatively low cost on the urban periphery. It was in response to these trends that many suburban municipalities, hungry to increase the size of their commercial tax base, began to zone large tracts of land exclusively for industrial uses (Figure 2.7). As part of this endeavour, municipalities frequently installed various forms of supporting infrastructure, such as roads, electricity and water supplies, in the hopes of making their community more attractive to manufacturing firms (Filion and Mock 1991). Again, these "industrial parks", as they came to be known, were segregated from other urban activity sites, often by considerable distance. Over the past several decades, peripheral locations, especially industrial parks, have become the location of choice for most urban manufacturing activities (Gad 1991).

Figure 2.7 Merivale Acres Industrial Colony, Nepean, Ontario
Source: Elliott 1991: 329

Institutional land uses too tended to decentralize and to take on lower-densities in the post-World War II period. Facilities such as universities, hospitals, and other community facilities have been drawn to suburban areas also, due primarily to the availability of large and relatively inexpensive tracts of land. For example, in Canada during the 1950s and 1960s several newly established post-secondary institutions – such as Simon Fraser University (Burnaby, British Columbia), the University of Calgary (Alberta), Brock University (St. Catharines, Ontario - Figure 2.8), Trent University (Peterborough, Ontario) and York University (Toronto, Ontario) – were built on previously undeveloped, or "greenfield", suburban sites. The location of these schools on the urban periphery differed considerably from that of longer-standing post-secondary institutions, such as the University of Toronto (Ontario) and Queen's University (Kingston, Ontario - Figure 2.9), which were often located in or near the urban core.

Figure 2.8 Brock University, St. Catharines, Ontario
Source: Brock University 2003

Figure 2.9 Queen's University, Kingston, Ontario
Source: Queen's University 2003

More recently it has been office employment that has relocated from the central city to suburban settings (Rutherford and Wekerle 1988: 134). In many cases this has involved the relocation of "back-office" functions (activities that do not require face-to-face contact with clients) from high-cost CBD locations to suburban office parks (Figure 2.10) where, once again, land and parking are both less expensive and abundant.

Figure 2.10 Kanata North Business Park, Ottawa, Ontario, 2001
Photo: C. Fullerton

2.10.1.2.2 Sociodemographic Trends in Employment

Several sociodemographic trends over the past several decades have also affected the spatio-temporal nature of metropolitan commuting. These include: increasing participation of women in the paid labour force; growing prevalence of dual-earner families; and an increase in lone-parent families. Whereby the proportion of Canadian women engaged in paid work has increased considerably, perhaps the social trend which has had the greatest impact on employment patterns has been women's increasing labour force participation. [2] Although this "feminization" of the labour market began slowly around 1900, it accelerated most rapidly after World War II (Griffin-Cohen 1994: 106). For example, in 1961 approximately 35% of Canadian women over the age of 15 were active participants in the paid labour force. This figure continued to rise through the 1960s and 1970s and reached 46.3% by 1980 (Table 2.1). By 2000 well over one-half of Canadian women aged 15 and over (55.5%) were employed or actively seeking employment. Indeed, as more women have entered the labour force, their level of participation has come close to equalling male levels of participation. Another important point of note is the particularly strong rate of employment for women with children. In 1976, only 39% of women with children less than 16 years old living at home were part of the employed workforce; by 2000, this had almost doubled to 70% (Statistics Canada 2001b).

[2] "Paid work" refers to employment in a job or business from which an individual earns wages, salaries, or income from self-employment (Frederick and Fast 2001: 8).

Table 2.1
Participation in the Paid Workforce by Gender, Men and Women Aged 15 & Over
1980 - 2000

Year	% of All Men Employed	% of All Women Employed	% of Total Employment	
			Men	Women
1980	72.8	46.3	60.4	39.6
1985	68.6	48.8	57.6	42.4
1990	69.9	53.7	55.6	44.4
1995	65.5	52.3	54.6	45.4
2000	67.5	55.5	54.0	46.0

Source: Statistics Canada 2001a.

Coincident with women's increasing labour force participation have been significant changes in the demographic composition of households. The strongest trend in this regard has been a dramatic decline in the proportion of households consisting of a single-earner family. A single-earner family is a husband-wife family in which only one spouse is engaged in paid work.[3] While in 1976 a majority of husband-wife families in Canada consisted of a single-earner (Crompton and Geran 1995), dual-earner families (husband-wife families in which *both* spouses are engaged in paid work) had come to outnumber single-earner families by a margin of almost three-to-one by 1998 (Table 2.2).

[3] "Husband-wife families" include married couples and common-law couples with or without children or other relatives living in the same household (Crompton and Geran 1995).

Table 2.2
Number of Income Earners, Husband-Wife Families, Canada, 1990-1998

	% of Husband-Wife Families				
	1990	**1992**	**1994**	**1996**	**1998**
Single-earner families	23.0	22.7	22.5	23.1	21.5
Dual-earner families	62.1	61.3	60.4	61.5	63.6
Neither spouse had earnings	15.0	16.0	17.1	15.4	14.9
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Statistics Canada 1999b.

Yet another important change in household composition has been an increase in the number of lone parent families. A lone parent family is a family with only one parent, male or female, and living with at least one child (Statistics Canada 2001b). The increasing prevalence of lone parent families has resulted primarily from high divorce rates (Table 2.3) and higher proportions of children born outside of marriage. As Table 2.4 shows, a consistent pattern has emerged throughout Canada's metropolitan areas in which female lone parent families make up approximately 11% to 15% of census families while male lone parent families range from 2 to 3% of total census families.

Table 2.3
Divorce Rate, Canada, 1971-1995

Year	Divorce Rate (Per 1,000 Population)
1971	134.8
1981	271.8
1991	273.9
1995	262.2

Source: Gentleman and Park 1997: 55.

Table 2.4
Family Structure, Census Metropolitan Areas, Canada, 1996

CMA	Total Census Families	Husband-Wife Families		Female Lone-Parent Families		Male Lone-Parent Families	
St. John's	47,590	39,590	83.2%	6,980	14.7%	1,015	2.1%
Halifax	91,015	76,505	84.1%	12,725	14.0%	1,785	2.0%
Saint John	34,550	28,730	83.2%	5,055	14.6%	770	2.2%
Chicoutimi - Jonquière	45,075	38,330	85.0%	5,380	11.9%	1,370	3.0%
Québec	182,770	153,285	83.9%	23,895	13.1%	5,585	3.1%
Sherbrooke	39,335	32,630	83.0%	5,445	13.8%	1,260	3.2%
Trois-Rivières	38,270	32,105	83.9%	5,065	13.2%	1,105	2.9%
Montréal	891,895	736,545	82.6%	129,695	14.5%	25,650	2.9%
Ottawa - Hull	271,600	229,120	84.4%	35,420	13.0%	7,065	2.6%
Oshawa	74,860	64,325	85.9%	8,685	11.6%	1,850	2.5%
Toronto	1,135,140	958,895	84.5%	149,910	13.2%	26,340	2.3%
Hamilton	173,115	148,325	85.7%	21,010	12.1%	3,785	2.2%
St. Catharines - Niagara	105,190	89,590	85.2%	13,090	12.4%	2,500	2.4%
Kitchener	104,915	90,505	86.3%	12,230	11.7%	2,180	2.1%
London	107,515	90,900	84.5%	14,435	13.4%	2,180	2.0%
Windsor	75,255	63,205	84.0%	10,210	13.6%	1,845	2.5%
Sudbury	45,060	38,200	84.8%	5,695	12.6%	1,165	2.6%
Thunder Bay	34,625	29,085	84.0%	4,530	13.1%	1,010	2.9%
Winnipeg	176,945	148,955	84.2%	23,785	13.4%	4,210	2.4%
Regina	51,285	42,780	83.4%	7,260	14.2%	1,250	2.4%
Saskatoon	57,130	48,060	84.1%	7,755	13.6%	1,315	2.3%
Calgary	219,085	190,080	86.8%	24,105	11.0%	4,905	2.2%
Edmonton	230,260	195,765	85.0%	28,630	12.4%	5,865	2.5%
Vancouver	477,870	411,325	86.1%	55,660	11.6%	10,895	2.3%
Victoria	82,875	71,125	85.8%	10,025	12.1%	1,720	2.1%

Source: Census of Canada 1996.

2.10.1.2.3 Economic Trends in Employment

Several economic trends have also served to modify employment and commuting patterns in the Canadian metropolis. These include: the decline of the standard workweek and the increasing commonality of part-time employment and weekend work; the more frequent use of flextime in worker scheduling; and more frequent moonlighting. The decline of the standard workweek refers to the movement away from a standard 35-to-40 hour workweek accompanied by increases in short (less than 35 hours) and long work weeks (more than 40 hours) through a process known as “hours polarization” (Hall 1999: 28). The most significant growth in this regard has been within the context of short workweeks, which have become more prominent largely as a result of employers’ greater use of part-time labour[4] (Dicken and Lloyd 1981; Krahn 1995; Mensah and Ironside 1993; Rose and Villeneuve 1993). The widespread use of part-time employment has affected women in particular, as some 70% of part-time workers are women. In 1996, close to 30% of women in the paid labour force were employed part-time, compared to only 10% of employed men (Table 2.5).

Table 2.5
Part-Time Employment in Canada, 1976-1996

Year	% Employed Part-Time	
	Men	**Women**
1976	5.9	23.7
1981	7.3	26.3
1986	8.9	27.9
1991	10.2	28.1
1996	10.8	29.2

Source: Statistics Canada 2001b.

Patterns of metropolitan employment have also changed as a result of increasing weekend work and the greater use of flextime scheduling. Between 1991 and 1995 there was a considerable increase in the proportion of employees working on weekends, much of which can be attributed to the advent of Sunday shopping (Akyeampong 1997). In 1991, approximately 10% of employees worked on Saturdays and 4% on Sundays. By

[4] Part-time employment involves working less than 30 hours per week in a particular position (Statistics Canada 2001b).

1995, these levels had increased to 14% and 8%, respectively. There has also been an increase in the number of employees with flextime work arrangements. Flextime refers to the ability of workers to have some variation of work start and end times (Akyeampong 1997). Between 1991 and 1995, the proportion of employees with flextime work arrangements rose from 16% to 24%.

Finally, another important change in employment patterns has been an increase in "moonlighting," which refers to the holding of two or more jobs (Pold 1995: 7). Many individuals have taken on a second employment position either to make ends meet, to compensate for the prevalence of part-time employment, or simply to increase their disposable income. Between 1984 and 1994, the number of families in which at least one spouse held two or more jobs jumped by 50%, reaching a total of 362,000 (Pold 1995: 7).

2.10.3 Implications for Public Transit Commuting

Post-war changes in land use and transportation planning, household structure, and patterns of employment have had a considerable impact on the viability of public transit commuting. While communities outside the central city were generally not provided with public transit service in the post-WW II period, growing concerns about the negative environmental impacts of automobile transportation in the early 1970s, particularly its role in the rampant consumption of non-renewable energy resources, prompted most provincial governments in Canada to provide large subsidies to transit systems that would enable them to expand their services to serve outlying suburban areas (IBI Group 1993). As a result, that decade witnessed the construction of numerous rapid transit projects, such as the construction of light-rail systems, and the extension of transit routes to suburban communities. Aided by strict parking controls in the downtown core and growing traffic congestion on intra-urban expressways, public transit ridership among suburban residents began to increase and grew even further in the early 1980s (Perl and Pucher 1995; Pucher 1998).

After the mid-1980s, however, public transit ridership for the journey to work first began to stagnate, then ultimately to decline. The impetus for this transition came with the widespread reduction, or outright cancellation, of funding subsidies to public transit operators by provincial governments (IBI Group 1993; IBI Group and Soberman 2001; Pucher 1998). Even though service had been expanded to suburban areas in the 1970s and ridership had been high between suburban communities and downtown work locations, most other suburban transit routes remained unprofitable. With smaller operating budgets, transit systems were forced to reduce service on financially inefficient routes, most of which were in suburban areas. As a result, the highest quality public transit service was provided to two groups: people travelling within the central city, and commuters travelling between suburban residences and downtown work locations during Monday-to-Friday peak periods. In other areas, service was reduced, or eliminated altogether (Pucher 1998).

The problem with this situation is that the various trends discussed above have served to alter considerably the demographic, spatial and temporal characteristics of metropolitan commuting – in other words, *who* commutes, and *where* and *when* they travel. Several of these trends have led to changes in the *spatial* characteristics of metropolitan commuting. The decentralization and dispersal of households and workplaces throughout the metropolis has resulted in a more diverse range of commuting flows. Today, the journey to work includes not only standard commuting (between central city and suburban households and workplaces in the CBD), but also reverse commuting (between homes in the central city and suburban places of employment), and cross commuting (between suburban residences and suburban workplaces) (Burns 1996; Hamilton and Jenkins 1989; Mensah and Ironside 1993; Sanchez 1999).

Women's increasing labour force participation and the rise in dual-earner and lone-parent families have also modified spatial characteristics of commuting. As these trends have emerged, the balancing of household and employment responsibilities has become an important part of the day-to-day lives of a greater proportion of commuters and has led to more frequent "trip chaining" as part of the journey to and from work (Michelson 1988). Trip chaining involves the linking of trips together, such as stopping to buy groceries, dropping off or picking up children, or running other errands (Blomberg et al. 2000; Clark 2000; Michelson 1988; Rose and Wexler 1993). According to Statistics Canada's 1998 *General Social Survey*, 41% of women made at least one stop on the way home from work on an average day, compared with 28% of men (Clark 2000: 20). For households with children under the age of five, the process of trip chaining was even more frequent: in this case, two-thirds of women made at least one stop, compared with 30% of men. As a result, commuting between home and work consists far less often of a direct, non-stop trip. Finally, the growing prevalence of workers holding two or more jobs has further altered commuting patterns, albeit to a lesser extent than the previous trends. For these workers, commuting often entails travel not only between home and work (and other stops in between, perhaps), but may also entail travel directly between workplaces (Mensah and Ironside 1993; Stanback and Knight 1976).

The temporal characteristics of metropolitan commuting have changed in response to the economic trends of more frequent part-time employment, the increasing prevalence of weekend work, and the greater use of flextime scheduling. Traditionally, the journey to work has also been characterized by commuting flows in which the bulk of travel takes place during two weekday peak periods: in the morning, generally between 6 a.m. and 9 a.m., and in the late afternoon, generally between 3 p.m. and 6 p.m. Although the morning and afternoon peak periods remain the time frames in which most commuting takes place, a growing proportion of workers are commuting outside of these hours. This includes travel not only during the midday and late evening, but also on Saturdays and Sundays.

As commuting patterns have changed over the past several decades, it has become increasingly difficult for many commuters to fulfill their access needs by public transit. A growing proportion of commuter trips now begin and/or end within suburban areas, yet it is within these areas that the infrastructure, facilities and services required by public transit users are most inadequate, if at all available (Perl and Pucher 1995). Commuters wishing to stop at required facilities and services between home and work face the problem of travelling between locations that are often located far apart from one another, thus reducing the ease with which they can be reached in a timely fashion without the use of a car. Individuals working part-time are also frequently unwilling or unable to commute by public transit as, in many cities, this service is geared to serve peak hour travellers moving between suburban residences and downtown work locations. Conversely, service during off-peak hours (midday, evenings and weekends), when part-time workers often commute, is often infrequent or altogether unavailable. For many individuals in the Canadian metropolis, the journey to work has therefore out of necessity become synonymous with transportation by automobile.

2.11 Remaining Problems

Given the growing concern for improving the viability of public transit as a transportation option for commuters, along with the numerous obstacles and deterrents to using public transit that have been identified by researchers, it is critical that planners be provided with a practical tool for evaluating public transit accessibility to employment. The challenge of creating such an instrument has been well elucidated in a more general observation by Evans *et al.*:

> [It] is difficult to come up with simple but consistent measures that can apply to the wide range of travellers who under various conditions might choose to use alternative modes […] The factors that contribute to the attractiveness of [a particular mode of transportation] must first be identified, and then ways of representing in the model the degree to which these factors are present or absent must be developed (Evans *et al.* 1999: 32-33).

The enormity of such a task is reflected in the fact that, although over the past half decade there has been a spate of research related to the evaluation of public transit quality, none of the methodological frameworks produced thus far is adequately suited to the evaluation of public transit accessibility to employment.

At least four frameworks for evaluating the quality of public transit have been devised in recent years. These include: the *Local Index of Transit Availability* (Rood 1997, 1998); the *Transit Friendliness Factor* (Evans et al. 1999); the *Gender Audit for*

Public Transport (Hamilton and Jenkins 2000; Hamilton, Ryley and Jenkins 1999); and the *Transit Capacity and Quality of Service Manual* (Transit Cooperative Research Program 1999). The *Local Index of Transit Availability* assesses opportunities to utilize public transit in small subareas of a metropolitan area (e.g. a census tract) by examining the seating capacity of local transit routes, the frequency of transit service, and route coverage (i.e. the proportion of streets in the area on which public transit service travels) (Rood 1997, 1998). The *Transit Friendliness Factor* was developed as a means of evaluating the public transit access environment, again at the small area level. It focuses on four elements: the availability and quality of sidewalks; the availability and quality of road crossings; travel distances to stops; and the availability of amenities at transit stops (Evans et al. 1999). The *Gender Audit for Public Transport* is "a checklist against which policymakers, planners and providers in the transport industry will be able to evaluate their policies, plans and systems in order to ensure that transport provision meets women's needs" (Hamilton and Jenkins 2000: 1793). Finally, the *Transit Capacity and Quality of Service Manual* is intended to provide "anyone who designs or sponsors transit services" with standards against which they can assess transit capacity and quality of service, whereby:

> "Transit capacity" deals with the movement of people and vehicles, depends on the size of the transit vehicles and how often they operate, and reflects the interaction between passenger traffic and vehicle flow. "Quality of service" is an even more complex concept that [reflects] a transit-user's perspective and [measures] how a transit route, facility, or system is operating under various demand, supply, and control conditions (Transit Cooperative Research Program 1999: 1).

While each of these initiatives represents an innovative means of evaluating conditions under which public transit users must travel, three important weaknesses limit their suitability for practical application within the context of public transit commuting. First, none of these involves the examination of *all* components of the public transit commuter's journey between their homes and workplaces. Second, they do not sufficiently incorporate the broad array of infrastructure, facilities and services required by public transit commuters, given the wide-ranging sociodemographic characteristics of this population. Finally, a spatio-temporal dimension has not been incorporated in any of these tools. What is therefore required is a practical tool for evaluating public transit accessibility to employment that: 1) assesses conditions related to each component of the public transit commuter trip; 2) incorporates the needs of all commuters; and 3) considers spatio-temporal dimensions of public transit commuting.

The following observation, expressed within the context of a discussion concerning the accessibility needs of persons with disabilities, effectively captures the essence of the public transit journey and the importance of evaluating conditions related to *each component* of that journey:

> A typical trip consists of many links (for example, home to curb, curb to vehicle, ride in vehicle, transfers, vehicle to curb, curb to entrance of building, entrance to destination). If any one link is not accessible, then the journey becomes impossible. Every link in the chain must be considered and improved as necessary (Suen and Mitchell 2000: 3).

The requirement that the needs of all commuters also be considered in evaluating the viability of commuting by public transit stems from the fact that, as Hanna (1990: 96) has observed,

> Different segments of the population perceive different, even incompatible, needs. […] A successful scheme needs to realize and address, even if it cannot fully satisfy, the range of concerns.

(See also Litman 2000; Nutley 1992; OECD 1977.) For example, a male commuter travelling directly between home and work may be most concerned with the frequency of public transit service and directness of public transit routes, while a female worker travelling during the evening may be concerned not only with these factors, but also with issues of personal security and the ability to also reach other destinations en route between home and work. Finally, it is also critical that a spatio-temporal dimension be added to the accessibility evaluation framework because, as noted earlier in this chapter, commuter flows and travel times have broadened considerably in the past several decades. As Ortuzar *et al.* (1997) have stated, "the origin-destination combination plays an important role, because travel options are not homogeneous," while "time of day of travel is also important, because conditions vary significantly between peak and off-peak periods."

2.12 Conclusion

The purpose of this chapter has been to situate this research project within the context of previous studies. As concern about the importance of pursuing sustainable development has grown in recent years, civic officials have opted to move beyond the long-standing automobile-oriented approach to urban transportation planning and have instead initiated efforts to promote the development of transportation systems that are at once environmentally benign, economically efficient, and socially equitable. As part of these efforts, increasing attention is now being devoted to the potential role that public transit might play within the context of metropolitan commuting. Given the constraints to travelling to work by public transit that have been identified in the literature, the promotion of more frequent public transit commuting clearly represents a formidable challenge. In order to facilitate these efforts, it is imperative that planners are provided with a tool for evaluating the conditions under which public transit commuters must travel in order that any obstacles or deterrents can be identified and eliminated.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

As discussed in Chapter One, this study was guided by two interrelated research questions. The first research question – "*What infrastructure, facilities and services must be in place in order for public transit to represent a viable transportation choice for the contemporary commuter population?*" – sought to address the lack of a comprehensive definition of public transit commuter needs. It was only by dealing with this question that the second research question – "*Can a simple and practical tool be devised that, when applied, will provide some indication of how well the needs of public transit commuters are served by the infrastructure, facilities and services currently in place?*" – could properly be addressed. The purpose of this chapter is to present and discuss the strategy employed in addressing these research questions, which ultimately involved the following three-stage process:

- Stage One: Identification of factors that promote public transit accessibility to places of employment, and their ultimate conceptualization under the label of "Public Transit Commuter Needs"
- Stage Two: Development of the "Public Transit Commuter Accessibility Audit," a practical tool for evaluating public transit accessibility to places of employment
- Stage Three: Testing of the "Public Transit Commuter Accessibility Audit" in two case studies applied within the City of Ottawa

An outline and justification of the research methods utilized in each of the three stages is provided in the following sections.

3.2 Stage One: Conceptualization of "Public Transit Commuter Needs"

In order to establish a theoretical foundation for the development of a practical tool for evaluating public transit accessibility to places of employment, the first objective of this research was *to conceptualize the notion of public transit commuter needs*. Bradshaw (1972) has identified four types of need: normative need; felt need; expressed need; and comparative need. Normative needs are defined using expert definitions of adequate levels of performance or service. Felt needs reflect expectations that members of a group have for their own outcomes, while expressed needs are based on the observed behaviour of a target population. Finally, comparative needs are expectations that are based on the performance of a group other than the target population. McKillip (1978) has noted that, although each type of need outlined by Bradshaw can provide an indication of the needs of a target population, each has its weaknesses as well. He points out that normative needs can be elitist due to the reliance on experts who may prescribe the provision of items or services that the target population will not use. The primary weakness of felt needs is that they can often represent wants rather than actual needs. The problem with expressed need is that it reflects demand for an item or service – an item or service that is used is deemed to be needed, while one that is not used is deemed not to be needed. This approach does not consider that an unused item or service may still be needed; there just may be an obstacle or deterrent to its use. Finally, the problem of comparative need relates to the fact that, in order to provide an accurate indication of need, the groups compared must share similar characteristics. Given the utility of each approach to defining need along with its respective weakness, McKillip has suggested that any effort to define need should employ a combination of techniques; that is, more than one approach should be used. With this advice in mind, the conceptualization of public transit commuter needs involved a mixed-method approach that included: 1) a comprehensive literature review; 2) the distribution of a survey questionnaire; and 3) informal consultations with members of three transportation advocacy groups. Each of these is discussed in turn below.

3.2.1 Comprehensive Literature Review

The primary means by which public transit commuter needs were defined was through an extensive review and synthesis of previous transportation research. Although this research project is framed within the context of sustainable transportation in Canadian cities, the literature review considered findings put forth by researchers worldwide. It was felt that investigation of findings from several countries would lead to a more solid conceptualization of "public transit commuter needs" than a study informed only by Canadian-based research because the conclusions drawn would be supported by a greater body of evidence. Furthermore, problems of automobile dependence and declining public transit ridership are just as prominent in other parts of the world as they are in Canada (Banister and Gallent 1999; Mackett 2001; Naess and Sandberg 1996; Ortuzar *et al.* 1997; Pucher 1988). Indeed, low-density suburban development, automobile-oriented urban transportation planning, and changing spatio-temporal employment patterns have become ubiquitous issues across the global landscape.

In terms of content, the literature examined in an effort to conceptualize public transit commuter needs can essentially be divided into seven groups. This included research that has investigated:

1) factors influencing public transit accessibility *in general*;
2) factors influencing public transit accessibility *to places of employment*; and

3) factors influencing public transit accessibility *from the perspective of particular population subgroups*.

Access to, and egress, from public transit also normally involves travel on foot, in a wheelchair, by bicycle, or in some cases by automobile. Accordingly, the literature review also included studies related to:

4) factors influencing *pedestrian accessibility*;
5) factors influencing *wheelchair accessibility*;
6) factors influencing *bicycle accessibility*; and,
7) factors influencing *accessibility to public transit by automobile*.

The first body of research that was examined included numerous studies that sought to investigate the range of factors that influence a commuter's ability and/or willingness to travel by public transit in general terms. In other words, the primary focus of these studies was not public transit commuting *per se*, but instead the various conditions that must be in place for public transit to represent a viable transportation choice regardless of the individual's destination. Here it was assumed that factors considered important by urban dwellers in their decisions whether or not to travel by public transit, regardless of destination, would be equally applicable to public transit commuters.

The second body of research consulted in the literature review was composed of studies that have specifically examined factors influencing public transit accessibility *to places of employment*. Not only have many of the studies in this category provided valuable insight concerning the infrastructure, facilities and amenities required by public transit commuters, they have also been instrumental in identifying spatio-temporal elements that must be considered by any municipality seeking to promote public transit commuting. The literature review continued with the analysis of a third body of research in which factors that influence public transit accessibility for particular population subgroups were examined. As discussed in the previous two chapters, a key challenge for planners and policymakers as they attempt to implement policies related to public transit commuting is to recognize the needs of women, persons with disabilities and low-income earners so that they are more equitably served. As a result, it was important to investigate the findings of these studies in order to ensure that the needs of various population subgroups were incorporated within the broader conceptualization of public transit commuter needs.

Because stops or stations are not usually located immediately at the commuter's trip origin and destination, travel by public transit is usually combined with travel by another mode. The four primary modes by which most people gain access to public transit, and by which they continue to their destination upon egress from the transit vehicle, are: on foot; in a wheelchair; by bicycle; or by automobile. As a result, four further bodies of research were examined as part of the conceptualization of public transit commuter needs. The fourth body of literature included studies examining factors that contribute to pedestrian accessibility, while the fifth included those discussing factors influencing wheelchair accessibility. The sixth body of literature was that discussing issues related to bicycle accessibility. In some cases, such as when commuters reside in rural settings outside the built-up urban area, access to and from public transit takes place by automobile. As a result, the literature review also considered studies that have examined factors influencing the use of "park-and-ride" facilities, the locations at which many such commuters make the modal transition between automobiles and public transit.

3.2.2 Survey Questionnaire

In order to buttress the results of the literature review, a survey questionnaire was also distributed to a small sample. In this part of the research, employees of Canadian Automobile Association (CAA) North & East Ontario, a well-known auto and travel club with three offices located in suburban areas of Ottawa, were asked to complete a brief questionnaire (Appendix 1). CAA North & East Ontario was selected for several reasons. First, two of its three offices are located in one of the case study employment areas where trial application of the accessibility evaluation tool took place later in the study. As a result, it was felt that not only might the survey findings complement results of the literature review in devising a comprehensive definition of public transit commuter needs, but they may also yield information that would prove useful when testing the evaluation tool in the case studies. A second reason for recruiting participants from this firm was the fact that they earned a wide range of incomes. CAA North & East Ontario employees range from relatively low-paid clerical staff to high-paid management. A third reason was that a large proportion of CAA North & East Ontario employees is female. This played an important role in the selection of this firm because it was deemed important to ensure that the public transit needs of women were taken into consideration. A final factor in the selection of this firm was the issue of convenience. A previous long-term working relationship with this organization provided an opportunity to obtain relatively easy access to management and subsequently to acquire permission to conduct the study on company premises.

On the questionnaire, respondents were asked to indicate their current mode of travel to work, their reasons for using this mode, and their attitudes concerning the quality of pedestrian, bicycle and public transit infrastructure, facilities and services currently in place between their home and workplace. Sixty-nine survey questionnaires were completed in the three CAA North & East Ontario offices. All thirteen employees in the Hunt Club office completed a survey questionnaire, while in the Orleans location twelve out of thirteen workers participated. The remaining 44 questionnaires were completed at the company's Lincoln Fields office, where 130 workers were employed. The overall response rate was therefore 43.4%.

3.2.3 Consultations with Transportation Advocacy Groups

The third and final research technique employed in the first stage of this study consisted of informal consultations with members of three transportation advocacy groups. These were also based in the City of Ottawa, and included:

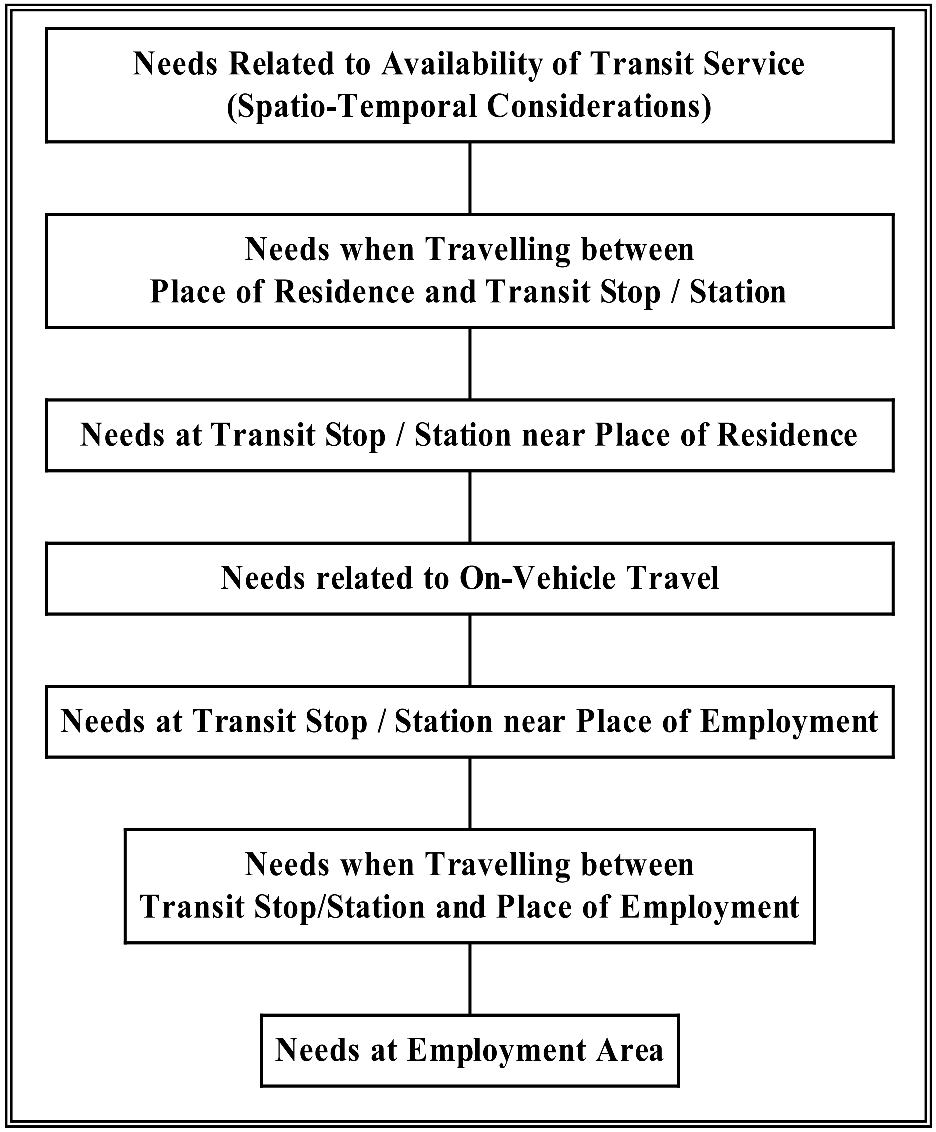
- *Auto-Free Ottawa*, a non-profit volunteer group, whose mandate is "to draw public attention to the full costs of a car-oriented transportation system, and to point out ecologically sustainable and socially rewarding solutions" (AFO 2002);
- *Transport 2000 Canada*, a non-profit national organization "whose primary purpose is research, public education and consumer advocacy [in the interest of promoting] environmentally-sound transportation solutions" (Transport 2000 Canada 2003); and,
- *Citizens for Safe Cycling*, a non-profit association that "promotes safe and efficient cycling in Ottawa" (CfSC 2003).

Meetings with representatives of each group took place over the course of several evenings during the month of May 2001. At each meeting, participants were asked to provide: 1) their ideas concerning the needs of public transit commuters, 2) their feedback on possible oversights in the research conducted up to that point, and 3) potential sources of further information.

3.2.4 Research Synthesis

Once the literature review, survey, and consultations with transportation advocacy groups were completed, the ensuing task was to consolidate the information gathered in order to formally define public transit commuter needs. The classification of public transit commuter needs was based upon the sequence of events involved in a typical public transit commuter trip. In determining whether public transit represents a viable transportation choice, commuters first consider whether public transit service is even available within the context of *their* spatio-temporal travel patterns. If public transit service is indeed accessible from their homes, travels close to their place of employment, and is available when they travel (or may need to travel), the decision of whether or not to commute by public transit then shifts to two further considerations: the quality of the built environment in which the journey would take place, and the quality of service received on board the transit vehicle. In this regard, the research showed that infrastructure, facilities and services required by public transit commuters can essentially be classified according to several "links" in the public transit commuter trip. Apart from those related to the availability of public transit service, each public transit commuter need was therefore classified according to the link(s) where that need is manifest (Figure 3.1). For example, the need for shelter while waiting for the transit vehicle to arrive would be placed under the "Needs at Transit Stop/Station near Place of Residence" *and* "Needs at Transit Stop/Station near Place of Employment" categories, while the need for adequate seating would fall under "Needs related to On-Vehicle Travel". This conceptual framework was deemed to be the most suitable approach to classifying public transit commuter needs because a "links"-based approach also provided an appropriate means of structuring the accessibility evaluation tool devised in the second stage of the research.

Figure 3.1
Classification of Public Transit Commuter Needs



3.3 Stage Two: Evaluating the Servicing of Public Transit Commuter Needs

Once the access needs of public transit commuters were formally and comprehensively defined, the second research objective was *to develop a straightforward and practical tool for evaluating public transit accessibility to places of employment.* In order to achieve this objective, the tasks at hand were: 1) to develop a series of indicators that was representative of the public transit commuter needs identified in the previous stage of the research, and 2) to incorporate the selected indicators into an appropriate evaluation framework. A review of the literature showed that, in order to be amenable to practical application by planning professionals, the evaluation tool should possess a number of characteristics related to: 1) its degree of complexity; 2) the geographical scale at which the tool could be applied; 3) the number of indicators included within the evaluation framework; 4) the type of information to be collected; 5) the reporting of evaluation results; and 6) the universality of evaluation.

The first issue of concern was the complexity of the evaluation tool. Since the purpose of this tool is to provide planners and policymakers with a means of identifying weaknesses or deficiencies that may hinder or prevent altogether commuting by public transit, it was important to select a evaluation framework that was suited to the skills and needs of its intended users. Discussions of the indicator development process have noted that planners generally prefer tools that are straightforward and easily understood (Akkerman 1982; Sawicki and Flynn 1996). On the other hand, Sawicki and Flynn (1996) have observed that academics more frequently seek to develop innovative methodologies, models, theories, and more complex indices that will stand up to the rigorous scrutiny of their peers. However, Handy and Niemeier (1997: 1182) have argued that a simplified approach would not be without academic merit. They wrote:

> Can simple measures be as effective or perhaps even more effective than complex ones in characterizing the physical structure of a community? Although they are based rather loosely on theories of travel behavior, they may give a good if rough indication of accessibility. […] They also have the advantage of ease of understanding.

Further support for using a simple and straightforward approach to evaluating accessibility can be provided by the fact that the use of indicators is not necessarily meant to *direct* the policy-making process, but rather to *inform* it (Rood 1997). Accordingly, a tool for evaluating public transit accessibility to employment need not be excessively complex if it is made clear from the outset that: 1) its intent is simply to provide planners with a *general* indication of accessibility, and 2) that any weaknesses or deficiencies related to the urban built environment or the provision of public transit service identified in applying the tool would still require further, more thorough, investigation before any interventions are implemented.

The second issue that required consideration was the geographical scale at which the accessibility evaluation tool would be applied. Many public transit commuter needs relate to micro-scale considerations such as, for example, the provision and quality of sidewalks, the availability of road crossing opportunities, and the presence of various amenities at transit stops and stations. In order to ensure that these and other issues were given adequate consideration when evaluating public transit accessibility to places of employment, it was necessary to design the tool so that it evaluated actual conditions at the small-area level, such as within a census tract, a neighbourhood or a community. Although much information related to micro-scale considerations is not easily accessible, since it is not routinely collected by most planning agencies (Handy and Clifton 2001a), this lack of readily available data could be compensated for by means of extensive field observations.

A third matter that required consideration before creation of a tool for evaluating the servicing of public transit commuter needs could proceed was the number of indicators to include in the evaluation framework. As Bracken (1981: 183) has noted, "the main operational consideration [is] to select a sufficient number of indicators […] to be useful, but not to use so many that they swamp the recipient with information." The approach used in this study therefore involved the incorporation of one or more representative indicators for each public transit commuter need while ensuring that those not relevant to a particular context could be disregarded during formal application of the evaluation framework. For example, if travel to transit stops or stations by automobile was not necessary, indicators related to park-and-ride facilities could be ignored without affecting the evaluation results.

The fourth and fifth considerations that had to be dealt with were closely related. These involved 1) the type of information to be collected in assessing public transit accessibility to places of employment and 2) the final product that would be used to report the evaluation results. In conjunction with academics' focus on the development of complex accessibility measures has also been a reliance on the use of quantitative indicators and the use of a single "index" in the reporting of results. However, two concerns emanate from this trend. Firstly, many public transit commuter needs – such as those related to aesthetic characteristics of the transit stop or feelings of personal security, for example – do not lend themselves to simple quantitative analysis, while in other cases the necessary quantitative data is not routinely collected and thus is not readily available. Secondly, as discussed in Chapter 2.10, the presentation of study results using a single measure of accessibility, such as an index, is of limited value to planners because they are most concerned with the identification of specific problems that reduce accessibility.

> Much important information is lost when the data are collapsed into a single or even a few measures. Traditional measures of accessibility may help planners identify neighbourhoods where accessibility is relatively high or relatively low, but they do not, on their own, point to the specific factors contributing to high or low accessibility for residents (Handy and Clifton 2001a: 69).

It is for these reasons that Handy and Niemeier (1997) have advocated the use of qualitative methods, and a focus on *evaluation* rather than *measurement*, when investigating accessibility. Whereas the notion of *measuring* accessibility implies the use of quantitative methods and the production of a quantitative score or index as the chief outcome of the process, the *evaluation* of accessibility implies a much broader approach and leaves room for the use of qualitative methods. Brandon et al. (1997: xvi) have defined "evaluation" as

> a technical-scientific procedure for expressing a judgement, based on values, about the impacts of a policy or of an action on the physical (natural or built) environment, or for assessing the effects of these impacts on the community (social dimension).

In this regard, Handy and Niemeier ask:

> Is it worthwhile to turn to a more qualitative approach in characterizing the accessibility of a community […]? Simple quantitative measures may be combined with qualitative evaluations to provide a much richer understanding of the accessibility characteristics of a community than may be possible with even very complex measures (Handy and Niemeier 1997: 1182).

A number of proposals have been put forth in recent years that reflect a growing desire to move away from a strictly quantitative approach in the evaluation of accessibility. For example, Handy and Clifton (2001a) have advocated the creation of an "accessibility database" and Hamilton and Jenkins (2000) have created a mixed-method auditing process, while Rood (1997) has posited that a simple rating system (e.g. "very good", "better than average", "worse than average", or "poor") could be used to give a general indication of accessibility.

The sixth and final concern addressed before proceeding with development of a tool for evaluating the servicing of public transit commuter needs related to the issue of universality. In order for it to be amenable to practical use *anywhere* – that is, in any geographical setting – the evaluation tool had to be applicable within the context of any commuting circumstance, regardless of the type of employment involved (e.g. factory workers vs. high-technology researchers) or the sociodemographic characteristics of commuters (e.g. upper-income families or low-income persons with disabilities). The tool was therefore designed to evaluate public transit accessibility between a selected metropolitan subarea and a particular employment area with consideration for the infrastructure, facility and services required by *all* commuter subgroups, even if 1) members of a particular commuter subgroup do not currently reside in this metropolitan subarea, and/or 2) members of a particular commuter subgroup reside in this metropolitan subarea but do not currently commute to the selected employment area.

Given the six considerations noted above, the second stage of the research involved development of a practical tool for evaluating the servicing of public transit commuter needs that:

- was attuned to the skill levels and needs of professional planners;
- could be applied at the small-area level;
- combined the use of quantitative and qualitative indicators;
- presented the results in disaggregate form; and,
- provided flexibility in terms of where it could be applied and what it evaluated.

This resulted in development of the "Public Transit Commuter Accessibility Audit," the structure of which is based on that of the "Gender Audit for Public Transport" developed in the United Kingdom by Hamilton, Ryley and Jenkins (1999). The "Gender Audit for Public Transport" is "a checklist against which policymakers, planners and providers in the transport industry will be able to evaluate their policies, plans and systems in order to ensure that transport provision meets women's needs, whilst encouraging sustainable development and providing value for money" (Hamilton and Jenkins 2000: 1793). More specifically, it is "a series of statements against which auditors are asked to rate the policies, programme or organisation being audited" (Hamilton and Jenkins 2000: 1799). Each statement is assigned a value or grade based on the extent to which it is true, and the final results are presented in a disaggregated format rather than as a single index. At the same time, justification is also provided to support the grade assigned to each statement.

3.4 Stage Three: Trial Application of the "Public Transit Commuter Accessibility Audit"

The final stage of the research project involved trial application of the *Public Transit Commuter Accessibility Audit* (*PTCAA*) in the form of two case studies applied to subareas of the City of Ottawa. Although the ultimate intention in creating the *PTCAA* is to provide planners with a means for evaluating the viability of commuting by public transit between *any* metropolitan subarea and *any* employment area, there were important reasons for selecting those settings in which trial applications were completed (Table 3.1). The case studies involved the evaluation of public transit accessibility to two suburban employment areas – the Orleans Town Centre and the Lincoln Fields

Shopping Centre – from two residential subareas, respectively. These employment areas were chosen because it was deemed most logical to test the *PTCAA* in suburban settings, which is where public transit accessibility to places of employment has been most inadequate in recent decades (Naess and Sandberg 1996). In the City of Ottawa's recently adopted *Official Plan* the Orleans Town Centre has been designated as a "Mixed-Use Centre". The ultimate planning goal is for this area to become a suburban downtown that is easily accessible by public transit from all surrounding communities. The Lincoln Fields Shopping Centre is a community-scale shopping facility for which no major planning goals have been established; instead, it is located in the "General Urban Area" according to the City of Ottawa's new *Official Plan*. This setting was chosen for trial application of the *PTCAA* because it was deemed necessary to also test the planning tool at a location where *explicit* measures to promote public transit commuting have not been, and will not be, pursued.

For each case study employment area, two residential subareas were chosen from which accessibility by public transit was evaluated. Once again, a specific rationale provided the foundation for their selection. As Rood (1997: 183) has commented, "local policymakers might best want to target investments to those areas that have the most to gain from them." With this in mind, the subareas selected for each case study were those that currently housed a large proportion of workers commuting to the corresponding employment area. If public transit commuting to a particular employment area from the metropolitan subareas in which most of its workers reside can be encouraged, this will go a long way in increasing public transit's share of the modal split for that employment area. Accordingly, the first case study evaluated public transit accessibility as it pertained to travel between the communities of Queenswood Heights and Fallingbrook and the Orleans Town Centre employment area. In the second case study the *PTCAA* was conducted between the Lincoln Fields Shopping Centre and the communities of Britannia-Lincoln Heights and Queensway Terrace South-Redwood Park.

Table 3.1
Case Study Employment Areas and Residential Subareas

Employment Area	# of Employees	Residential Subarea	% of Workers at Employment Area Living in Residential Subarea	% of Total Workers Covered by Case Studies
Orleans	2,702	Queenswood Heights	9.4	**22.5**
		Fallingbrook	13.1	
Lincoln Fields	819	Britannia-Lincoln Heights	18.0	**28.0**
		Queensway Terrace South-Redwood Park	10.0	

Source: *1995 NCR Origin-Destination Survey*

3.5 Conclusion

The purpose of this chapter has been to discuss the methods employed in developing a practical tool for evaluating public transit accessibility to places of employment. By means of a literature review, a survey, and consultations with transportation advocacy groups, an effort has been made to conceptualize public transit commuter needs. This has provided a theoretical foundation for the creation of a *Public Transit Commuter Accessibility Audit*, which is intended to provide planners with a methodological framework for evaluating the quality of infrastructure, facilities and services in place to serve public transit commuters. Finally, case studies in which public transit accessibility to two employment areas located in the City of Ottawa have been conducted in order to test the practical utility of the *Public Transit Commuter Accessibility Audit*.

CHAPTER FOUR: TOWARDS A COMPREHENSIVE DEFINITION OF PUBLIC TRANSIT COMMUTER NEEDS

4.1 Introduction

The first objective of this research project was to conceptualize the notion of public transit commuter needs in order to provide a theoretical foundation for the development of a practical tool for evaluating public transit accessibility to places of employment. As discussed in Chapter Two, one of the foremost problems associated with long-standing approaches to the evaluation of urban transportation system quality, and with the development of accessibility measurement tools thus far, has been a lack of attention to the broad range of factors that promote accessibility as it pertains to a particular mode of transportation, including public transit. Accordingly, several means were employed to ensure that the conceptualization of public transit commuter needs was formulated *from the perspective of public transit commuters themselves*. The research strategy therefore included the synthesis of information collected through a comprehensive literature review, the distribution of a survey questionnaire, and informal consultations with sustainable transportation advocacy groups. It culminated with the formulation of a "Comprehensive Definition of Public Transit Commuter Needs", shown in Box 4.1.

As the definition makes clear, the contemporary metropolitan labour force requires a broad range of infrastructure, facilities and services in order for public transit to represent a viable transportation choice for the journey to work. While the literature review entailed the consultation of previous research conducted in a broad range of countries, particular consideration also had to be given to the geographical setting of Canada's cities. With the long, cold winters experienced in most of Canada's metropolitan areas, it was essential that the "Comprehensive Definition of Public Transit Commuter Needs" was developed with full consideration for the planning implications of "winter-induced discomforts" (Pressman 1996: 528). The purpose of this chapter is to present and discuss the "Comprehensive Definition of Public Transit Commuter Needs" within the context of the seven dimensions outlined in Chapter Three, including:

- needs related to the availability of transit service;
- needs related to travel between the place of residence and transit stops/stations;
- needs related to transit stops/stations near the place of residence;
- needs related to transit vehicles and on-board travel;
- needs related to transit stops/stations near the place of employment;
- needs related to travel from transit stops/stations to the place of employment; and
- needs related to the employment area.

4.2 Dimension #1: Availability of Service

The viability of commuting by public transit depends in large part on the spatial and temporal characteristics of the service provided. Spatial characteristics are of critical importance because they determine whether public transit travels *where it is needed* and, if so, *how direct the route between home and work will be.* Temporal characteristics also play a crucial role because they determine whether public transit service is provided *when it is or may be needed* and, if so, *how often*. Transportation researchers have identified numerous obstacles and deterrents to public transit commuting that relate to spatial and temporal service characteristics.

Box 4.1
A Comprehensive Definition of Public Transit Commuter Needs

Before deciding to use public transit, commuters need…

- frequent public transit service that travels directly to their place of employment or that provides the opportunity to transfer efficiently to another route that travels to their place of employment
- public transit service between their homes and places of employment that is available before, during and after their workday

When travelling between their places of residence and transit stops/stations, public transit commuters need…

- a variety of shops and services required on a day-to-day basis
- direct access along aesthetically-pleasing and well-lit pedestrian and bicycle routes that are highly visible by passing traffic and from adjacent buildings
- wide, properly maintained, obstacle-free and wheelchair-accessible sidewalks that are separated from busy roadways by buffers and cleared of snow and ice during winter months
- wide, clearly demarcated and obstacle-free bicycle lanes
- road crossing opportunities that include audible, pedestrian-controlled signals

At transit stops/stations near their places of residence, public transit commuters need…

- a clean, well-lit, highly-visible and paved boarding area
- shelter from the elements
- service information, including scheduled arrival times, impending service changes, route maps and system maps
- trash receptacles and newspaper boxes
- bicycle racks or storage facilities
- [at stations] convenience stores/vending machines, public and emergency telephones, public washrooms
- [at stations] easily accessible, well-lit, highly visible, and security-monitored park-and-ride facilities that provide ample free parking and direct access to a transit stop/station

When travelling on transit vehicles, public transit commuters need…

- safe, friendly and reliable service from drivers who announce major stops
- clean, universally accessible, uncrowded public transit vehicles that clearly display the route number and destination on the front, side and back
- bicycle racks on public transit vehicles

Concluded on next page

Box 4.1 (concluded)
A Comprehensive Definition of Public Transit Commuter Needs

At transit stops/stations near their places of employment, public transit commuters need…

- a clean, well-lit, highly-visible and paved boarding area
- shelter from the elements
- service information, including scheduled arrival times, impending service changes, route maps and system maps
- trash receptacles and newspaper boxes
- bicycle racks or storage facilities
- [at stations] convenience stores/vending machines, public and emergency telephones, public washrooms

When travelling between transit stops/stations and their places of employment, public transit commuters need…

- a variety of shops and services required on a day-to-day basis
- direct access along aesthetically-pleasing and well-lit pedestrian and bicycle routes that are highly visible by passing traffic and from adjacent buildings
- wide, properly maintained, obstacle-free and wheelchair-accessible sidewalks that are separated from busy roadways by buffers and cleared of snow and ice during winter months
- wide, clearly demarcated and obstacle-free bicycle lanes
- road crossing opportunities that include audible, pedestrian-controlled signals

At or within the vicinity of their places of employment, public transit commuters need…

- a variety of shops and services required on a day-to-day basis
- bicycle racks or storage facilities
- showers, lockers and change room facilities

Spatial Characteristics

In terms of spatial characteristics, obstacles and deterrents to public transit commuting are generally associated with weaknesses and deficiencies in the configuration of routes. *Route configuration* refers to the spatial distribution of public transit service, in terms of the activity sites served and the paths followed between these sites. In this regard, problems cited in the research have included: 1) transit service not being available at one or both ends of the commuter trip (i.e. near the place of residence and/or the place of employment); 2) transit services following circuitous routes; and 3) a lack of coordinated schedules when transferring between transit vehicles is necessary.

The first problem related to route configurations concerns the frequent lack of public transit service *where it is needed*. This issue has become especially prominent in conjunction with the increasing decentralization of metropolitan employment and the subsequent increase in levels of commuting to suburban employment sites. Although municipalities throughout Canada and other industrialized nations have witnessed considerable growth in reverse- and cross- commuting over the past several decades, public transit agencies have not kept pace with these trends in the planning and provision of service. Instead, public transit services in most metropolitan areas continue to cater primarily to the access needs of central city and suburban residents who are employed in the Central Business District. At the same time, service provided to suburban employment centres from both central city and suburban residential locations is often inadequate, if even available (Burns 1996; Mensah and Ironside 1993). As a result, "poor route configuration could mean that although a worker has good [public transit] access from his or her residence, the transit system may not go close enough to appropriate employment locations" (Sanchez 1999: 292).

A lack of public transit service to suburban work locations has had an especially negative impact on individuals who do not have or who cannot use an automobile for commuting purposes. In many municipalities, accessibility to suburban employment areas may be so poor that the employment opportunities available to transit-dependent commuters are severely restricted (Ong and Blumenberg 1998; Sanchez 1999; Shen 2001). Two studies – one conducted in Canada, another in the United States – provide examples of this dilemma. In a study of commuting in Edmonton, Alberta, Mensah and Ironside (1993) found that poor public transit linkages between the central city and suburban employment areas presented a considerable barrier to low-income earners in accessing employment opportunities for which they were qualified. Similarly, when examining the employment circumstances of inner-city African-American women, Bethea (1996) found that 47% of respondents had refused or quit a job due to a lack of public transit accessibility, while 67% stated that they had taken a job simply because they could get there by bus. Hamilton and Jenkins (1989) have pointed out a similar lack of accessibility for cross commuters. They have argued that although women's travel often involves movement between two or more suburban areas rather than suburb-to-centre journeys, these travel patterns are also not well served by most public transit systems.

Bianco and Lawson (1996) have shown that commuters who have the option of choosing between travel by automobile and travel by public transit give serious consideration to the relative difference between the two modes in terms of travel time (also Hine and Mitchell 2001; Michelson 1988; Watts and Pietrucha 1997). As a result, even in cases where service *is* available at both ends of the commuter trip, a second problem related to the configuration of routes has been identified as a deterrent to travel by public transit: a frequent lack of *direct* service between residential communities and employment areas (Focas 1989; Gurin 1981; Pickup 1989; Poister 1996; Sanchez 1999; Stern Iannuzziello *et al.* 2002). In this regard, it has been demonstrated that commuters frequently choose to travel by automobile because the circuitous nature of many public transit routes adds considerably to travel time.

Yet another deterrent to public transit commuting concerns the issue of transferring between transit vehicles (Knoppers and Muller 1995; Pursula and Weurlander 1999; Rosenbloom and Burns 1995). The requirement to transfer between public transit routes reduces the attractiveness of transit as an alternative to the private automobile because transferring can once again add considerably to the total travel time. As Pursula and Weurlander (1999) have noted, it would clearly be impossible to provide *all* workers with direct public transit service between their homes and workplaces due to the increasing complexity of metropolitan commuting patterns; however, it is nonetheless important to avoid making people transfer any more than truly necessary by ensuring that major points of origin and destination are adequately linked. Furthermore, when transferring *is* required it is essential that route schedules are efficiently coordinated so that waiting time at the transfer point is minimized.

Considerable evidence has been provided to support the argument that route configurations play an important role in the facilitation of public transit commuting. Stern Iannuzziello *et al.* (2002) conducted a comprehensive review of services provided by Cornwall (Ontario) Transit and found that the agency's most circuitous route was also the one on which the lowest ridership levels were recorded. A lack of direct transit routes was also a common concern among workers employed at CAA North & East Ontario in Ottawa (Box 4.2). For example, when asked why they travelled to work by automobile, one respondent wrote that "there are too many buses involved to take the bus," while another stated, "Many buses are only available during peak hours which is not always suited to my work schedule. The milk route buses are the only ones available all day." On the other hand, studies by Pushkarev *et al.* (1982), JHK and Associates (1987) and Cervero (1993) have all demonstrated that the highest levels of public transit ridership are found in settings where *direct* linkages are provided between residential and employment areas. Additional support for this argument is evident in Frisken and Keall's (1977) finding that young adults indicated their willingness to travel more frequently by public transit if improvements to route configurations were made, and Mackett's (2001) finding that workers in the United Kingdom most frequently cited improvements to transit routes as the one key factor that would induce them to travel by public transit in lieu of the private automobile. Mackett's observations match closely with results of the survey conducted at CAA North & East Ontario, where the most frequent suggestion of how to encourage public transit ridership was once again the creation of more direct routes (Box 4.3). The validity of these suggestions is supported by the results of a survey conducted in the United States, which revealed that several transit agencies experienced ridership increases after making service modifications such as "redesigning routes for efficiency, simplifying routes for user-friendliness, […] and focusing service on major corridors and activity centres" (Hess *et al.* 2002: 43). The study also found that several transit agencies attracted more passengers after opening new intermodal transit centres designed to help coordinate and improve transfers.

Box 4.2
Reasons for Commuting by Car
Related to Spatial Characteristics of Public Transit Service,
CAA North & East Ontario Employees, May 2001

- "Convoluted bus connection: travel time would be approximately 1 hour instead of 15 minutes."
- "It's the fastest way to go to work."
- "Easier, faster. No direct bus route, too many transfers."
- "Faster."
- "No direct bus route."
- "It's faster to drive."
- "I live in the country, work in the city, no bus service, very rural area."
- "There is no bus service to my home."
- "No public bus access like OC Transport [sic], we do have a private bus company that operates from my hometown but it runs only downtown Ottawa and not my hours to work."
- "No bus service from my area."
- "I live too far for the bus services."
- "It is the only way to get to and from work."
- "No buses – 35 minutes away in the country."
- "Fastest way and only way I can get from home to work (only method of transportation)."
- "Bus service not available from where I live in Cumberland."
- "It's too far to walk and too many buses involved to take the bus."
- "I would not take public transit because it would take too long and cost about the same as driving my car. I also would not give up my car so I would not want to pay for public transit and a car. It takes too long, and I would have to take a couple of buses."
- "I would have to take a couple of buses."
- "Long duration on buses."

Box 4.3
Improvements Related to Spatial Characteristics of Public Transit Service that could Potentially Encourage Modal Shift to Transit, CAA North & East Ontario Employees, May 2001

- "Bus would have to first take my daughter to school with me on the bus, then take me to CAA office on a direct route."
- "Direct bus route"
- "I would love to take public transit if I didn't have to transfer."
- "I would take the bus if I could take and it would take me directly; not 2 or 3 buses."
- "Better bus routes (less driving around – more direct routes all the time)."
- "More direct bus routes with fewer stops."
- "Need bus system or train from Plantagenet to City of Ottawa."
- "Increased public transit."
- "To be able to leave for any destination upon my own recognizance, pick up dates, leave the bus waiting for me in parking lots, and not have to transfer buses for 99% of all of the destinations in the city."

Temporal Characteristics

While the availability of direct public transit service between residential areas and workplaces, along with the opportunity to transfer efficiently when direct service is not available, are clearly important public transit commuter needs, the viability of travelling to work by public transit is also influenced by temporal service characteristics. In this regard, two key weaknesses and deficiencies have frequently been identified: first, public transit service is often unavailable when it is needed; and second, when it is provided, the frequency of service is often inadequate. As discussed in Chapter Two, the increasing prominence of part-time employment and the expansion of business hours has resulted in the diversification of working times to a point where commuting has virtually become a 24-hour-a-day, seven-day-a-week phenomenon. Consequently, a growing proportion of commuter trips now takes place outside of traditional Monday-to-Friday morning and afternoon peak periods. For example, although more than two-thirds of all full-time workers in the United States left home between 6 a.m. and 8:29 a.m in 1990, only 40% of part-time workers departed during the same period (JCPES 1995). Instead, part-time workers travelled to work in greater proportions later in the morning (between 8:30 and 10:30 a.m.) and during the early afternoon (between noon and 4 p.m.). Furthermore, the share of part-time workers who left for work after 12 noon was three times higher than that of full-time workers.

It has been within the context of expanded commuter travel times that researchers have frequently identified gaps between individuals' hours of work and public transit agencies' hours of service provision (Bianco and Lawson 1996; Focas 1989; Gaber and Gaber 1999; Hamilton 2001; Hamilton and Jenkins 1989, 2000; Mackett 2001; Michelson 1988; Pickup 1989). The chief concern in this regard has been that public transit schedules generally remain matched primarily to the needs of weekday, peak-hour commuters, while service tends to be less convenient at other times of the day and week, if it is even available (Root *et al.* 2000). One of the most common outcomes of this trend has been a predicament in which public transit service may be available for commuting in one direction, but not the other (Sanchez 1999). For instance, an employee working an evening shift may be able to travel to work by public transit in the afternoon peak period but find that service stops for the day before the end of his/her shift in the late evening. An example of this problem has been provided by Stern Iannuzziello *et al.* (2002), who found that services provided to local industrial parks by Cornwall Transit did not match the needs of shift workers. For example, at one major facility 500 workers were employed on 12-hour shifts running from 7:00 a.m. to 7:00 p.m. and from 7:00 p.m. to 7:00 a.m.; however, transit service was not provided to the facility when the 7:00 p.m. shift change took place. As a result, workers whose shifts ended at this time could not travel home by public transit and workers whose shifts started at this time could not travel to work by public transit. Hess *et al.* (2002) have also demonstrated the importance of considering working hours in the promotion of public transit commuting. In their survey of transit agencies in the United States, they learned that 81% of responding agencies experienced ridership growth after increasing service hours, primarily by providing additional or extended evening and weekend service.

Research has also demonstrated that commuters require a high frequency of transit service, not only before and after work but also while they are *at work* (Benjamin and Hartgen 1994; Bianco and Lawson 1996; Litman 2000, 2001; Mackett 2001; Mensah and Ironside 1993; Ortuzar *et al.* 1997; Pickup 1989; Pratt 2000; Rosenbloom and Burns 1995). Travel behaviour surveys have shown poor public transit service frequencies to be a major factor in decisions to travel by automobile. For example, in a study of commuting behaviour at Portland State University in the United States, poor frequencies were among the deterrents to transit use most often identified by men (Bianco and Lawson 1996). Similarly, transit users and non-users both highlighted frequency of service as the most needed improvement to transit service in a study conducted in Atlanta, Georgia (Byrd 1976), while many workers in the United Kingdom indicated to Kingham *et al.* (2001) that they would consider using public transit if service frequencies were increased. This issue was among the most prominent concerns of automobile commuters surveyed at CAA North & East Ontario in Ottawa (Boxes 4.4 and 4.5).

Box 4.4
Reasons for Commuting by Car Related to Temporal Characteristics of Public Transit Service,
CAA North & East Ontario Employees, May 2001

- "My convenience – I leave home when I work, I leave work when I'm done, No waiting for buses."
- "It is more convenient than the bus."
- "More flexibility with my own car."
- "If I take the car to work, I can sleep in longer. I have a busy schedule after work and would be late if I took the time to walk or to wait for a bus."
- "Need flexibility."
- "Public transit would have to be very convenient schedule for me to use it. I often stay late, have appointments or seminars and presentations to go to."
- "I like the convenience of having my own vehicle and not having to rely on public transit."
- "Inflexible, long public transit schedules."
- "Bus – not applicable except I would not consider public transit if the scheduling was poor. 1 bus every half-hour is not convenient at lunchtime."
- "Inconvenient bus schedule. Long waits."
- "I would have to leave far too earlier to get to work."
- "I would not use the public transit because it would not be worth for me (time – locale – bus is only every ½ hour). I have to be home before 3 p.m. for my kids before they get home from school."
- "There is no bus service to my home. There is no way of getting home to my son in case of an emergency."
- "I own a car and like to have a vehicle at work in case I have to leave due to an emergency at home."
- "I prefer to have instant access to my own transportation."

Box 4.5
Improvements Related to Temporal Characteristics of Public Transit Service That could Potentially Encourage Modal Shift to Transit, CAA North & East Ontario Employees, May 2001

- "I would […] want service travelling both ways, so if I am sick or need to get home to my son, I would be able to get home."
- "Increased public transit."
- "Public Transit – all the time if there was a local bus every ten minutes and if it was cheaper."
- "More frequent bus schedules, i.e. every 15 minutes vs. every 35 minutes."
- "To be able to leave for any destination upon my own recognizance, pick up dates, leave the bus waiting for me in parking lots, and not have to transfer buses for 99% of all of the destinations in the city."

A high frequency of transit service must be provided to commuters for at least three reasons. First, time spent waiting at transit stops is viewed as wasted time that could otherwise be used for more productive purposes, such as earning an income or attending to household responsibilities (Cervero 1988; Hamilton 2001; Michelson 1988). This is particularly true among women due to their more frequent need to balance paid employment with household and family responsibilities, such as escorting children to daycare and shopping for groceries. Michelson (1988: 87) has studied women's travel patterns extensively and has found that "the most tension-producing daily activities in women's routines are transitions to and from household responsibilities and outside employment" because, for example, "they have to see children off or accompany them to their destinations, yet must still appear at the place of employment on time and ready for work." Hanlon (1996: 653) has clearly outlined the modal choice consequences of this situation:

> Women today tend to be combining a number of roles. As a result, women have a higher value of time. That is, we have less time to achieve more

> activities, such as work, study and family responsibilities. Convenience becomes a key factor in balancing these activities and, with current [public transit] service provision levels, it is no wonder we tend to favour the car.

Commuters also require a high frequency of public transit service because this provides them with greater flexibility of travel times (Mierzejewski and Ball 1990). A notable obstacle to public transit usage has been the requirement to plan trips according to fixed route schedules, particularly when service is provided at very low frequencies – for example, only every 30 or every 60 minutes. In cases such as these, public transit commuters are often forced to arrive at work early and/or face excessively long waits for transit service after work due to inconvenient transit schedules (Rosenbloom and Burns 1995). The requirement for a high frequency of service throughout the workday, and not just at commute times, stems primarily from employees' need for assurance that there will not be a long wait for a transit vehicle if they must leave work on short notice. For example, a parent who must pick up a sick child at school must be ensured that he/she will not be forced to waste precious time waiting at the transit stop upon leaving the workplace or after departing the school.

A third reason for which a high frequency of service is required as part of efforts to encourage public transit commuting relates to issues of personal comfort and security (Reed *et al.* 1999). In terms of personal comfort, this stems primarily from the adverse weather conditions frequently experienced in Canada's cities, particularly during the winter months.

> Wind chill makes one feel much colder than the air temperature, alone, might suggest. Lengthy exposure to the cold – for example, waiting twenty minutes for a bus in –20º C, which can produce frostbite – is debilitating and extremely unpleasant, if not painful (Pressman 1988: 55).

At the same time, for many passengers, especially women and persons with disabilities, long waits at transit stops or stations have been shown to induce feelings of vulnerability and fears of becoming the victim of crime. Reed *et al.* (1999) have noted that passengers feel less secure waiting at bus stops than they do while on board the transit vehicle. Accordingly, the provision of service at high frequencies – particularly after dark – can do much to alleviate personal security concerns by minimizing wait times.

4.3 Dimension #2: Travel between Place of Residence and Transit Stop/Station

Beyond those associated with spatial and temporal characteristics of transit service, commuters also have several needs related to the conditions under which actual public transit journeys are made. Accordingly, the second dimension of public transit commuter needs includes the broad range of infrastructure, facilities and services required by individuals as they travel between their homes and public transit stops or stations. Based on the research previously conducted, along with that carried out specifically for this study, it can be concluded that the following conditions must be in place in order for public transit to represent a viable commuting option. Firstly, workers require the provision of facilities and services frequented on a regular (i.e. day-to-day) basis within their home communities. Secondly, direct access to and from transit stops or stations should be available. Finally, adequate pedestrian and cycling infrastructure must be provided that enables public transit commuters to travel between their homes and transit stops and stations safely, securely, and comfortably.

Land Use Mix

One of the most widely cited factors influencing the viability of public transit as a transportation choice for the journey-to-work is the availability of required goods and services within close proximity of the worker's home (Gurin 1981; Hamilton and Jenkins 1989; Litman *et al.* 2002; Mackenzie 1988; Mackett 2001; Rosenbloom and Burns 1995). As Murray *et al.* (1998: 327) have noted, "where individuals go during their travel is an important factor for public transport use and should be accounted for to the greatest extent possible, if demand for public transport is to be increased." This observation is especially relevant in light of the continuing growth of trip chaining, whereby travel to and from the workplace is frequently combined with stops at other destinations (Bianco and Lawson 1996; Porter 1997; Root *et al.* 2000). Indeed, commuter trips have become increasingly complex over the past several decades as more and more workers attend to personal and household business while travelling between home and work (Bianco and Lawson 1996). For example, Root *et al.* (2000) have noted that in the United States the number of stops made by commuters on the way to work has increased by about 50% since 1980, while the number of stops in the homebound direction has grown by about 20%. Researchers have also found trip chaining to be more common and more complex among female commuters, primarily due to their more frequent combining of household roles (Bianco and Lawson 1996; Hamilton and Jenkins 1989; Mackenzie 1988; Michelson 1988; Root *et al.* 2000). While men have been shown to be more likely to travel *directly* between home and work, one study demonstrated that about two in three women make stops on their way home and, furthermore, that about 25% of women make more than one stop (Root *et al.* 2000).

Despite the increasing importance of trip chaining in metropolitan journey to work patterns, it has frequently been argued that urban land use and transportation planners have failed to accommodate this trend and that this oversight can in turn be cited as a major deterrent to public transit commuting. Given that women more frequently engage in trip chaining, it is not surprising that much of this criticism has been expressed in the gender-based research. As Mackenzie (1988) has noted, planners have made “few concessions to the fact that women must travel not only to work but also to shopping areas and day care.” The crux of this argument is that the various activity sites to which commuters must travel on a day-to-day basis are located too far apart from one another to be accessed by public transit in a reasonable travel time frame. This problem has been linked to the widespread enforcement of zoning by-laws that aim to prevent the juxtaposition of incompatible activities in order both to preserve the physical homogeneity of residential neighbourhoods and to minimize automobile traffic volumes travelling therein. For example, zoning bylaws frequently preclude the construction or operation of facilities such as daycare centres, grocery stores, and medical offices in close proximity to housing (Rose and Wexler 1993). When such laws are in place, they prevent commuters from progressing through their trip chains within a confined geographical area and instead force them to travel long distances between destinations. While this necessitates the inefficient use of one’s time during any season, it is especially problematic during the cold winter months, when one’s concerns about personal comfort while travelling are added to those about dealing with time constraints (Zepic 1985).

Given the widespread segregation of land use activities, along with the oft-cited deficiencies of public transit service discussed in the previous section (e.g. meandering route configurations and infrequent headways), it is therefore not uncommon for commuters who have the option of travelling instead by automobile to forego the use of public transit. In their survey of travel behaviour among female commuters at Portland State University in the United States, for example, Bianco and Lawson (1996) found that trip chaining was frequently highlighted as an important reason for not using public transit. Similarly, a study by Weber *et al.* (2000, cited in Hardin 2001) revealed that a considerable proportion of survey respondents travelled to work by car in order to allow them to fulfill family responsibilities and/or personal tasks during the day. Trip chaining was also frequently cited in the survey of workers at CAA North & East Ontario in Ottawa (Box 4.6). In the case of workers who do not have automobile access to employment or those who have simply chosen to travel by public transit, on the other hand, the segregation of land uses forces them to board and leave public transit vehicles several times, and to wait at stops between trips, as they move through the various links of their trip chain.

It has been with trip chaining-related constraints in mind that researchers have identified mixed-use development as an essential ingredient in efforts to promote public transit commuting (Litman *et al.* 2002; Mackett 2001; Michelson 1988; Naess and Sandberg 1996; Rood 1997; Watts and Pietrucha 1997). Mixed-use development involves the physical integration of compatible activities within a small geographical area in order to minimize travel distances between destinations (Parker 1994). As part of this argument, it has been noted that if required facilities and services are available within the commuter's home community, it is possible that: 1) trip chaining can still take place, but could be conducted while travelling between home and the transit stop before and/or after work, or 2) travel to these destinations may take place as separate home-based trips. The variety of facilities and services recommended for inclusion in mixed-use developments varies considerably among researchers. For example, Davidson (1991) analyzed commuter trip chains and found that a typical journey between work and home included stops at grocery stores, shops, and daycare facilities. Additional studies have identified other destinations that play important roles in trip chaining behaviour, including banks, post offices, medical and dental clinics, and schools (Bianco and Lawson 1996; Handy *et al.* 1998; Handy and Clifton 2001b; Michelson 1988; Naess and Sandberg 1996).

Box 4.6
Reasons for Not Using Public Transit Related to Trip Chaining, CAA North & East Ontario Employees, May 2001

- "Because I have to drop my daughter off at school first."
- "Convenience – day care pickup."
- "I have to drop off my daughter to school and pick her up after work, so it is definitely time consuming since she goes to school in another district."
- "Because I have to bring my son to the baby-sitter along the way."
- "I have to take my children to school and the baby-sitter's before work. It would take too long to take the bus."
- "I have a busy schedule after work and would be late if I took the time to walk or to wait for a bus."
- "Being single, I often do not go directly home after work (errands, groceries, meeting friends for dinner)."
- "I drive my son to school before work. It's faster to drive."
- "Because of time constraints, as I have 3 children to get ready besides myself."
- "Takes too much time."
- "Times an issue [sic]."
- "Time restraint."
- "Because it takes longer!!"
- "I don't think I would be able to do it in an acceptable time."
- "Taking my son to the sitter and picking him back up would mean I'd have to take four buses in the morning and the same at night."
- "I would have to leave far too earlier to get to work, and I have an infant in daycare. There is no way I could or would drop her off, pick her up and go to and from work by bus."

An extensive body of empirical evidence supports the argument that mixed-use development encourages public transit commuting (Cervero 1989; Cervero and Radisch 1996; Nowlan and Stewart 1991; Parsons Brinckerhoff Quade and Douglas 1996; Rice Center for Urban Mobility Research 1987; Rood 1997). For example, in a comparative study of "standard suburban" communities (those with little to no land use integration) and "traditional" communities (those with greater mixed-use development) in San Francisco, Friedman *et al.* (1992) found higher levels of automobile commuting in standard suburban communities and higher levels of public transit commuting in traditional communities. Similarly, an examination of eleven metropolitan areas in the United States showed that public transit held a higher share of the journey-to-work modal split in settings where non-residential uses were situated in close proximity to residential functions (Parsons Brinckerhoff Quade & Douglas, Inc. *et al.* 1996). Finally, Cervero and Radisch (1996) also found evidence that the availability of retail functions in neighbourhoods can induce transit commuting by enabling transit users to shop when walking between stops or stations and their homes.

Land Use Provisions for Childcare

Perhaps the most widely discussed type of facility required by commuters has been the daycare centre. As Michelson (1988) has noted, the location of childcare facilities in land use planning has seldom been given explicit consideration and is instead typically one of the last land uses considered when land or buildings are allocated or constructed. The fallacy of this approach is underscored by an abundance of research showing that travel to daycare facilities is an integral component of contemporary commuting patterns. For example, a survey conducted by Neal *et al.* (1993) found that two-thirds of families with children under the age of eighteen used some form of out-of-home childcare arrangements, while Bianco and Lawson (1996) have argued that, for most working parents with young children, at least one of the adults in the household must take the children to daycare before work and pick them up after work. More often than not, it is the female parent who travels to a daycare facility. In his gender-based study of commuting patterns in Toronto, Michelson found that mothers were about four times more likely than fathers to escort a young child to and from a daycare centre (Michelson 1988).

The integration of daycare facilities in mixed-use developments is of paramount importance in efforts to promote public transit commuting for at least two reasons. First, when daycare facilities are not located in close proximity to the commuter's place of residence, travel to these locations between home and work adds considerably to the total travel time. Neal *et al.* (1993) found that the time required for travel to and from childcare facilities played an important role in determining whether employees were late or left early from work, and that the extra travel time devoted to this task also increased "caregiving stress" and "difficulty combining work and family." Their research subsequently showed that concerns about the travel time to and from daycare prompt more workers to travel by automobile due to the longer travel times associated with public transit commuting. When daycare centres are located close to homes, on the other hand, children may be escorted to and from these facilities by an adult while he/she is travelling to and from the transit stop or station, thus decreasing the perceived need to travel by automobile.

A second reason why the location of daycare facilities has been cited as an important factor in the promotion of public transit commuting relates to equity concerns. As Rutherford and Wekerle (1988) have stressed, the accessibility of childcare plays an important role in determining the variety of employment choices available to individuals who do not have the use of an automobile. When public transit commuting includes stops at a daycare facility, and perhaps other locations as well, and when these facilities are physically isolated from one another, the travel time may be prohibitive and may therefore hinder the individual's ability to procure adequate employment. The employment opportunities available to workers who rely on public transit may therefore be broadened due to the reduction in time devoted to travelling to and from childcare facilities.

Distance to Transit Stops/Stations

Research has also shown that the distance between homes and transit stops is an important factor in determining the commuter's willingness and/or ability to use public transit (Calthorpe Associates 1990; Cervero 1988; Cervero and Gorham 1995; Evans *et al.* 1999; Hamilton and Jenkins 1989, 2000; Hsiao *et al.* 1999; Kain 1988; Loutzenheiser 1999; Michelson 1988; Parsons Brinckerhoff Quade & Douglas 1996; Pickup 1989; Rosenbloom and Burns 1995; Stringham 1982). In the past, an important obstacle to the use of public transit has been long travel distances resulting from a *lack of direct routes* between places of residence and transit stops (Watts and Pietrucha 1997). This can be attributed to two related weaknesses in the design of most suburban communities built after World War II: first, the presence of circuitous road layouts; and second, a lack of convenient access to transit stops and stations. The problem of circuitous road networks emanates from planners' continuing reliance on the "Neighbourhood Unit" as a model for the design of suburban communities. While this approach has enabled planners to achieve their long-standing objectives of reducing and slowing automobile traffic within neighbourhoods, it has also made it difficult for transit planners to locate transit routes in close proximity to residences (McEachern 1991). Because transit vehicles cannot serve crescents and cul-de-sacs, services tend to be provided only on neighbourhood collector roads, or on arterial roads located along the neighbourhood's outer limits. Thus, even when public transit service is technically available to residents of a neighbourhood, commuters must often travel long distances to reach it.

A second and related reason for extensive travel distances to public transit stops has been developers' resistance to providing through-connections between streets or blocks (Hess *et al.* 1999; Litman *et al.* 2002; West and Lowe 1997). When subdivisions are laid out with winding crescents and cul-de-sacs, and also have few or no connections to the collector and arterial roads on which public transit routes operate, commuters are forced to follow the meandering road networks. As a result, the time spent travelling to and from a transit stop can add considerably to the total time cost of the commuter trip (Watts and Pietrucha 1997). For example, Hess *et al.* (1999) examined travel distances to transit stops in the central Puget Sound region of Washington, USA, and found that roundabout routes added an average of 600 feet to walking distances, a significant distance from the pedestrian's perspective. Further discomfort can be experienced by those who must travel long distances to transit stops or stations during inclement weather, such as that experienced in Canada's winter climate. Accordingly, "under very adverse conditions, it is desirable to either minimize or entirely eliminate the necessity to be outdoors […] Better accessibility, especially in suburban areas, will be essential to reducing walking and waiting times" (Pressman 1996: 525).

The problem of long travel distances to transit stops and stations can ultimately be solved through changes in community design and the provision of less circuitous road layouts (McEachern 1991). According to Hess *et al.* (1999), this presents community planners with two challenges. First, they must incorporate transit-friendly policies and designs into plans for newly developing areas. Second, they must retrofit existing built-up areas during redevelopment planning to better support transit. In either case, land-use, transportation, and public transit planners must ensure that public transit users are provided with quick and direct access to transit stops. Research has shown that the maximum distance people are willing to walk in order to reach public transit service is 400 metres (Murray *et al.* 1998; Watts and Pietrucha 1997). It is important to note, however, that this is the *maximum* distance; ideally, transit service should be available at distances much lower than this. Although this solution can likely be more easily implemented in newly established communities than in mature neighbourhoods, Hess *et al.* (1999) have argued that land use planning policies should require the provision of accessways that prevent the need to follow circuitous road networks as one way of minimizing travel distances to stops (Figures 4.1 and 4.2).

Figures 4.1 and 4.2 Accessways to Transit Stops and Stations, Ottawa
Photos: C. Fullerton

Pedestrian Infrastructure

Urban built environments have all too often been designed without consideration for the needs of pedestrians (Blomberg *et al.* 1999; Litman *et al.* 2002). In the words of Bushby (1996: 29), "roads created primarily for cars are [also] hostile environments for pedestrians." Because most trips to and from transit stops are made on foot (Frank 2000), efforts to promote public transit commuting must therefore also consider the type and quality of routes upon which pedestrians must travel (Evans *et al.* 1999; Hess *et al.* 1999; Hine and Mitchell 2001; Hsiao *et al.* 1999; Kim 1998; Mackett 2001; Porter 1997; Rood 1997). According to Litman *et al.* (2002), pedestrian needs can be classified into three groups: functionality; safety and security; and comfort and aesthetics. In terms of functionality, pedestrians require a continuous network of sidewalks that are of sufficient width, in satisfactory surface condition, and that meet the needs of persons with disabilities. Within the context of safety and security, pedestrians must be safeguarded from the dangers of vehicular traffic and protected from crime. Finally, in the area of comfort and aesthetics, pedestrians require wide sidewalks and a visually attractive walking environment.

Commuters' first and foremost need when travelling between places of residence and transit stops is for sidewalks (Rood 1997; Hsiao *et al.* 1999; Porter 1997). Sidewalks provide pedestrians with a refuge from vehicular traffic and its associated safety risks; as a result, when sidewalks are not in place (Figure 4.3) the attractiveness of walking is seriously diminished, particularly along busy collector or arterial roads. While the provision of sidewalks is clearly a fundamental need, it is also essential that sidewalks possess several further characteristics. As West and Lowe (1997: 174) have stated, “Unless they are designed to feel safe, sidewalks will receive limited use and do little to promote foot traffic.”

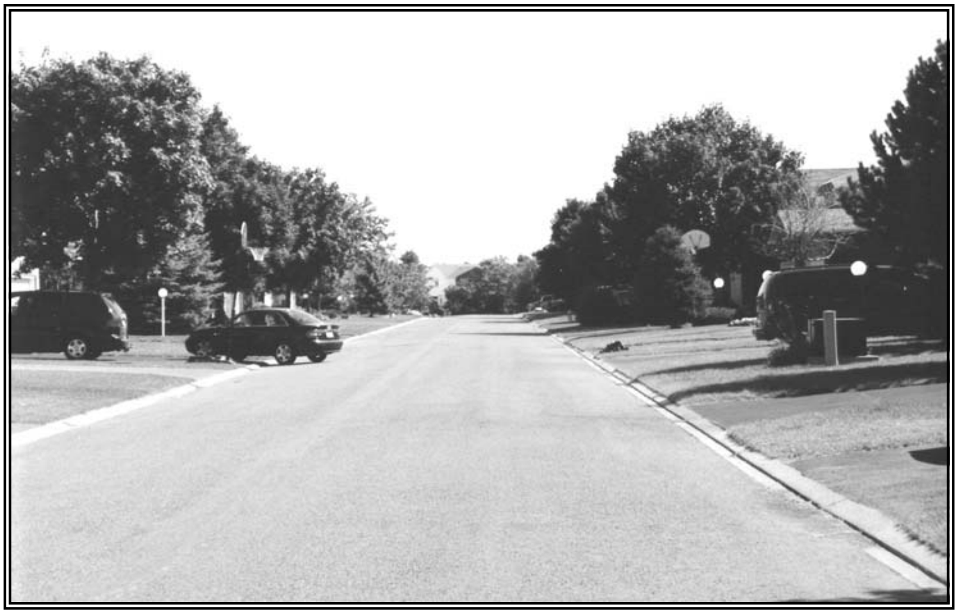


Figure 4.3 Residential Street without Sidewalks, Ottawa
Photo: C. Fullerton

First, sidewalks must form a *continuous* network that enables the commuter to travel to and from the transit stop without having to walk directly on roadways *at any time* (Cambridge Systematics 1994; Hess *et al.* 1999; Holtzclaw 1994). Second, they should be wide and free of obstacles (Bushby 1996; Hess *et al.* 1999; West and Lowe 1997). Where sidewalks are not wide enough to accommodate large pedestrian volumes or are blocked by obstacles such as newspaper vending machines or parked cars, pedestrians may be forced to instead walk on the roadway, thus once again putting themselves at risk of being hit by a motor vehicle. Hess *et al.* (1999: 18) have argued that “the width of sidewalks must be commensurate with the width of the street or arterial.” Their rationale was that automobile travel speeds are typically higher on wider roads and that wide sidewalks enable pedestrians to keep a safe distance away from the roadside as they walk. Another means by which pedestrian safety can be promoted is through the placement of buffers between sidewalks and roadways (Hess *et al.* 1999; Watts and Pietrucha 1997). Buffers include trees, grass, berms, bollards, and other items that physically separate sidewalks from adjacent roadways (Loutzenheiser 1999). Buffers have a positive impact on pedestrian perceptions of safety because they provide a protective barrier between themselves and passing motor vehicles. Furthermore, they also promote pedestrian comfort by offering increased protection from tire spray during wet weather.

A further public transit commuter need related to pedestrian infrastructure is for the provision of physical accessibility to persons with special needs. In this regard, sidewalks should properly maintained and repaired, and should also have curb ramps (also referred to as "curb cuts") installed (Litman *et al.* 2002; New Jersey Department of Transportation 1996). Curb ramps are essential components of the sidewalk network because they provide accessibility to wheelchairs, baby strollers, and other mobility aids at intersections, building entrances, and other areas where the sidewalk is elevated by a curb.

Beyond the provision and quality of sidewalks, several other factors also influence the attractiveness of travelling to transit stops or stations on foot. Another important consideration in the modal decision is personal security, an issue that emanates primarily from concerns about becoming a victim of crime. In terms of the journey to work, personal security concerns have become more prevalent in conjunction with the increasing prominence of commuting between dusk and dawn that has resulted from the widespread diversification of working hours. Furthermore, Root *et al.* (2000) found that many women who work during the day complete trips for household and domestic duties during evening hours. It is therefore not surprising that exposure to real or perceived danger while travelling to and from transit stop and stations has been identified as an important concern of many current or potential public transit commuters, especially women and persons with disabilities (Focas 1989; Gurin 1981; Litman 2001; Loutzenheiser 1999; Rosenbloom and Burns 1995). A study in the United Kingdom cited by Root *et al.* (2000), for example, found that between 50% and 70% of women were afraid of going out after dark in cities and that this fear, therefore, influenced their willingness to utilize public transit.

In order to address personal security concerns, it is essential that pedestrian routes to transit stops be designed with consideration for the following criteria. First, they should be highly visible from nearby buildings (such as homes and businesses) and by passing traffic. When travel to or from a transit stop includes movement through isolated or sparsely inhabited areas, many individuals feel more vulnerable and thus less likely to embark on such a trip (Hine and Mitchell 2001). At the same time, the pedestrian's – and therefore the public transit commuter's – sense of security has been shown to increase with higher development densities and the presence of other pedestrians (Bushby 1996). Furthermore, it is also necessary to ensure that sidewalks are adequately lit as a further means of ensuring that pedestrians can see and be seen. In a study of pedestrian travel behaviour in New York, for example, Shriver *et al.* (1996) found that 23% of women and 21% of men cited that being able to see who is on the street after dark would be the most important factor in encouraging them to walk more in the evening. Researchers have also found that the aesthetic quality of pedestrian routes is an important consideration for many individuals in the decision to walk. For example, it has been shown that the presence of graffiti, litter, vacant lots and dilapidated buildings all have a negative impact on pedestrian traffic volumes because they induce discomfort and concerns about personal security. Accordingly, efforts to promote public transit commuting must also ensure that pedestrian routes to transit stops and stations are free of negative conditions such as these.

Given the extreme weather conditions associated with Canada's winter climate, pedestrian safety concerns also require planners to address the need for prompt and efficient snow and ice removal from sidewalks (Litman *et al.* 2002). As Zepic (1985: 61) has observed:

> While […] a long wait for a bus is an annoying and aggravating experience under any climatic conditions, it becomes even more so in the countries where winters are long, cold and snowy. […] [Waiting] for the bus on a snowy, windy day at the intersection of two busy streets where one is constantly splashed by speeding cars is one of those experiences one would prefer to forget. Or walking for a mile along an icy sidewalk to the bus stop from a windswept suburban cul-de-sac.

The long-standing favouritism expressed toward automobile transportation, however, has meant that, in many cases, roads are given the highest priority for snow and ice removal during and after inclement weather. At the same time, sidewalks are not cleared for several hours or even several days, thus forcing public transit users to walk along the side of roadways instead and putting them at risk of being hit by a passing motor vehicle. Also, if ice is not removed from sidewalks this increases the risk of slip-and-fall injuries, particularly among public transit users whom already suffer from restricted mobility. A further problem is that responsibility for clearing sidewalks in some cities rests with the owners of adjacent properties, many of whom tend to neglect this civic duty. In response to this problem, Zepic (1985: 75) has stated: "Instead of the present system of fines and penalties for not shovelling, area municipalities should provide full snowclearing [sic] services for sidewalks as well as (if not before) clearing roads."

Public transit ridership can also be encouraged by addressing individuals' need for safe road crossings (Hess *et al.* 1999; Litman *et al.* 2002). Most public transit commuters will have to cross a roadway at one time or another (e.g. en route to or from the transit stop) and, as a result, it is essential that adequate road crossing infrastructure be in place. With particular reference to the public transit user's experience in cities with winter climates, Zepic has observed:

> There is much more concern and sympathy for drivers sitting comfortably in their cars than for the pedestrians [...] trying to cross the road. […] To cross six or eight lanes of traffic in a blizzard or freezing rain and at the same time pulling a stroller is a major undertaking during the winter months.

Thus, as Loutzenheiser (1999) has asserted: "If the difficulty of crossing a road or highway is too great, travelling by public transit may prove less attractive to the commuter." First and foremost, efforts to address this situation should include the provision of formal road crossing opportunities, ideally in the form of traffic signals. Furthermore, these should be situated at frequent intervals in order to prevent pedestrians and wheelchair users from having to travel long distances simply to cross the road, and should also provide the opportunity to manually activate the signal (e.g. with a push button) as a means of reducing the time required to wait before crossing.

Bicycle Infrastructure

In some cases, travel to transit stops or stations may take place by bicycle rather than on foot. For example, this may represent an attractive travel option: 1) when transit stops or stations are located beyond walking distance at the home and/or work end of the trip, and 2) in cases where transit service is unavailable at the time the commuter is scheduled to return home from work. For the most part, the needs of public transit commuters who travel to and/or from stops by bicycle are similar to those of pedestrians. Once again, they require direct, aesthetically pleasing, and well-lit travel routes. Because bicycle riders are normally not allowed to ride on sidewalks and must instead travel on the roadway, however, two distinct needs exist. First, cyclists should be provided with clearly demarcated *bicycle lanes* as a means of separating them from motor vehicles (Figures 4.4 and 4.5) and, second, they should be provided with clearly demarcated *bicycle routes*. When bicycle routes and lanes are clearly signed and posted, it legitimizes the cyclist's presence on the roadway and thus reduces the risk of inducing hostility among automobile drivers.

Figure 4.4 Bicycle Lane on Major Arterial Roadway, Ottawa
Photo: C. Fullerton

Figure 4.5 Bicycle Lane on Neighbourhood Collector Road, Ottawa
Photo: C. Fullerton

4.4 Dimension #3: Transit Stops and Stations near Place of Residence

The next dimension of public transit commuter needs involves those related to conditions at the transit stop. One of the most frequent criticisms of public transit identified in the research is that people dislike waiting at transit stops and stations (Cervero 1998; Evans *et al.* 1999; Hamilton and Jenkins 2000; Project for Public Spaces 1999; Rojas 1999). At least three reasons can be offered for this prevailing attitude: 1) waiting environments are often perceived as being unsafe; 2) waiting at a transit stop or station can be an uncomfortable experience, particularly during hot, cold, or inclement weather; and 3) waiting for the transit vehicle is often viewed as a waste of time. While it clearly would be impossible to eliminate altogether the wait for transit service, efforts to make this experience as favourable as possible can play an important role in the promotion of public transit commuting. The creation of high quality waiting environments can assist considerably in shaping individuals' overall perceptions of public transit, while at the same time ensuring their safety, security, and comfort (Project for Public Spaces 1999). The importance of devoting attention to the quality of the waiting environment in which it is located was well elucidated by Rojas, who stated:

> Like train stations and airports, bus stops are the 'welcome mats' to the transit system and the communities they serve. The user is introduced to the transit system and the different communities and locations that the system serves through the bus stop (Rojas 1999: 11).

Perhaps the most common concern related to the quality of transit stop and station environments revolves around the issue of personal security while waiting (Benjamin and Hartgen 1994; Hanlon 1996; Hine and Mitchell 2001; Ingalls *et al.* 1994; Levine and Wachs 1986; Litman 2001; Loukaitou-Sideris 1999; Loukaitou-Sideris *et al.* 2001; Lynch and Atkins 1988; Project for Public Spaces 1999; Reed *et al.* 1999; Rosenbloom and Burns 1995; Schulz and Gilbert 1996). Researchers in several countries have shown that fears of becoming a victim of crime have a strong influence on individual travel behaviour, including, for example, what mode of travel is used or whether a trip is even made. Not surprisingly, members of vulnerable groups such as women (Hamilton and Jenkins 1989, 2000) and persons with disabilities (Hine and Mitchell 2001) have most frequently expressed fears about transit stop crime. For example, in a study conducted in Southampton, England, 16% of women surveyed noted that they felt unsafe at bus stops during the day and 35% felt unsafe while waiting at stops at night (Lynch and Atkins 1988). Furthermore, it has also been demonstrated that many women forego travel at night all together in order to avoid exposing themselves to this risk. In discussing this issue, Hanlon (1996: 652) has commented:

> [Service] providers continue to underestimate the degree to which [the perception of fear] seriously impacts on a woman's willingness to use […] public transport and, thereby, dictates her travel patterns and those of her dependents.

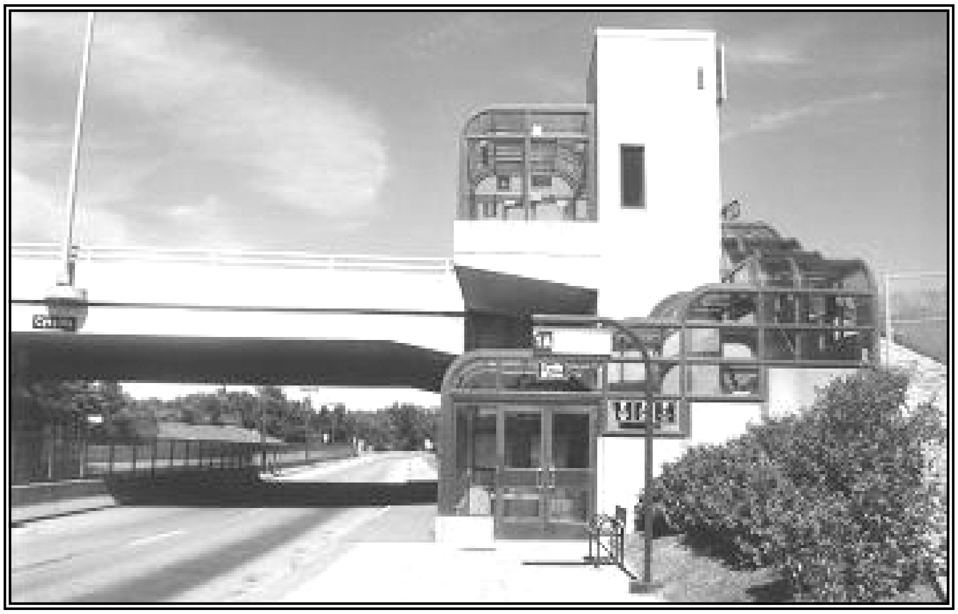
Hine and Mitchell (2001) have noted a similar reluctance to travel by public transit at night among the visually impaired, due to a combination of extensive waiting times and transit stop environments that are deemed to be unsafe.

Research has also shown that public transit users' fears about crime at stops or stations are not unfounded, nor based on misconceptions. For example, one study by Levine and Wachs (1986) showed that 32% of transit crimes (i.e. those which took place in a public transit-related environment) occurred at transit stops. Similarly, Buckley (1996) analyzed over 120,000 telephone calls made to Vancouver (British Columbia) Police over a four-month period and found that 49% of reported crimes in Vancouver during that time took place within 750 metres of a Skytrain (light-rail transit) station. According to Schulz and Gilbert (1996), the likelihood of crime taking place at a transit stop depends on three key factors: firstly, the presence of potential victims; secondly, the availability of hiding places in which an attacker may wait for victims; and thirdly, a lack of potential witnesses. Figures 4.6 and 4.7 provide an excellent example of a poor waiting environment as it pertains to personal security concerns. Although the transit station contains lighting and emergency call boxes, it is also located amidst open fields, sits below street level, and is separated from a neighbouring highway by a large berm. Thus, the station cannot be seen by passers-by. At the same time, landscaping in the form of bushes and shrubs provides ample opportunity for potential attackers to hide in wait for victims. As a result, the transit station is not heavily used, despite the presence of several large workplaces within walking distance.

Loukaitou-Sideris (1999) found a direct correlation between environmental factors and crime at transit stops in her examination of transit stop conditions in central Los Angeles (California). She identified several characteristics of transit stops where crime had been reported. Generally, these were stops that:

- lacked adequate lighting and public phones
- fronted on empty lots or vacant, semi-vacant, or dilapidated buildings
- were located adjacent to liquor stores and bars; and
- were located in areas with an abundance of litter and graffiti.

Rojas (1999) has attributed the problem of unsafe waiting environments to lack of co-ordination between transportation and public transit planners in the siting of transit stops. "Transportation planners often fail to understand or recognize the intimate relationship between bus riders and the places where they wait for, and get off, the bus" while, at the same time, "transit operators are more concerned about bus stops meeting the placement requirements for loading and unloading of passengers, getting through the intersection, and other similar criteria" (Rojas 1999: 11). As a result, the quality of the built environment is rarely given due consideration and bus stops are all too frequently located in unsafe and/or uncomfortable settings.



Figures 4.6 and 4.7 Poorly Visible Transit Station, Ottawa
Photo: C. Fullerton

Researchers have identified a number of ways that personal security concerns related to public transit waiting environments must be addressed. For the same reasons as those provided in the previous section (within the context of pedestrian and cyclist travel between homes and transit stops), it is necessary to ensure that all stops are highly visible from nearby buildings and by passing traffic and, furthermore, that they are adequately and effectively lit after dark (Hamilton and Jenkins 2000; Project for Public Spaces 1999; Reed *et al.* 1999). It has also been noted that emergency call boxes (Figure 4.8) and public telephones should also be provided to public transit passengers (Hamilton and Jenkins 2000; Hine and Mitchell 2001; Project for Public Spaces 1999). Although this would not likely be possible at every transit stop, these should be provided at all transit stations, at the very least, as further means of promoting the security of public transit commuters.

Figure 4.8 Emergency Call Box at Transit Station, Ottawa
Photo: C. Fullerton

The planning and provision of stops and stations must also consider the comfort needs of public transit commuters. Yet another common deterrent to public transit travel has been a lack of amenities at stops that can make the time spent waiting more pleasant, or at least less unpleasant. One such problem has been the placement of stops in locations that are not well suited to waiting (Evans *et al.* 1999; Zepic 1985). This most commonly takes the form of transit stops being situated on unpaved areas such as road shoulders or private lawns. This acts as a deterrent to the use of public transit because waiting in these settings can be very uncomfortable in inclement weather. For example, when a passenger must wait in the rain at a transit stop located on the shoulder of the road, he/she must potentially walk through mud, negotiate puddles, and face the risk of being splashed by passing vehicles. As a result, usage of transit stops located in areas such as these is sure to be discouraged. In lieu of such a setting, transit agencies must ensure that their stops are located on paved boarding areas that eliminate the need to stand on grass, gravel, or dirt.

Public transit commuters also have other comfort-related needs while waiting at transit stops and stations. Among these is the need for shelter from the elements and a place to sit while waiting (Evans *et al.* 1999; Hine and Mitchell 2001; Mackett 2001; Project for Public Spaces 1999; Pucher 1998; Zepic 1985). The need for shelter is especially important in settings where public transit service frequencies are low and extreme weather conditions are commonly experienced. This would ideally take the form of an enclosed and air-conditioned shelter (e.g. heated in cold climates, cooled in hot climates) so that rain, ice, snow, and extremely cold or hot temperatures do not discourage transit use (Hamilton and Jenkins 2000; Pressman 1986, 1988; Pressman and Zepic 1986; Zepic 1985).

Rojas (1999) has noted that many transit agencies have delegated responsibility for the provision of benches and shelters to large advertising companies, and that these firms are more interested in having passing motorists read their advertisements than they are in comfortably accommodating public transit passengers. Because the advertising is ineffective while a person is sitting on the bench, firms place these amenities in inappropriate locations to discourage their use. For example, they may place the bench "far from the bus stop, in front of where people enter or exit the bus, or too close to a curb for a passenger to sit on the bench comfortably, thus promoting the advertising of the bench and only the pseudo-comfort of the passenger" (Rojas 1999: 10). Similarly, "bus shelters are placed according to where automobile traffic volume [is] high, not according to patron needs or ridership levels" (Rojas 1999: 10).

In order to meet the comfort needs of public transit commuters it is also essential that garbage receptacles are provided at stops and stations, and that waiting areas are kept clean and free of graffiti. The rationale here is that passengers are less likely to feel vulnerable if the area is well maintained, because graffiti, etching and other signs of disorder have fear enhancing qualities (Schulz and Gilbert 1996).

Yet another factor that can affect public transit users' comfort has to do with their degree of familiarity with the transit system (Bakr and Robinson 1978; Stern Iannuzziello *et al.* 2002; Whelan 1988; Zepic 1985). When passengers are unsure about service-related issues they are more likely to look unfavourably at public transit as a travel option than if they have the required information. As Hardin *et al.* (2001: 13) have noted:

> The completion of the transit trip is dependent on a passenger having enough knowledge and information to know that the service exists, where the service travels, where and how to catch a bus, what time the bus arrives and departs, and where to disembark. Without any piece of this information, the trip may not be made or, if it is made, may be accompanied by anxiety and frustration on the part of the passenger.

Accordingly, researchers have argued that another essential ingredient in the promotion of public transit ridership is the provision of service information at stops (Benjamin and Hartgen 1994; Hamilton and Jenkins 2000; Hine and Mitchell 2001; Mackett 2001). More specifically, passengers would be best served through the provision of posting at stops of scheduled arrival times (Figure 4.9), route maps, a system map (Figure 4.10), and information about impending route or schedule changes.

Figure 4.9 Screen Indicating Waiting Times for Transit Service, Ottawa
Photo: C. Fullerton

Because, as noted earlier, time spent waiting at transit stops is often seen as wasted time, a further means of making the waiting experience more pleasant is by providing newspaper vending machines (Evans *et al.* 1999; Project for Public Spaces 1999). In this case, the argument is that reading a newspaper distracts the passenger and shifts their focus away from the time spent waiting. Concerns about time wasted while waiting can also be alleviated by providing convenience stores and other shops or services at transit stations, as this can potentially assist commuters in the trip chaining process.

Figure 4.10 Public Transit System Map Mounted at Transit Station, Ottawa
Photos: C. Fullerton

Another issue that planners must address concerns the needs of commuters who travel to stops by bicycle. Although some may wish to transport their bicycle on the transit vehicle in order to continue their journey by bicycle after alighting (which is discussed in Section 4.5), others may simply want to leave their bicycles at the stop while they are at work. It is therefore essential that bicycle storage facilities be provided at stops where such travel patterns are likely to exist (Hamilton and Jenkins 2000;

Loutzenheiser 1999). For example, a study cited by Fritzel (1997) found that 39% of people said that they would likely bicycle to transit stations if secure bicycle parking was provided at those locations.

Public transit service may sometimes be located too far away from a community to be accessed on foot or by bicycle. In such cases, the provision of park-and-ride lots can encourage the use of public transit for commuting trips (Figures 4.11 and 4.12) (Hess *et al.* 2001; Hsu and McDermott 1977; Michelson 1988; Pucher 1998). Park-and-ride facilities provide commuters with the ability to integrate automobile and public transit travel by providing them with a convenient place to park their cars before boarding the public transit vehicle (Bolger and Morrall 1995). If park-and-ride lots are to be used to their full potential, however, several needs must once again be addressed. First, the park-and-ride must be easily accessible from neighbouring roadways and must contain an adequate supply of parking. If it is difficult to enter the facility, this may discourage drivers from using it and prompt them instead to make their entire journey by car. Similarly, if a commuter cannot be assured that he/she will find a vacant parking space upon arrival at the park-and-ride lot, he/she may decide against using it for fear of being late for work while waiting for a spot to become available (Bolger and Morrall 1995).

Concerns about crime have also been expressed in park-and-ride research. Schulz and Gilbert (1996) have noted that parking lot crime is an important issue, especially for women. Accordingly, park-and-ride facilities should be well lit, should be highly visible from nearby buildings and by passing traffic, and should be monitored by security cameras or personnel (Figure 4.13). In combination, these actions would serve two purposes: first, they would reduce commuters' fears about personal security when walking through the facility; and second, they would reduce commuters' fears about their vehicles being stolen while they are away at work.

Figures 4.11 and 4.12 Park & Ride Facilities, Ottawa
Photos: C. Fullerton

Figure 4.13 Security Monitoring of Park-and-Ride Lot, Ottawa
Photo: C. Fullerton

Two other factors have also been identified as being important considerations in the decision to use park-and-ride facilities. Because commuters weigh the financial cost of using public transit against the financial cost of travelling by automobile, it has been argued that park-and-ride usage is less attractive if a parking fee is imposed. Commuters may instead find the marginal use of fuel to be cheaper, thus encouraging them to drive all the way to work instead of changing modes at the park-and-ride facility. Commuters also weigh the travel time by public transit against the travel time by automobile. Accordingly, it is not only important that the park-and-ride facility be easily accessible from neighbouring roadways and that adequate parking spaces are provided, it is also important to ensure that the transit stop or station is located on-site, or at least nearby

(Figure 4.14). This can then minimize the walking distance between the commuter's automobile and the transit stop.

Figure 4.14 Transit Stop at Park-and-Ride Lot, Ottawa
Photo: C. Fullerton

4.5 Dimension #4: On-Vehicle Travel

The third link in the typical public transit commuter journey, and thus the fourth dimension of public transit commuter need, involves travel on board the transit vehicle. At this point in the trip, issues shown to be of concern to commuters fall within two categories: 1) characteristics of the transit vehicle, and 2) the quality of customer service provided. Characteristics of the transit vehicle that are of critical importance include: the quality of vehicle signage; the presence of steps; the availability of seating; vehicle cleanliness; and the availability of bicycle racks. In terms of customer service quality, research has shown additional factors to be of critical importance in determining the attractiveness of travelling by public transit. These include: driver courtesy; the announcement of stops; and personal security while on board.

Visibility of Vehicle Route Number/Destination Board

The clarity and legibility of signage on the transit vehicle have been cited as important matters of concern for many public transit users. At the heart of this issue is the fact that, if individuals cannot read the route number and destination sign when the vehicle arrives at the transit stop and there is more than one route serving that location, there is the potential for the transit vehicle to pass them by because they are unable to indicate that they would like to board that particular vehicle. This aspect of vehicle design has most frequently been noted by members of population subgroups such as persons with visual impairments and seniors. As a result, arguments have been put forth supporting the installation of highly visible bus destination boards that facilitate identification of transit vehicles arriving at stops (Hine and Mitchell 2001). According to Hamilton and Jenkins (2000), transit vehicles should have clear information on the front, sides and back in order that passengers are not left behind when the vehicle leaves the stop (Figure 4.15).

Figure 4.15 Large-Font Destination Board on Transit Vehicle, Ottawa
Photo: C. Fullerton

Physical Accessibility of Vehicle

A second characteristic of the public transit vehicle that has been identified as an important matter of concern relates to its physical accessibility. Surveys of public transit users and non-users have frequently shown a major obstacle, or outright deterrent, to travelling by this mode to be the requirement to use steps when boarding and alighting from the transit vehicle. This issue has been cited by numerous groups, ranging from individuals travelling with children or elderly relatives, to those carrying groceries or other large items, to persons with mobility impairments. For example, in a series of focus groups conducted in Nebraska by Gaber and Gaber (1999) participants frequently cited the presence of steps that were both too high and too narrow as a major obstacle to transit use in their communities.

Problems related to transit vehicle accessibility have also frequently been discussed in the gender-based transportation research, particularly within the context of trip chaining (Hamilton and Jenkins 1989; Hanlon 1996; Mackett 2001; Modlich 1983; Pickup 1989). For instance, Hamilton and Jenkins (1989) noted that a significant proportion of women's journeys involve escorting a child or an elderly relative while also carrying heavy loads such as groceries. In this regard, they cited women's common assertion that transit vehicles were not adequately designed to facilitate these types of trips due to the presence of high steps, a lack of storage space for bags, strollers, and other items, and a lack of assistance from drivers when boarding and alighting. Some women have also asserted that they encounter negativity from other public transit users when travelling with strollers, bags, and children (Hanlon 1996).

Research has also shown that efforts to promote the use of conventional public transit services by persons with disabilities in lieu of specialized transit services have been hindered by the presence of steps on transit vehicles (Suen and Mitchell 2000). It has been within the context of these problems that researchers have advocated the use of low-floor transit vehicles (Hamilton and Jenkins 2000; Project for Public Spaces 1999; Pucher 1998; Suen and Mitchell 2000). Low-floor vehicles do not have steps at the doors, which makes it easier for individuals – both those on foot *and* those in wheelchairs – to board and alight from the vehicle (Figure 4.16).

Several studies have demonstrated that the use of low-floor transit vehicles may bring about a positive impact on public transit ridership. For example, Hanlon (1996) has noted that many women have cited issues related to transit vehicle accessibility as the primary reason why they use their private automobiles in lieu of travelling by public transit, while a survey of workers conduced in the United Kingdom by Mackett (2001) found that 7% of people who were willing to abandon their cars in lieu of public transit cited the need to first improve the physical accessibility of transit vehicles. Indeed, Hess *et al.* (2002) discovered that numerous transit agencies in the United States reported ridership increases after acquiring low-floor vehicles.

Figure 4.16 Low-Floor Transit Vehicle with Bicycle Rack, Ottawa
Photo: C. Fullerton

Availability of Seating and Storage Space

The availability of seating and storage space is an important concern in the decision to use public transit for at least three reasons. Firstly, when seating is unavailable due to overcrowded conditions this increases passengers' levels of discomfort, primarily due to a lack of personal space and privacy (Hamilton 2001; Pooley and Turnbull 1999). Secondly, although public transit collisions are infrequent, the risk of being injured in an accident is higher for those standing than for those sitting. Finally, the availability of adequate space is important because, as noted earlier, individuals travelling with strollers, bags or other large items require room for storing these items while the transit vehicle is in motion. Two possible means of addressing these concerns are available. First, transit agencies can ensure that an adequate level of service is provided on all routes so that enough seating is available for all passengers and overcrowding is therefore avoided. Second, transit vehicles should be designed in ways that allow strollers, bags and other heavy items to be stored without causing discomfort both for the passengers carrying them and for other passengers. This can be done, for example, by providing wide aisles or luggage racks (Modlich 1983).

Vehicle Cleanliness

Although less frequently cited than other issues, the cleanliness of transit vehicles has also been identified as being worthy of attention in efforts to promote public transit ridership (Litman 2000; Hamilton and Jenkins 2000; Ortuzar *et al.* 1997). The justification for this assertion is similar to that provided in Section 4.3 about the cleanliness of transit stops and stations. A transit vehicle that is free of litter, graffiti, and dirty seats lends itself to a much more pleasant experience while travelling on the transit vehicle. This factor plays a considerable role in influencing the public transit user's level of comfort and perceptions of personal security.

Availability of bicycle racks

As noted in Section 4.2, commuters may sometimes wish to combine travel by bicycle with travel by public transit when travelling to or from the workplace. Due to space restrictions, however, bicycles cannot usually be transported *within* the transit vehicle and the ability to transport the bicycle therefore depends on the availability of a bicycle rack on the front of the vehicle (Figure 4.16). The provision of bicycle racks on transit vehicles can play an important role in promoting public transit commuting because it allows cyclists to continue their journey on bicycle after they leave the transit vehicle (e.g. when the workplace is located beyond walking distance of the nearest transit stop) (Fritzel 1997; Litman *et al.* 2002; Project for Public Spaces 1999). It has also been noted that cyclists may be less willing to store their bicycles at a transit stop near their homes while they are at work for the day than they would be to store their bicycles at their workplaces due to concerns about theft or vandalism.

Customer Service

The quality of customer service provided by drivers also has a strong influence on individuals' willingness to travel by public transit (Hine and Mitchell 2001; Michelson 1988; Ortuzar *et al.* 1997; Project for Public Spaces 1999; Winters *et al.* 1991). Indeed, as Friman *et al.* (1998) have noted, the driver is the employee of the public transit agency to whom the customer is most frequently exposed and is also the person who is directly responsible for the passenger's safety and security while he or she is on board the transit vehicle. Consequently, efforts to promote public transit commuting must also consider customer service characteristics such as driver friendliness and helpfulness, the announcement of stops and stations, driver safety, and passenger control. Driver *friendliness* is an important consideration because unfriendly drivers can tarnish a transit user's perception of public transit quality by making their experience unpleasant, while driver *helpfulness* is critical in ensuring that passengers are provided with the information about transit routes, schedules and stops when needed (Project for Public Spaces 1999). The importance of addressing these concerns was well established by Friman *et al.* (1998) in their analysis of complaints registered with a public transit agency in Gothenburg, Sweden. They found that most complaints related to how customers were treated by drivers, including the failure to stop where requested (either when waiting for a vehicle or when trying to leave the vehicle) and drivers not knowing the answers to their service-related questions.

Announcement of stops and stations by drivers also affects public transit accessibility for some groups. For example, in their examination of constraints to the use of public transit experienced by the visually impaired in Scotland, Hine and Mitchell (2001) found a frequent concern to be a lack of assistance on the part of drivers in telling them when they had reached their destinations. As a result, these and other authors (e.g. Hanlon 1996) have argued that public transit agencies should ideally require drivers to announce all major intersections and stops as a means of assisting not only those with visual impairments, but also any other individuals who may not be familiar with their surroundings while travelling on the transit vehicle.

Personal Safety and Security

Researchers have also found concerns about personal safety and security while travelling on board transit vehicles to play central roles in the decision to use public transit (Benjamin and Hartgen 1994; Focas 1989; Mackett 2001; Reed *et al.* 1999; Schulz and Gilbert 1996). Safety issues generally pertain to the driver's speed of travel; for example, Friman *et al.* (1998) found that several complaints registered with the transit agency in Gothenburg, Sweden, were associated with concerns about unsafe or uncomfortable driving on the part of drivers. Passenger concerns about personal security, on the other hand, stem primarily from the discomfort associated with inappropriate behaviour exhibited by other passengers. This includes negative conduct such as smoking, spitting, and the making of unnecessary noise (Schulz and Gilbert 1996), as well as obscene language and verbal abuse, public drunkenness, vandalism, and disorderly conduct (Reed *et al.* 1999).

Fears about personal security on board transit vehicles have been demonstrated in several empirical studies. In their examination of commuting behaviour at Portland State

University in the United States, for example, Bianco and Lawson found that "feeling unsafe on the bus" and "finding other passengers to be sometimes offensive" represented two of the three most unpleasant characteristics of public transit reported by women. In a second study, many survey respondents commented that they frequently utilized less convenient transit routes in order to avoid unsafe areas or "unseemly riders" (Reed *et al.* 1999). A third example is provided by Benjamin and Hartgen (1994), who examined perceptions of public transit safety in Greensboro, North Carolina, and found that almost one-half of residents surveyed perceived crime on transit to be a problem. The various concerns related to personal safety and security while travelling on public transit vehicles once again suggest an important role for public transit drivers. At the most fundamental level, it is necessary to ensure that transit drivers operate their vehicles safely and that they are vigilant in guarding the security of transit passengers.

4.6 Dimension #5: Transit Stops and Stations near the Place of Employment

After leaving the transit vehicle, the next dimension of public transit commuter needs pertains to conditions at the transit stop or station near the place of employment. Although the transit user would not likely wait at stops or stations near his/her workplace when travelling to work, but would instead continue their journey on foot or by bicycle, they must of course wait at stops or stations near the place of employment when returning home. Accordingly, the facilities and infrastructure required at this location are identical to those discussed in Section 4.3 ("Transit Stops and Stations near the Place of Residence") and are therefore not repeated here.

4.7 Dimension #6: Travel between Transit Stops/Stations and Place of Employment

In terms of travel between transit stops or stations and places of employment (in either direction), the infrastructure, facilities and services required by public transit commuters are also similar to those needed when travelling between homes and transit stops or stations. Once again the viability of commuting by public transit depends in part on the availability of direct access between the stop or station and the workplace (Filion 2001; Filion *et al.* 2001; Porter 1997; Rosenbloom and Burns 1995), as well as the availability of adequate pedestrian and bicycle infrastructure (Figures 4.17 and 4.18).

Figures 4.17 and 4.18 Suburban Employment Areas without Sidewalks, Ottawa
Photo: C. Fullerton

As far as barriers that impede pedestrian travel between transit stops or stations and workplaces are concerned, however, one further issue is worthy of note. In order to assure automobile drivers that an abundant supply of parking is available, the placement of parking lots at the front of buildings such as shopping malls and office facilities has become standard practice. Thus, buildings are often set back a considerable distance from the roads on which they are situated, with parking lots in between. In some cases, public transit planners deal with this predicament by having transit routes enter the development and so that passengers may board or leave the vehicle at or near the building entrance (Figure 4.19). The problem with this approach is that it increases travel time for riders who are continuing *beyond* this destination because the transit vehicle must deviate from its main route. As another solution, transit planners often locate one or more stops at the roadside so that transit routes do not have to enter the development. However, this often forces passengers to walk across parking lots when travelling to and from stops. This is problematic once again, however, because adequate pedestrian facilities are often not available and transit users are instead forced to walk between long rows of parked cars (Bicycle Federation of America 1998b).

Figure 4.19 Transit Stop Located Directly at Front of Workplace, Ottawa
Photo: C. Fullerton

Researchers have offered two potential solutions to these problems. First, it has been proposed that land use planners can address public transit commuters' need for direct access to workplaces by reducing building setbacks, in order that access to buildings such as shopping centres and offices is provided immediately adjacent to the street (Bicycle Federation of America 1998a, 1998b; Porter 1997). The benefits of this solution are two-fold: public transit vehicles could follow direct routes rather than having to enter large-scale developments and, concurrently, commuters would have direct access to workplaces without having to cross busy and dangerous parking lots. A second and less convenient solution, but one that has greater potential for implementation in employment areas that have already been built, would be to provide adequate pedestrian infrastructure between transit stops and building entrances. Ideally, this infrastructure should be designed in a way that minimizes interaction with automobile traffic. In cases where this would not be possible, however, proper crossing infrastructure, such as signs and or traffic signals, should also be provided to make pedestrian-automobile interaction safer (G.D. Hamilton and Associates 1998; Hess *et al.* 1999).

4.8 Dimension #7: Employment Area

Researchers have also shown that the presence of various facilities and services within the employment area influence the commuter's willingness and/or ability to commute by public transit. Due to the importance of trip chaining, as discussed throughout this chapter, it has been argued that a diversified land use mix in the employment area can facilitate public transit commuting in much the same way as it can within workers' home communities. Furthermore, the integration of bicycle travel with travel by public transit can be promoted by ensuring that workers are provided with bicycle storage facilities, showers, change rooms, and locker facilities.

Land use mix

The crux of the argument supporting the integration of activities *within employment areas* is that, when facilities and services required on a day-to-day basis are located within walking distance of workplaces, employees have the opportunity to visit these destinations before work, after work, or during coffee or meal breaks (Filion 2001; Litman *et al.* 2002). Furthermore, if commuters are able to accomplish tasks near their places of employment that would otherwise make up part of a more geographically-extensive trip chain, public transit becomes a more viable transportation choice due to the reduced need for travel to physically isolated activity sites (Porter 1997; Schimek 1997). In lieu of automobile-based trip chaining, individuals could travel from their homes to the employment area by public transit, visit required facilities and services on foot, then return home by public transit at the end of the workday (Figure 4.20).

Figure 4.20 Broad Land-Use Mix Facilitates Public Transit Commuting, Ottawa
Photo: C. Fullerton

Frank (2000) has suggested that implementation of mixed-use development as a means of promoting public transit commuting has greater potential for success in employment areas than within residential areas because it would likely prove less controversial. Michelson (1988) and Bianco and Lawson (1996) have both suggested the inclusion of daycare centres at or near workplaces as one component of mixed-use development. This is primarily because, as noted earlier in this chapter, one of the most frequent links in a trip chain involves escorting a child to and from daycare. However, Michelson (1988) has argued that this option is less favourable than the provision of daycare in the home community because, although it reduces the parent's need to travel, it increases the child's. Furthermore, travelling with a child on public transit is made more difficult.

Several empirical studies have demonstrated the positive impacts on public transit ridership associated with mixed-use development in employment areas (Cervero 1988; Ewing *et al.* 1994; Frank and Pivo 1994; Hooper 1995; Newman and Kenworthy 1991; Pill 1983; Pushkarev *et al.* 1982; Rice Centre for Urban Mobility Research 1987). For example, in one study Cervero (1989) found that levels of public transit commuting were higher when a significant amount of retail uses were located within suburban employment centres than in cases where there was not.

Bicycle Infrastructure

Transportation researchers have also noted that combined bicycle/public transit commuting can be encouraged by ensuring that infrastructure and facilities required by bicycle users are provided within employment areas (Bicycle Federation of America 1998a; Litman *et al.* 2002; Mackett 2001). In this regard, one important need that must be addressed is that for bicycle storage facilities. Because workers are generally at their places of employment for several hours at a time, it is crucial that those commuters arriving by bicycle are provided with appropriate facilities for storing their bicycles while they work (Figure 4.21). Ideally, these should be located in secure and highly-visible areas, in order: 1) to ensure that the cyclist can be seen from nearby buildings and by passing traffic, thus reducing his/her risk of becoming a victim of crime; and 2) to minimize the risk of bicycle theft (Fritzel 1997; Litman *et al.* 2002). The integration of bicycles and public transit can be made even more attractive by providing workers with *sheltered* storage areas (Figure 4.22) so that bicycles are not damaged in inclement weather, such as rain or snow (Litman *et al.* 2002). Finally, it has been noted that commuters also require showers, change-rooms and locker facilities at their workplaces in order for bicycle/public transit integration to represent a viable commuting option (Mackett 2001). The essence of this argument is that cycling is an arduous activity and that workers arriving by bicycle must therefore shower and change clothes before they begin their workdays. The provision of lockers enables workers to keep extra clothing at the workplace, rather than having to carry it with them while cycling.

Figures 4.21 and 4.22 Bicycle Storage Facilities, Ottawa
Photo: C. Fullerton

4.9 Conclusion

The purpose of this chapter has been to conceptualize the notion of public transit commuter needs in order to establish a theoretical foundation for the creation of a practical tool for measuring public transit accessibility to places of employment. Based on the information just presented, it is clear that a wide range of infrastructure, facilities, and services must be in place in order for public transit to represent a viable transportation choice for the journey to work. The discrete needs highlighted throughout this chapter have been consolidated to form a "Comprehensive Definition of Public Transit Commuter Needs" that reflects both the sociodemographic diversity of the contemporary metropolitan labour force and the increasing complexity of spatio-temporal commuter travel flows. Transit agencies will clearly play the most critical role in the promotion of public transit commuting. They have control over the spatial and temporal characteristics of public transit service, the quality of waiting environments, the physical attributes of transit vehicles and park-and-ride lots, and the quality of customer service provided by drivers. At the same time, however, responsibility for addressing public transit commuter needs also rests with several other groups, including land use planners, transportation planners, private developers, and individual employers.

Land use planners can assist in serving the needs of public transit commuters by advocating the adoption of planning policies that encourage mixed-use development in both residential and employment areas, require developers to build compact communities in which direct access to transit stops is provided, reduce building setbacks, and encourage the maintenance of aesthetically pleasing urban environments. Transportation planners will also play an instrumental role in the promotion of public transit commuting. Their primary obligation is to ensure that access to transit stops or stations is maximized through the provision of high-quality pedestrian and bicycle facilities and infrastructure. The viability of public transit commuting both now and in the future will also depend on the willingness of developers to adopt transit-friendly designs in the construction of new communities, in the infilling of established communities, and in other construction projects, both large and small. Finally, responsibility for addressing public transit commuter needs also falls upon individual employers, in this case primarily through the on-site provision of services, such as daycare, and facilities, such as bicycle storage and change-room facilities.

CHAPTER FIVE:
THE *PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT*

5.1 Introduction

As discussed in Chapter Three, a tool for evaluating accessibility should be straightforward and user-friendly in order to be of practical use to planning professionals. Accordingly, in this study the most appropriate methodological framework for evaluating public transit accessibility to places of employment was deemed to be one that involved the assessment of conditions at the small-area level using a mix of simple quantitative and qualitative methods. This resulted in creation of what has been labelled the *Public Transit Commuter Accessibility Audit (PTCAA)*, a six-step process for evaluating the servicing of public transit commuter needs (Box 5.1). The *PTCAA* has been deliberately designed to provide a great deal of flexibility in terms of how and where it is applied. This has been done in order to accommodate differences in terms of the following parameters: the availability of necessary data; the geographical setting in which planners would like to apply the *PTCAA*; and the time available to conduct the study.

The first three steps of the *PTCAA* involve the selection of an employment area and one or more metropolitan subareas between which public transit accessibility will be evaluated, along with the determination of working hours at the selected place of employment. Once these decisions have been made and relevant information has been compiled, a spatial and temporal foundation for the actual auditing process has been established. The next two steps form the heart of the *PTCAA*. These involve 1) completion of the *PTCAA Checklist* and 2) completion of the *PTCAA Report Card*. The *PTCAA Checklist* is used as the recording mechanism on which information concerning the conditions under which public transit commuters must travel is collected. The compilation of these data requires consultation of available literature, such as public transit route maps and schedules, as well as extensive field observations within the areas being examined. Once the *PTCAA Checklist* has been filled out, the next step in the *PTCAA* involves the assignment of grades on the *PTCAA Report Card*. At this point, a normative approach is used to examine gaps between "what is" and "what ought to be". Finally, completion of the *PTCAA Report Card* is followed by the provision of recommendations concerning any improvements to infrastructure, facilities and/or services that may be necessary in order to improve public transit accessibility between the selected metropolitan subarea(s) and the selected place of employment.

Box 5.1
Steps in the *Public Transit Commuter Accessibility Audit (PTCAA)*

Step One: Select the employment area for which the *PTCAA* will be conducted.
Step Two: Identify hours of work within employment area.
Step Three: Select a metropolitan subarea from which PTCAA will be conducted.
Step Four: Complete *PTCAA Checklist*.
Step Five: Complete *PTCAA Report Card*.
Step Six: Make recommendations for improvement where necessary.

5.2 Step #1: Selection of Employment Area

The first step in conducting a *PTCAA* is to choose the employment area to which public transit accessibility will be evaluated. This can range from a single, stand-alone facility (e.g. a big-box retail store or factory) to a larger employment district composed of several workplaces (e.g. an office park or suburban mixed-use centre). However, it is likely that planners would be most interested, at least initially, in evaluating public transit accessibility to locations delineated in local planning documents as major employment centres where public transit is expected to hold a large share of the journey-to-work modal split. A focus on this type of setting would provide an opportunity to ascertain not only whether the needs of public transit commuters are served, but also whether stated policies related to public transit commuting are achieving their intended impacts. Furthermore, although the selection of a larger employment area requires more extensive data collection and thus a greater expenditure of time and labour than if only a small employment setting was selected, these costs are balanced by the ability to evaluate public transit accessibility for a larger share of metropolitan commuters.

5.3 Step #2: Identification of Temporal Commuting Patterns

Once a particular employment area has been selected, the next step is to determine as accurately as possible when workers are present at this location. This information – which must include both days of the week *and* times of day – is required in order to gauge whether or not public transit service is provided to and from the employment area when it is needed or may be needed. This was cited in Chapter Four as a critical factor in determining commuters' willingness and/or ability to travel by public transit. Because a temporal dimension, as it pertains to hours of work, has not been incorporated in the development of accessibility measurement tools thus far, it was not possible to turn to the research as a means of identifying an appropriate means by which working hours might be identified. There are at least four potential methods for doing so, however, although the usefulness of each approach will vary according to the size of the employment area involved and the types of employment found therein. Potential methods include a storefront survey; examination of origin-destination survey data; an employer survey; or an employee survey.

In some cases, it may be possible to infer working hours by means of a storefront survey. For example, if planners are interested in evaluating public transit accessibility to a big-box retail district they can record the hours of operation posted outside of each business. Thus, if all businesses in the study area are open from 9:00 a.m. to 9:00 p.m. seven days per week, it can be assumed that public transit service is required to and from this facility from shortly before 9:00 a.m. to shortly after 9:00 p.m. In cases where hours of operation vary considerably from one business to another, the objective would be to identify the time of day at which workers first begin to arrive and that when most workers have left for the day. The storefront survey approach is most suitable for identifying hours of work in settings where services are provided to the public. It is less likely to be appropriate in cases where workers do not open their doors to customer traffic and therefore do not post their hours of operation.

A second option is to determine working hours through the examination of origin-destination survey data collected for urban transportation planning purposes. In order to ascertain when people use the local transportation system, origin-destination survey respondents are normally asked to indicate their times of travel, the purpose of their trips, and their destinations (the latter of which are recorded in terms of traffic zones).

This information can be used in aggregate form to obtain a general picture of commuting times to and from a particular employment area (at the traffic zone level), thus providing an overall indication of when public transit service to and from this location should be scheduled. Although origin-destination survey data provide a quick and easy means of identifying hours of work within an employment area, if it is available, there are also two potential problems with this approach. Firstly, for smaller employment areas the low number of respondents from whom information is collected (usually 5% of the population) may lead to an incomplete representation of commuting times. Secondly, origin-destination surveys are generally carried out only about once every decade in most metropolitan regions, if they are conducted at all. As a result, even if such information *is* accessible significant changes in working hours may have occurred since the survey date – for example, due to the opening of a new business or office, the extension of retail hours, or the addition an extra shift. If so, the information provided by the origin-destination survey results may not fully reflect current hours of work and may therefore be of limited use when conducting the *PTCAA*. This approach to estimating working hours method should therefore be used with these considerations in mind.

A third way of determining hours of work is by collecting information about firms' hours of operation and/or shift schedules by contacting the employers themselves. For example, if an employer indicates that shifts extend from 7 a.m. to 3 p.m. and from 3 p.m. to 11 p.m., this provides a rough indication of the times at which the bulk of workers is found at this place of employment. The viability of using this approach once again varies with the size of the employment area – the greater the number of employers, the more time that must be spent contacting employers. A fourth and final means by which working hours at the employment area can be gauged is by distributing a survey questionnaire to workers employed within the study area. Although this approach involves a far greater investment of time and money than methods previously discussed, it provides the opportunity to solicit additional information at the same time that might prove useful when conducting the *PTCAA*, such as workers' current modes of commuting and their reasons for this modal decision. Direct employee input may provide auditors with evidence of possible obstacles or deterrents to public transit commuting that may not otherwise have been discovered during the evaluation of current conditions later in the *PTCAA* process.

5.4 Step #3: Selection of Metropolitan Subarea

The third step is to select a metropolitan subarea from which public transit accessibility to the employment area in question will be evaluated. The *PTCAA* is designed in such a way that any type of subarea may be selected, regardless of how its boundaries are defined. This can include, for example, a single traffic zone, a neighbourhood, a census tract, or even a larger community comprised of several traffic zones or census tracts. A logical starting-point, however, would be to choose a subarea where many workers at the specified employment area currently reside, or would be expected to reside. At the census tract level, this information can be obtained in the form of "Place of Work" statistics, which are collected every five years as part of the Census of Canada.[1] Origin-destination surveys represent a second potential source of information concerning the residential location of workers. In these studies, a sample of

[1] Because this information is not routinely disseminated, Statistics Canada charges a fee for this data.

households in each traffic zone is asked to indicate the workplace locations of all employed individuals. If access to these data is available, it can be used to determine which traffic zones are home to large proportions of individuals working within the employment area being examined.

If data concerning the residential location of workers are unavailable, a third option might be to choose a metropolitan subarea that would be *expected* to house individuals working within the employment area. For instance, if an area has been designated as a "suburban downtown" and is intended to serve as a focal point for the employment activities of nearby residents, it would make sense to evaluate public transit accessibility from one or more surrounding neighbourhoods or communities. In this case, neighbourhood or community boundaries could be delineated, for example, by consulting local real estate listings or community associations.

5.5 Step #4: Completion of the *PTCAA Checklist*

Once the employment area and residential subarea have been selected, and hours of work at the employment area have been obtained, a spatial and temporal context for conducting the *PTCAA* has been established. The next step involves completion of the *PTCAA Checklist* (Appendix Two), the most time-consuming and labour intensive part of the process. It is comprised of 94 statements, each of which reflects a public transit commuter need discussed in the previous chapter. Each statement is singular in nature in order to simplify the grading process, which is discussed in detail in the following section. Had more than one public transit commuter need been included in each statement, it would be more difficult to assign a grade if only part of the statement were true or untrue.

The structure of the *PTCAA Checklist* coincides with that of the *Comprehensive Definition of Public Transit Commuter Needs*. Accordingly, completion of the *Checklist* begins with the collection of data related to the availability of transit service, all of which can be easily obtained from transit maps and schedules. Subsequent sections of the *Checklist* involve the examination of infrastructure, facilities and services found along the actual public transit journey between the selected residential subarea and employment area. This includes the evaluation of actual conditions:

- between homes and transit stops/stations;
- at transit stops/stations within the home community;
- on board transit vehicles;
- at transit stops/stations in or near the employment area;
- between transit stops/stations and workplaces in the employment area; and
- within the employment area.

Another benefit of the *PTCAA* as currently designed is that, although its primary intention is to be used in evaluating public transit accessibility to places of employment as it pertains to all seven dimensions, it can nonetheless be used to conduct less extensive evaluations, if desired. For example, where planners are simply interested in examining the infrastructure, facilities and services in place at transit stops and stations within a particular employment area, they can complete the *PTCAA Checklist* as it pertains to Dimension #5 ("Transit Stops/Stations near Place of Employment").

Most data required to complete these sections of the *PTCAA Checklist* are not usually documented by local planning agencies and must therefore be collected by means of extensive field observations. While this may initially seem a daunting task, another benefit associated with the structure of the *PTCAA Checklist* is the fact that, once information related to a particular residential subarea or employment area is collected, this can frequently be used to conduct *several* evaluations of public transit accessibility. For example, once data are collected concerning the infrastructure, facilities and services in place within a particular employment area in order to evaluate public transit accessibility to this location from Community A, it would not be necessary to collect this information again when conducting a similar evaluation from Community B. The same logic applies at the residential subarea end; once information related to current conditions within a particular community is recorded it can be used in evaluations of public transit accessibility from that community to several different employment areas.

Completion of the *PTCAA Checklist* involves collection of both qualitative and quantitative data. In some cases, it may be possible to evaluate conditions simply by counting the number of locations where a particular type of infrastructure, or facility or service is located. For example, Statement #7 in Dimension #3 (Transit Stops/Stations near the Place of Residence) reads: "Seating is provided at transit stops and stations." How accurately this statement reflects current conditions in a particular residential subarea can be ascertained by determining the proportion of transit stops that have benches. In other cases, the evaluation of conditions is more subjective in nature. For example, Statement #3 in Dimension #2 (Travel between Homes and Transit Stops/Stations) declares: "Travel routes between places of residence and transit stops/stations are aesthetically pleasing." Individual perceptions of "aesthetically pleasing surroundings" will clearly differ from one person to the another and therefore defies quantification. As a result, data entry on the *PTCAA Checklist* as it pertains to this and other statements involving subjective considerations would be more qualitative than quantitative. In this case, the auditor may provide a textual description of the surroundings and perhaps also provide photographic supporting evidence.

5.6 Step #5: Completion of the *PTCAA Report Card*

Once current conditions have been documented, the next step is to assign a "grade" to each statement based on the information gathered in the previous step and, subsequently, to present these on the *PTCAA Report Card* (Appendix 3). The central purpose of this task is to pinpoint any potential weaknesses or deficiencies related to the provision of infrastructure, facilities and services required by public transit commuters that may hinder, or prevent altogether, travel by public transit between the subarea and employment area being examined. Three possible "grades" can be assigned to each statement, ranging from *A* to *C* (Box 5.2). An *A*-grade is assigned to those statements that are true or very close to being true. A grade of *B* should assigned in cases where the statement is only partially true, therefore implying that public transit commuter needs are not *fully* served. Finally, the *C*-grade is used to reflect circumstances in which conditions are especially poor and the statement is completely, or almost completely, false. For example, if the data indicate that every street in a census tract has sidewalks, the statement reading "A *continuous sidewalk network* provides pedestrians with physical access to transit stops/stations" would receive an "A". If sidewalks were available on collector and arterial roads, but not on smaller streets, a "B" grade would be appropriate. Finally, if there *no* sidewalks were provided on *any* streets within the census tract, a grade of "C" would be assigned.

Box 5.2
Grading Scheme
Public Transit Commuter Accessibility Audit Report Card

A = Statement mostly or completely true; needs generally satisfied
B = Statement partially true; some deficiencies exist
C = Statement mostly or completely false; needs generally not satisfied
DNA = Data not available
N/A = Not applicable

In completing the *PTCAA Report Card*, two further selections are also possible for each statement. Firstly, auditors can check "Data Not Available" ("DNA") if relevant data could not be obtained; for example, the question of whether sidewalks are adequately cleared of snow and ice could not be addressed if the *PTCAA* is conducted in the month of July. Secondly, "N/A" is available for selection in cases where the statement is not relevant to the *PTCAA* being conducted. For example, questions related to the provision and quality of park-and-ride facilities would not pertain to census tracts from which commuters are not required to travel by car to gain access to public transit service.

For each statement on the *PTCAA Report Card*, it is of paramount importance that justification be offered for the grade assigned or for selection of the DNA or N/A options. Because an important function of the *PTCAA* is to provide evidence of obstacles or deterrents to public transit commuting, any deficiencies related either to the provision of infrastructure, facilities and services or to the availability of data must be explicitly identified. It is only by first distinguishing these deficiencies that corrective actions may be undertaken. Furthermore, providing justification for each selection assures readers of the final report that the *PTCAA* was applied in an objective manner. As a result, space is provided beside each statement for the insertion of relevant comments.

The format of the *PTCAA Report Card* has been designed to avoid a key deficiency of past approaches to evaluating accessibility. As discussed in Chapter Three, past efforts to develop accessibility measures have tended to present results as a single, comprehensive index, rather than leaving their findings in disaggregated form. The former approach has been deemed to be problematic because it masks specific accessibility constraints. Thus, with the *PTCAA Report Card* structured to present each indicator and its associated grade in disaggregate form, the reader can immediately determine how well *each* public transit commuter need is served.

5.7 Step #6: Recommendations

Perhaps the most important task besides the compilation of accurate data is to communicate the *PTCAA* results and their implications, especially recommendations concerning any weaknesses or deficiencies that have been identified. Ideally, the results of the *PTCAA* should be reported to *all* planners and policymakers responsible for land use planning, transportation planning and public transit planning within the areas evaluated. Discussion of any planning implications should also make clear which statements could not be validated due to a lack of data, as this may provide the impetus for new data collection exercises. As noted earlier, an effective means of supporting findings related to unmet public transit commuter needs is through the use of photographic evidence. The inclusion of photographs demonstrating unsatisfactory conditions can make more evident to readers the problem(s) at hand, thus adding credibility to the report.

5.8 Conclusion

This chapter has presented and discussed the *Public Transit Commuter Accessibility Audit*, a six-step process which has been devised to address the need for a straightforward and user-friendly tool that can be used to evaluate public transit accessibility to places of employment. The design of the *PTCAA* is intended to provide the utmost flexibility in terms of the small-area level in which it is applied and the data sources from which necessary information is derived. Although completion of the *PTCAA Checklist* entails significant labour-intensive research, this drawback is outweighed by the ability to use information that is collected for one study in successive evaluations of public transit accessibility, either from a different residential subarea to the same employment area or from the same residential subarea to a different employment area. The usefulness of the *PTCAA* was tested by means of two case studies conducted in the City of Ottawa. These are discussed in the following chapters.

CHAPTER SIX: INTRODUCTION TO STUDY AREA

6.1 Introduction

The purpose of this chapter is to introduce the study area, the City of Ottawa, in order to establish a geographical context for the setting in which trial applications of the *Public Transit Commuter Accessibility Audit* were conducted. After a brief overview of recent changes to the structure of municipal governance in Ottawa and its implications for urban and regional planning, this chapter provides a historical account of public- and private-sector planning and development activities in the Ottawa area over the past century-and-a-half, with particular attention to the ways in which these initiatives have affected public transit's viability as a transportation choice for the City's commuter population. Following discussion of public transit commuting in the pre-1945 period, the impacts of four major post-World War II planning exercises are highlighted: one initiated by the federal government in the 1940s and three spearheaded by the former Regional Municipality of Ottawa-Carleton in the 1970s, 1980s and 1990s. The chapter concludes with an overview of Ottawa's newest official plan (adopted in May 2003), again with particular emphasis on those goals, objectives and policies related to public transit commuting.

6.2 Municipal Governance in Ottawa and its Relation to Transportation Planning

Ottawa is Canada's capital city and part of the country's fourth-largest urban agglomeration. Between the years 1969 and 2000, Ottawa residents were served by a two-tier system of municipal government. At the upper level was the Regional Municipality of Ottawa-Carleton (RMOC), which was responsible for the region-wide provision of hard and soft services such as, for example, water and sewage infrastructure, social services, regional planning, and public transit. At the lower level of the two-tier system were eleven urban, suburban and rural municipalities (Figure 6.1). These included: the Cities of Ottawa, Vanier, Nepean, Gloucester, Cumberland, and Kanata; the Townships of Goulbourn, Osgoode, Rideau, and West Carleton; and the Village of Rockcliffe Park. Each lower-tier municipality was responsible for the provision of local services such as, for example, public libraries, fire protection, and local community planning and zoning.

On January 1, 2001, the RMOC and the eleven lower-tier municipalities were dissolved and an amalgamated City of Ottawa was created in their place, with its outer limits corresponding to the boundaries of the former RMOC. This change in public administration represented one of several municipal restructuring initiatives carried out in Ontario in the past few years, all of which were prompted by the Government of Ontario's desire to eliminate the economic inefficiencies, duplication of services and bureaucratic obstacles to development that it felt to be associated with two-tier systems of municipal government (Thomas 1999: 21).

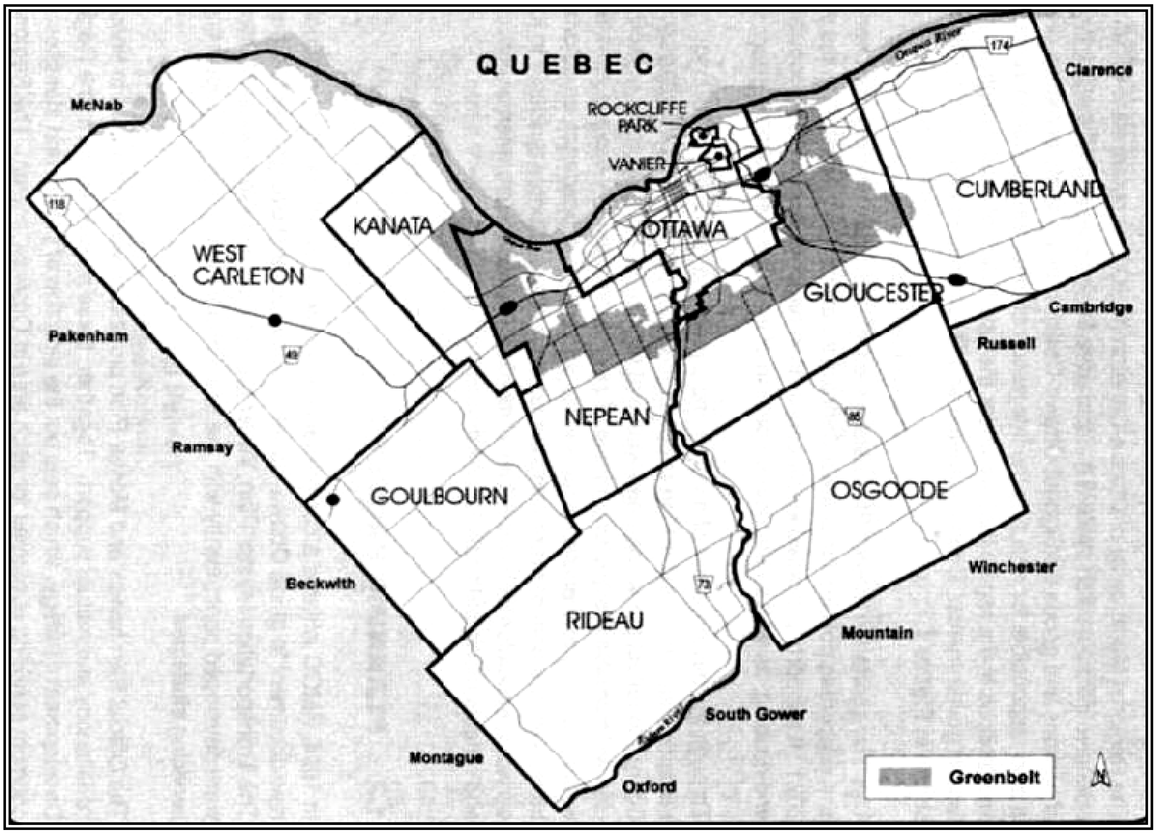


Figure 6.1 Former Regional Municipality of Ottawa-Carleton
Source: RMOC 1997a

The amalgamation of Ottawa-area municipalities has had important implications for land-use and transportation planning. Before municipal restructuring, the RMOC was charged with the adoption of regional planning policies in the form of a regional official plan, and all lower-tier municipalities' official plans were subsequently required by provincial legislation to reflect regional goals and strategies. RMOC planners concerned themselves primarily with the location and staging of urban development, the timing of public works, the construction and maintenance of major arterial roads, and the provision of public transit service within the Region's urban and suburban areas. Lower-tier municipalities were generally responsible for the adoption and implementation of locally relevant planning policies, the enforcement of zoning bylaws, and subdivision approval.

Since the creation of a new City of Ottawa in 2001, responsibility for all planning functions falls under the domain of a single municipal administration. While at the same time attempting to accommodate intra-regional differences in attitudes toward growth and development, municipal restructuring was intended to lead to more efficient community planning. As Cervero has noted (1998: 240), the RMOC wielded "approval and veto powers over municipal zoning and subdivision actions, [but] in practice it rarely [overruled] the wishes of a municipality, barring any egregious conflicts with the region's Official Plan." It was in light of this delicate relationship that many well-intended regional planning policies related to the promotion of a "transit-first" land use planning philosophy were not aggressively enforced throughout the RMOC's 32-year history. As a result, "outside [Ottawa's] core its landscape is classic suburbia, not unlike many medium-size Canadian and U.S. metropolises" (Cervero 1998: 237).

The dissolution of the eleven local municipalities and their replacement by a single entity, therefore, has the potential to ensure that planning policies are more strongly enforced in the interest of achieving region-wide objectives. As noted earlier, administration and planning of public transit service in the Ottawa area was a regional government responsibility before 2001. In carrying out its business, the RMOC was quite successful at developing a public transit system that served all urbanized areas of the region, as indicated, for example, by the provision of transit service within 400 metres of most homes. Despite their lack of direct involvement in transit planning, lower-tier governments nonetheless played a key role in determining the viability of travelling by public transit, in this case by means of their local-level land use and transportation planning policies and activities. As a result, much of the decline in public transit ridership witnessed in Ottawa in recent years can likely be attributed to a lack of concern on the part of local governments for ensuring that built environment conditions amenable to public transit-based travel have been in place. The amalgamation therefore also suggests that, with responsibility for land use, transportation, and public transit planning falling under one roof, a more coordinated effort to promote public transit commuting may occur.

Before proceeding, it is important to distinguish the City of Ottawa from two functional regions of which it is part (Table 6.1). First, Ottawa is part of the Ottawa-Gatineau Census Metropolitan Area, which is defined by Statistics Canada on the basis of inter-municipal economic integration and cross-border commuter flows and includes several municipalities on both sides of the Ontario-Quebec border.[1] Second, it also falls within the National Capital Region, a geographical area extending far beyond Ottawa's city limits in which the federal government conducts planning activities related to the area's role as the national capital.

[1] The Ottawa-Gatineau CMA was previously referred to as the Ottawa-Hull CMA; its renaming followed the recent amalgamation of several municipalities on the Quebec side of the Ottawa River that culminated with the creation of a new, amalgamated municipality, the City of Gatineau.

Table 6.1
Components of the City Of Ottawa,
Ottawa-Gatineau Census Metropolitan Area (CMA) and National Capital Region

City of Ottawa	Ottawa-Gatineau CMA	National Capital Region
• (New) City of Ottawa • includes former: • City of Cumberland • City of Gloucester • City of Kanata • City of Nepean • City of Ottawa • City of Vanier • Township of Goulbourn • Township of Osgoode • Township of Rideau • Township of West Carleton • Village of Rockcliffe Park	***Ontario*** • City of Ottawa • City of Clarence-Rockland • Township of Russell ***Quebec*** • City of Buckingham • City of Gatineau • City of Masson • Municipality of Cantley • Municipality of Chelsea • Municipality of La Pêche • Municipality of Pontiac • Municipality of Val-des-Monts	***Ontario*** • City of Ottawa • Town of Almonte • Township of Beckwith • Township of Pakenham • Township of Ramsay • Township of Russell ***Quebec*** • City of Buckingham • City of Gatineau • City of Masson • Municipality of L'Ange-Gardien • Municipality of La Pêche • Municipality of Notre-Dame de la Salette • Municipality of Pontiac • Municipality of Val-des-Monts

6.3 Public Transit and Commuting in Ottawa, 1850 – 2000

It is impossible to effectively discuss contemporary public transit commuting trends and patterns in a particular city without first examining the historical evolution of urban development in that place. Many of the factors promoting or deterring the use of public transit for commuting purposes in Ottawa can be traced to planning and development decisions that have been made as long ago as the early 1800s. Accordingly, the purpose of this section is to present an overview of how public transit commuting has evolved in Ottawa since its founding in 1826.

6.3.1 Public Transit Commuting up to World War II

Between 1826 and 1857 most employment in Ottawa was found in and around the lumber mills located along the Ottawa River.[2] During this time Ottawa was only a small town measuring just a few square kilometres in size and, because most workers resided only a short walking distance away from their places of employment, there was little need for public transportation (Hendricks and Philpott 1985). Following Queen Victoria's selection of Ottawa as the new capital of Canada in 1857, and even more so after Confederation in 1867, governmental functions quickly became an important source of local employment. As a result, Ottawa blossomed into a city in the early second-half of the 19th century, due primarily to the considerable population growth that resulted from the arrival of Parliamentarians, civil servants and other bureaucrats (Taylor 1986).[3] Initially, most public sector jobs were found on or within close proximity to Parliament Hill in order to provide easy accessibility to government officials, while residences were located a short distance away. Eventually, however, population growth continued to the point where it was no longer possible to accommodate all households within easy walking distance of the urban core. Because at this time only the wealthy could afford private modes of transport, such as a horse and buggy, this led to the widespread consensus that public transportation services were required to provide commuters with physical access to their jobs from residential areas located farther away (Hendricks and Philpott 1985).

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[2] Ottawa was originally named "Bytown" in honour of Lieutenant Colonel John By, who managed the construction of the Rideau Canal between 1826 and 1832. The name was changed to Ottawa in 1855.

The need for public transportation resulted in the incorporation of the privately owned Ottawa City Passenger Railway (OCPR) in 1866. The OCPR began operation in 1870 along a four-mile route extending from New Edinburgh in the east to the Chaudiere Falls in the west, using horse-drawn streetcars in summer months and bobsleds during the winter months. The new public transit service proved to be immensely popular and, as a result, the OCPR carried almost 300,000 passengers in its first year of operation (Hendricks and Philpott 1985). Despite its popularity, however, the initial arrival of public transit in Ottawa induced little in the way of horizontal urban growth. This was primarily because the OCPR operated only within already urbanized areas and, unlike the first horse-drawn public transit services offered in many other cities, did not extend beyond the city's built-up periphery (Elliott 1981; Hauser 1985). Furthermore, the relatively slow speeds at which horse-powered streetcars or bobsleds could travel, particularly during winter months, acted as a deterrent to the extension of streetcar lines because then, as now, most commuters were generally not willing to commute for more than thirty minutes between their homes and workplaces.

Towards the end of the 19th century, Ottawa's population continued to grow along with the number of commuters travelling to and from the downtown core on a daily basis. As a result, the limitations of horse-drawn vehicles became a matter of increasing concern due to the continually growing need for public transportation (Elliott 1991). It was fortunately during the same period that electrification of streetcars had been perfected, thus enabling the operation of transit vehicles at much higher speeds and

[3] For example, the city's population almost doubled from 14,669 in 1861 to 27,412 in 1881 (Taylor 1986: 210).

without many of the limitations associated with horse-powered movement. Ottawa's public transit woes were subsequently alleviated to a great degree in 1891 when the Ottawa Electric Street Railway Company (OESR) began operations (Figure 6.2). That year, the OESR opened four lines, all of which radiated from the city's downtown core. The electrified service was an instant success, carrying over one-and-a-half million riders in its first eleven months of operation (Hendricks and Philpott 1985).[4] Two years later, the OESR took control of the OCPR and was renamed the Ottawa Electric Railway (OER).[5] Public transit ridership continued to climb, amounting to over 2.75 million passenger trips in 1893. It reached 4.1 million trips in 1895 (OC Transpo 2003), despite the city having fewer than 70,000 residents.

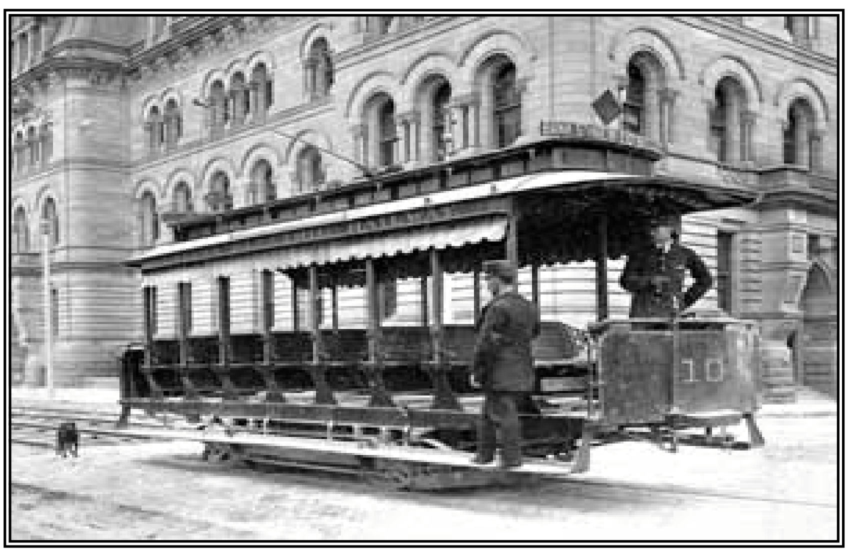

Figure 6.2 OESR Streetcar, Elgin Street, Ottawa, 1891
Source: OC Transpo 2003

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[4] The OCPR, still relying on horsepower, carried only 575,000 passengers during the same period.

[5] Unable to compete and prevented from electrifying its services by Ottawa City Council, it lasted only until 1893 before being absorbed by the OESR (OC Transpo 2003).

Much of the growth in public transit ridership in the 1890s resulted from the continuing extension of OER services (Elliott 1991). In order to augment the revenues generated by the provision of electric streetcar services within the City of Ottawa, the OER sought to create a further market for its services by establishing a number of parks and amusement areas in rural settings just outside of Ottawa's built-up area. The company's intention was to create refuges from the noise and pollution of the city that were easily accessible by public transportation, such that families would travel there to spend their valued leisure time (Hendricks and Philpott 1985). Among the parks developed at this time were Lansdowne Park (opened in 1891), the West End Park (1895) and, farthest away from the city (four miles), Britannia Park (1900) (Figure 6.3).

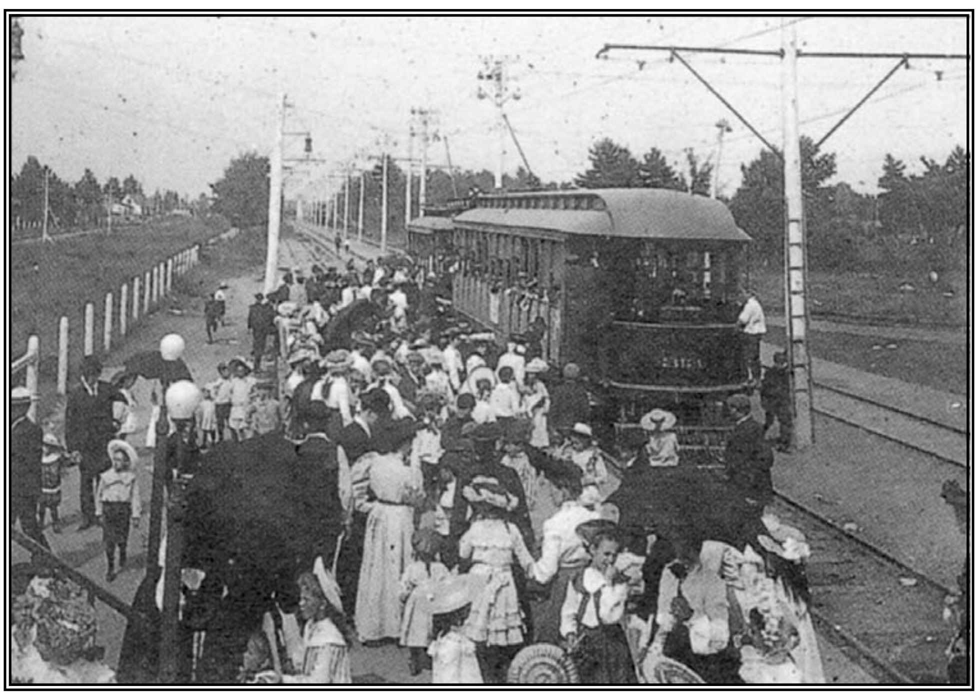

Figure 6.3 Electric Streetcar at Britannia Amusement Park, 1900
Source: RMOC 1993

Although several local historians have noted that this was not an original intention of the OER, the extension of streetcar lines also stimulated considerable residential development (Elliott 1991; Hauser 1985; Hendricks and Philpott 1985). Demand for housing adjacent to OER tracks was initially weak, however, due primarily to the perennial problem of slow winter travel speeds associated with the accumulation of snow along streetcar tracks. This problem was eventually eliminated, however, with the introduction of specially-designed electric sweepers that rested on the front of streetcars (OC Transpo 2003). This enabled faster and more efficient winter service and thus made year-round commuting from suburban settings more attractive to downtown workers. Accordingly,

> the period from 1891 to the First World War [in Ottawa] was the era of streetcar suburbs, for much of the land development that was projected during that period anticipated or followed from the extension into the countryside of electric railway lines […] Though initially intended to carry city residents out to rural recreational areas, the Bank Street, Holland Avenue, and Britannia lines soon doubled as commuter runs and stimulated a new spate of subdivisions (Elliott 1991: 175).

The impact of the OER on patterns of residential location in Ottawa is apparent in Figure 6.4, which shows the extent of urban development in Ottawa as of 1906. At that point in time, streetcar lines ran westward and southward from the downtown core, with the western line running as far as Britannia. As a result, Ottawa's early 20th century urban landscape was similar to that found in many other North American centres, characterized by a compact central core from which extended a linear pattern of streetcar suburbs.

As Ottawa's population continued to grow considerably into the first decade of the 1900s, civic officials began to recognize the need for formal city planning (Taylor

1986). It responded by hiring a professional town planner, Noulan Cauchon, who in 1910 published a comprehensive plan for Ottawa. Among Cauchon's ideas were the relocation of railways away from the city centre, the creation of a segregated industrial area in the east end of Ottawa, and improvement of the city's public transportation network. Although City Council endorsed Cauchon's plan and subsequently created a town planning commission in 1921, "when it came to actually doing anything, the city fathers showed little enthusiasm. […] [By] the mid-20s and by the 1930s, council was totally uninterested" (Taylor 1986: 146).

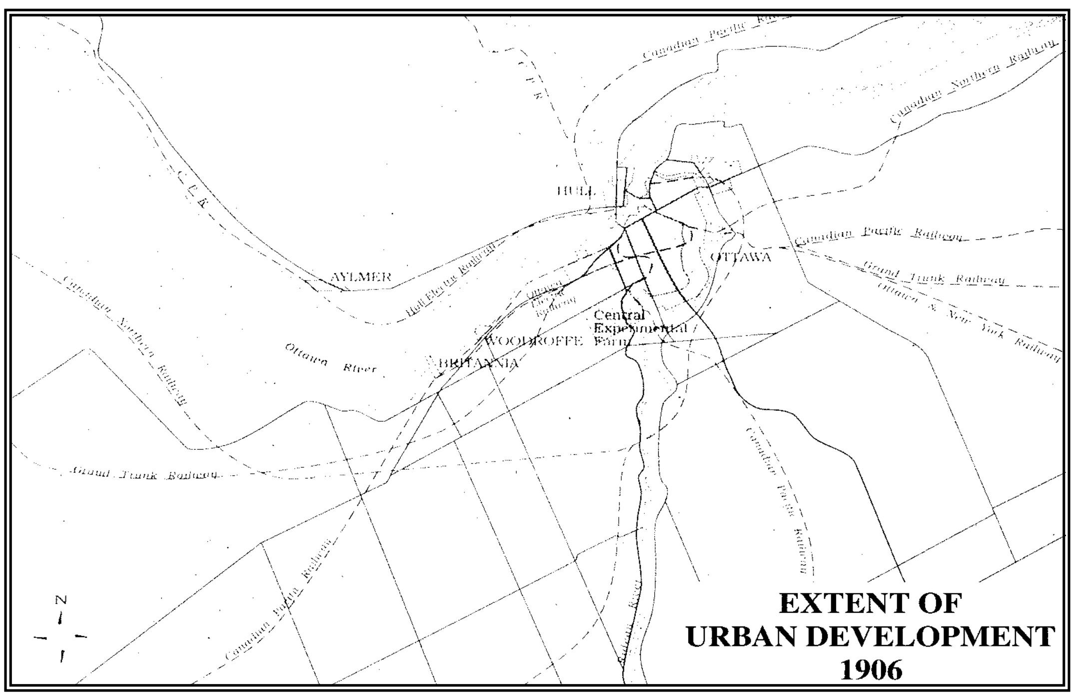

Figure 6.4 Extent of Urban Development, Ottawa, 1906
Source: Adapted from RMOC 1993

As in most North American cities, the period between World Wars I and II marked both the beginning of the end for the electric streetcar and the start of the automobile era. By 1925, Ottawa's urban population had increased to over 130,000 and much of this growth continued to concentrate along the city's streetcar lines (Figure 6.5). It was around that same year, however, that the Ottawa Electric Railway extended service on Ottawa's periphery for the last time. Although the first automobile with an internal combustion engine had appeared on Ottawa streets in 1901, there were only 400 cars registered in the city by 1912. By 1931, however, vehicle registrations amounted to 23,000 cars and 3,200 trucks (Taylor 1986: 146). Automobile ownership permitted a small but growing proportion of Ottawa households to pursue their dreams of owning homes on large lots away from the congested city, and in most cases this involved settlement in the Townships of Gloucester and Nepean, the two rural municipalities surrounding Ottawa (Coleman 1978; Elliott 1991). As a result, both Gloucester and Nepean experienced considerable population growth between the 1920s and 1940s that was driven not by the expansion of streetcar lines, but rather by the construction of housing in areas that were accessible only by automobile.

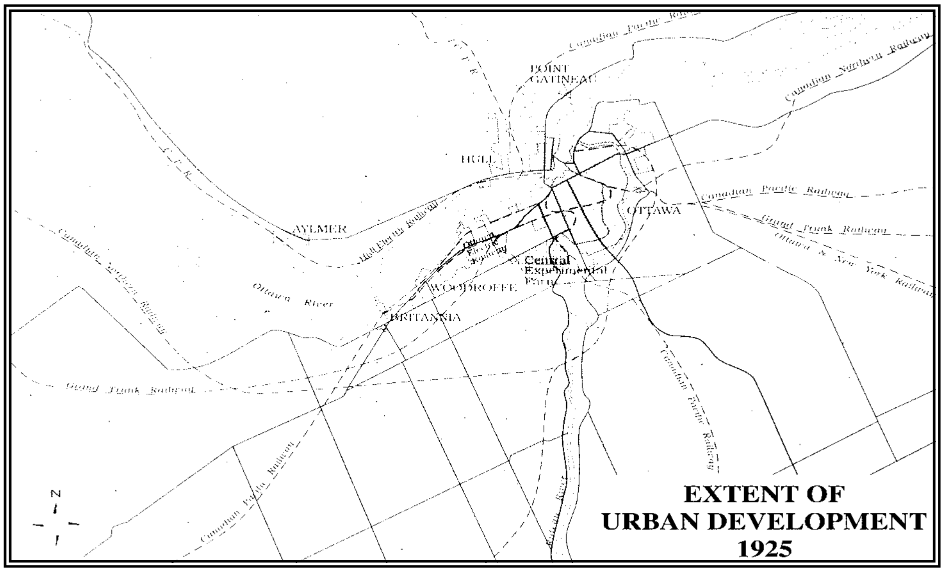

Figure 6.5 Extent of Urban Development, Ottawa, 1925
Source: Adapted from RMOC 1993

By the onset of World War II increasing concern had begun to develop about the economic inefficiency of scattered suburban housing construction. As in other settings across North America, population growth in the rural municipalities surrounding Ottawa often took the form of discontiguous development that required the use of wells and septic tanks. Over time, however, this became problematic because continued population growth brought with it the lowering of water tables and the increased risk of pollution. These issues inevitably resulted in requirements for piped water and sewage services, yet Gloucester and Nepean did not possess the tax base that would allow them to pay for the introduction of these services, nor for the schools, public transportation and other services frequently demanded by the new residents (Coleman 1978). Most commonly, the solution to this problem had been annexation of these areas by the City of Ottawa, which could then draw from its much larger property tax base and financial resources to cover the costs of providing necessary services to its new residents (Table 6.2).

Table 6.2
Land Annexations by City of Ottawa, 1887-1950

Year	Area(s) Annexed
1887	New Edinburgh
1889	Parts of Gloucester and Nepean Township, including Stewarton, Rochesterville, Mount Sherwood and Orangeville
1907	Bayswater, Hintonburg, Ottawa East, Ottawa South, Rideauville
1909	Part of Nepean Township
1911	Mechanicsville
1946	Part of Nepean Township
1947	Part of Nepean Township
1950	Parts of Gloucester and Nepean Township

Source: Adapted from Taylor 1986: 115

6.3.2 Public Transit Commuting after World War II

Despite the partial remedy provided by annexation, it was quickly realized that formal land-use planning policies and regulations would be required if further discontiguous, automobile-oriented development on Ottawa's periphery was to be prevented (Taylor 1986). At the time, however, the City of Ottawa and its neighbouring rural municipalities did not have formal planning bodies. With the rapid acceleration of population growth in the Ottawa area after 1945 and a corresponding increase in automobile ownership, the need for greater governmental control over patterns of urban development and land-use could no longer be ignored. As a result, it was in an effort to reap the benefits of the private automobile while at the same time mitigating its negative impacts that various levels of government became active players in planning Ottawa's future urban form. Actions on the part of each would bring about considerable change in terms of the viability of travelling between households and workplaces by public transit.

6.3.2.1 The Immediate Post-War Period

It was at the provincial government level that the first effort to control urban sprawl around Ottawa was made after World War II. In 1946 the Government of Ontario grouped the City of Ottawa and its surrounding townships into a Joint Planning Area and created the Ottawa Area Planning Board as a forum in which it was hoped the constituent municipalities would work together to develop well-coordinated land use and development policies. However, because provincial legislation did not *force* the municipalities to adopt compatible policies, but instead sought voluntary action on their parts, "the Ottawa Area Planning Board quickly proved ineffective due to conflicting views and differing development strategies favoured by city members versus their rural counterparts" (Hosse 1978: 94).

The failure of the Ottawa Area Planning Board prompted the City of Ottawa once again to resort to annexation as a means of promoting planned growth and development outside its municipal boundaries. Due to the rural townships' unwillingness to participate in coordinated regional planning and their continued approval of low-density subdivisions without municipal services, it had become apparent by the late 1940s that annexation of lands in Gloucester and Nepean would once more be inevitable (Coleman 1978; Gordon 2001; Hosse 1978). This time, however, the City of Ottawa sought to pre-empt the need for *future* annexations by requesting permission from the provincial government to take control of a much larger portion of land than that on which urban development had already begun. This way, the City could *plan* more efficiently for future development and its servicing, rather than constantly attempting to mitigate damage already done. Although the Province of Ontario did not allow Ottawa to annex as much land as it had sought (Gordon 2001), the annexation of 1950 ultimately resulted in Ottawa's take-over of large portions of Nepean and Gloucester Townships.

6.3.2.2 *Plan for the National Capital*, 1950

Despite the initiation of formal land use planning by the City of Ottawa, and notwithstanding a lack of constitutional authority for involvement in urban planning matters, the Government of Canada also became an active participant in the planning of Ottawa and its surrounding areas after World War II. Indeed, it was a series of actions spearheaded by the federal government that would bring about the greatest changes to Ottawa's urban form over the next two-and-a-half decades. During his tenure as Prime Minister, William Lyon Mackenzie King was eager to see Ottawa become a world-class national capital (Cox 1983; Gordon 2001), yet was troubled by what he felt to be the absence of an effective local plan aimed at achieving this vision. To rectify this perceived deficiency King invited Jacques Gréber, a renowned French architect-planner whom he had once met on a visit to Paris, to come to Ottawa where he would spearhead the development of a comprehensive master plan for the Ottawa area. Gréber arrived in Ottawa in 1945, and the project culminated in 1950 with the publishing of the *Plan for the National Capital*.

In his plan, Gréber began with a preliminary survey of local conditions. Although he expressed numerous concerns about patterns of growth in and around Ottawa, Gréber found two issues to be especially troubling: the growing prevalence of discontiguous urban development on the city's periphery, and increasing traffic congestion. In seeking to address these issues within the *Plan for the National Capital* Gréber drew much of his inspiration from the Garden City concept, first introduced by Ebenezer Howard in his

1898 book, *Tomorrow: A Peaceful Path to Real Reform*. Howard's primary motivation for creating the Garden City concept had been the deterioration of living conditions in urban and rural England during the final stages of the Industrial Revolution. With regard to urban areas, Howard was concerned about the increasing prominence of overcrowded housing and unsanitary living conditions that had developed as a result of unprecedented levels of rural-to-urban migration (Howard 1965). Howard was also concerned about rural living conditions, where residents had to contend with problems such as inadequate drainage and sanitary facilities.

Howard felt that, despite their respective problems, the city and country nonetheless possessed attributes conducive to a high quality-of-life. As a result, he argued that "town and country must be married" (Howard 1965: 48), and proposed that this could be accomplished through the planning of towns in advance of their construction so that all that was good about cities and rural areas could be combined. Howard's vision involved the development of an urban system whereby a number of functionally independent "garden cities" would surround a larger, central city (Figure 6.6). As part of his concept Howard called for the central city to house a maximum population of approximately 58,000, while garden cities would each contain a maximum population of about 32,000. Together, the urban system would house a combined population of about 350,000. [6] Howard's ultimate goal was to develop socially and economically balanced cities, places that would accommodate all classes of people and provide access to a range of employment in primary, secondary, and tertiary sectors.

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[6] Howard noted that these figures were somewhat arbitrary in nature, and would have to be modified according to individual circumstances when formally applied.

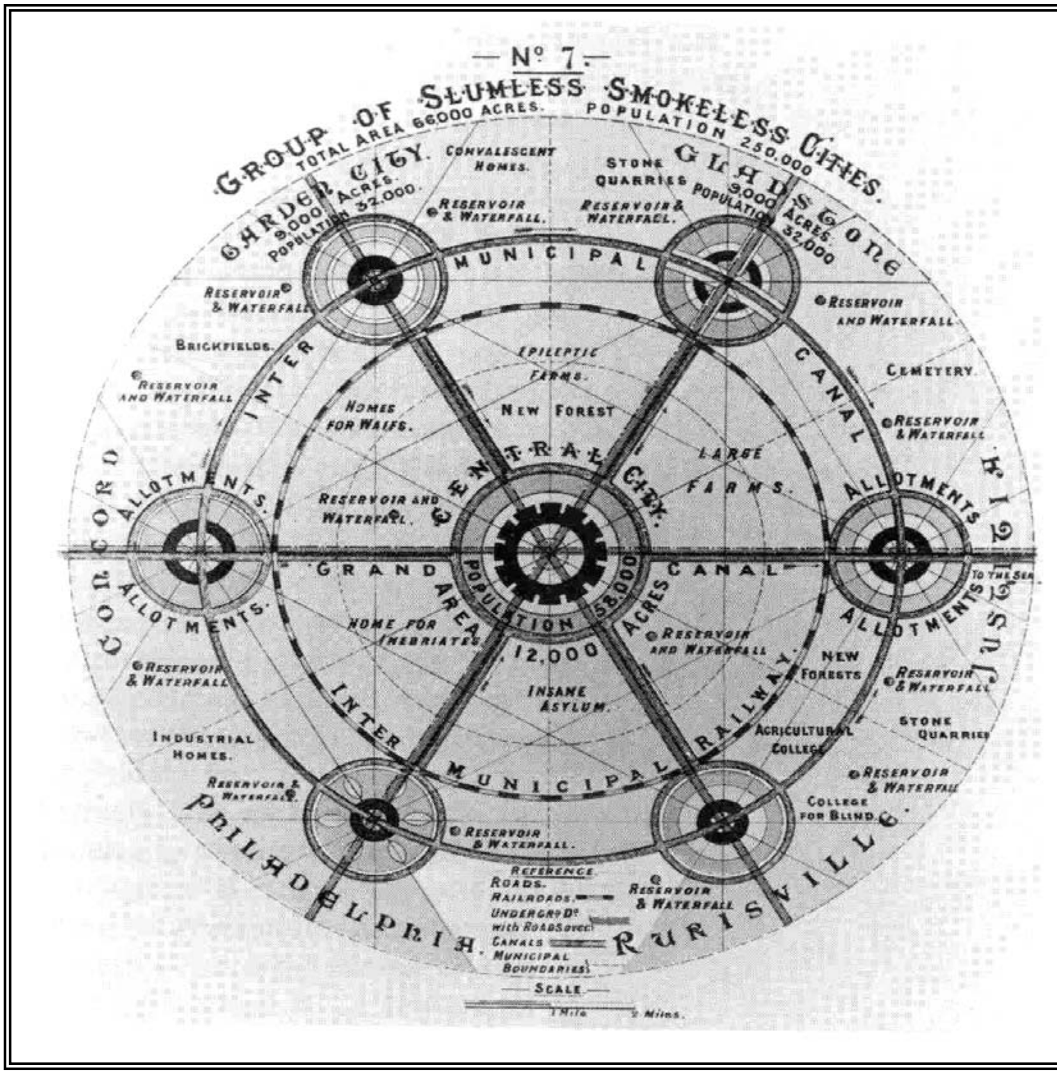

Figure 6.6 The "Garden City" Concept
Source: Howard 1898

An integral element of Howard's concept was the use of a greenbelt to separate the garden cities from the central city, and from one another (Howard 1965: 54-55). This greenbelt would measure about 4,000 acres in size and would contain facilities best suited to a rural setting such as, for example, farms, hospitals, convalescent homes, and agricultural schools. The greenbelt would also serve as an urban growth boundary, thus ensuring that the central and garden cities would remain self-contained physical entities.

In order to promote spatial interaction between the garden cities and the central city, however, the system would be tied together by an efficient, electrically powered and rail-based public transportation system.

The Garden City concept also called for the adoption of zoning techniques to assure the orderly arrangement of land uses. Within this scheme, service activities and public buildings, such as the town hall, theatre, public library, museum and hospital, would be located at a well-defined town centre, which would then serve as a community focal point. Surrounding the town centre would be a series of planned residential neighbourhoods, each with its own schools, playgrounds, gardens, and churches. Furthermore, the outer edges of the city would provide a location for factories and railways, thus ensuring the separation of incompatible uses.

It is clearly evident in reviewing the *Plan for the National Capital* that Gréber was strongly influenced by the Garden City idea. However, it is also clear that Gréber was very interested in accommodating the private automobile (Gordon 2001). He ultimately hoped the *Plan* would encourage the development of a well-defined urban area in which employed persons resided close to their places of work and automobile traffic circulated freely. In order to achieve these objectives, Gréber proposed several major initiatives, including:

- the creation of a greenbelt;
- the eventual creation of satellite cities;
- the removal and relocation of railway and streetcar lines; and
- the decentralization of federal government offices.

One of Gréber's most serious concerns in formulating the *Plan for the National Capital* was the disorderly conversion of rural land to urban uses on Ottawa's periphery.

It was here that he drew especially from Howard's concept by recommending the creation of a greenbelt that would halt urban sprawl in its tracks and therefore prevent the continuing urbanization of outlying rural areas. In delineating the greenbelt's potential boundaries, Gréber sought to confine future urban development to those areas where sewer and water facilities could be extended at a reasonable cost to taxpayers. He also assumed that, by restricting the supply of vacant land inside the greenbelt, high and medium density development might be encouraged therein. Based on this assumption, Gréber argued that the amount of land available inside the greenbelt would meet local needs for several decades. He wrote:

> The Master Plan shows the maximum delimitation of the future urban extension within an area amply sufficient for a total population of 500,000 inhabitants, a figure which is merely indicative, the anticipated densities being based on data covering existing conditions, but eventually subject to modification in relation to the likely increase of multiple dwellings and apartments replacing single family dwellings. It is thus possible to envisage the eventual population reaching without inconvenience 600,000 within the limits of the agglomeration defined in the plan (Gréber 1950: 191).

Despite this assertion, Gréber was fully aware that the supply of land available for urban development inside the greenbelt would eventually be exhausted. He therefore proposed that several self-contained satellite cities be created outside the greenbelt's boundaries once this had occurred. Once again consistent with Howard, Gréber assumed that each satellite city would develop its own employment base and would be located far enough away from Ottawa to avoid reliance on the central city as a place of work, thus preventing cross-greenbelt commuting. While Howard's *Garden City* concept called for satellite cities to house a population of about 32,000, Gréber's proposal in the *Plan for the National Capital* was slightly more modest:

> Exterior to the rural greenbelt and at a sufficient distance therefrom to ensure the permanency of a rural frame to the future Capital, other nuclei of populations could be established in the rural zone in the form of complete self-contained communities comprising from 20,000 to 25,000 inhabitants […] (Gréber 1950: 191).

After proposing the creation of a greenbelt and satellite cities as means of preventing further urban sprawl, Gréber began to address planning matters *inside* the proposed greenbelt's inner boundary. It is in this regard that his desire to accommodate the automobile and, subsequently, that the damage caused by the *Plan for the National Capital* to the viability of commuting by public transit are most clearly manifest. One of Gréber's foremost concerns in formulating the *Plan for the National Capital* was how to deal with Ottawa's increasing traffic congestion problems, which he attributed to two key factors. First, he felt there to be a lack of adequate road space to accommodate the increasing number of cars in Ottawa. Secondly, Gréber opined that trains and streetcars were frequently impeding the movement of automobile traffic. In order to resolve these problems, he proposed that a majority of Ottawa's railway tracks – which amounted to over 100 kilometres in length in 1945 – and all of its streetcar lines be removed. Following the Garden City Concept once again, railways and their associated industrial activities would be relocated from the central city to the urban periphery. Furthermore, streetcars would be replaced by diesel buses, which in turn would travel in the same lanes as automobiles. Not only would these changes eliminate conflict between automobiles, streetcars and trains, Gréber argued, but a vast road transportation network could also be constructed along the former railroad rights-of-way in order to improve even further the circulation of automobile traffic:

> This solution of the railway problem provides opportunity for the reorganization of traffic circulation generally; railway rights-of-way which will be released will be utilized in the provision of a new system of main arteries and parkways. From this will result inestimable advantages in the amelioration and systemization of all traffic movements within the interior of and around the urban zone (Gréber 1950: 160).

The extent to which Gréber sought to accommodate automobile traffic on the vacant rights-of-way is well reflected in his conceptualization of the road transportation network that would be built following the removal of the railway lines. Figures 6.7 and 6.8 show the roadway system at the time the *Plan for the National Capital* was developed and after the construction of new parkways, highways and arterial roads, respectively. In 1950 Ottawa was already criss-crossed by a vast network of roads, yet this paled in comparison to the complexity of the system proposed for construction by Gréber.

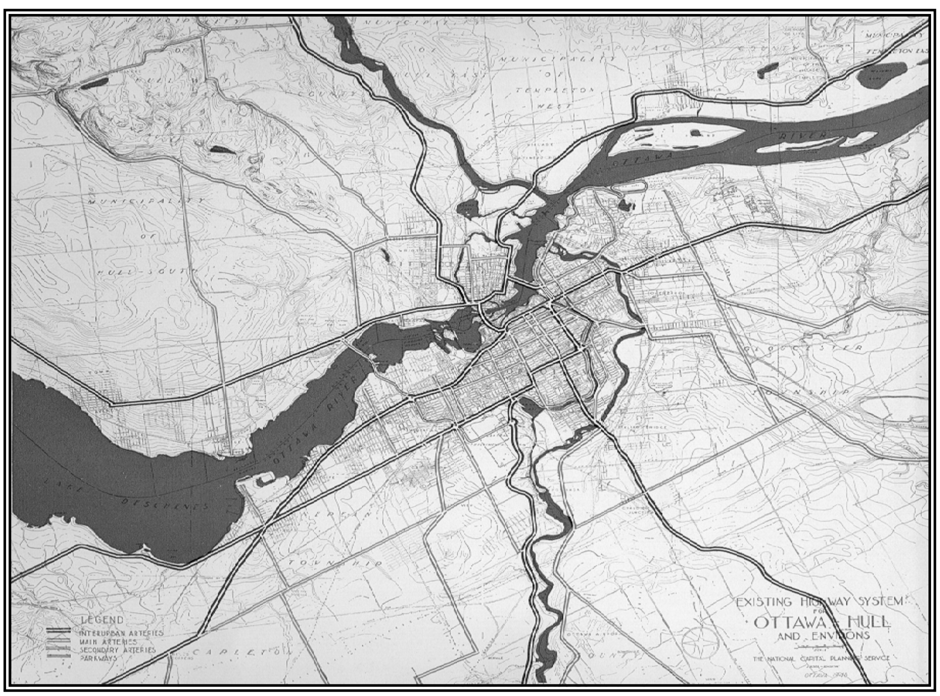

Figure 6.7 Existing Roadway System, Ottawa, 1950
Source: Gréber 1950

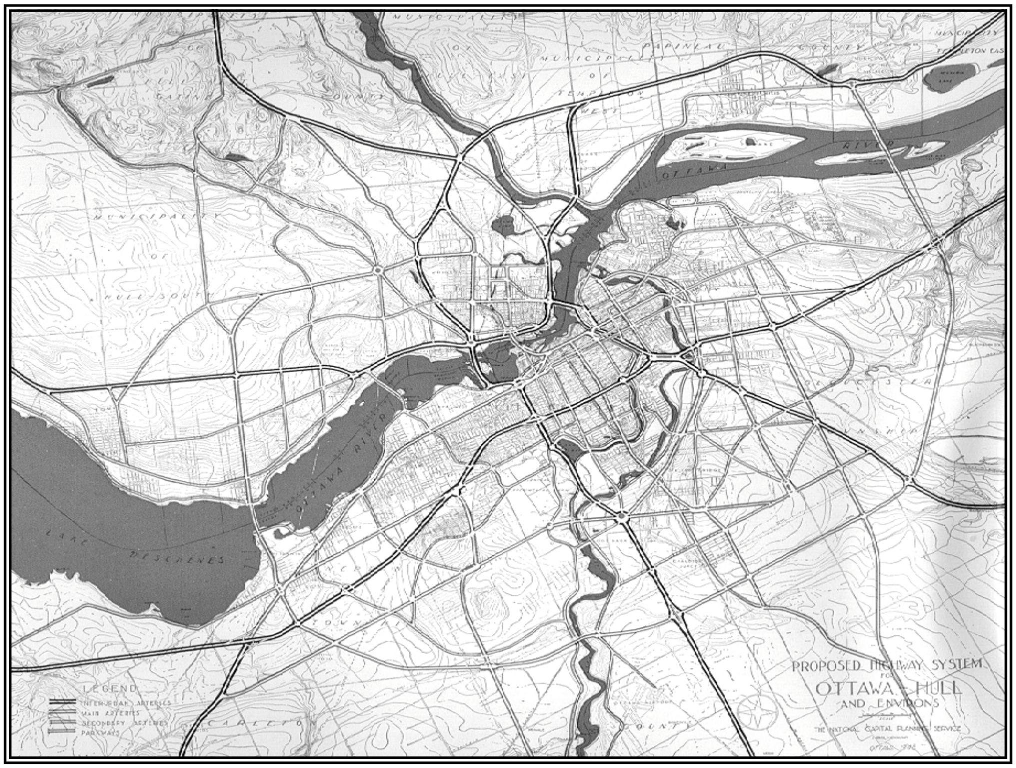

Figure 6.8 Proposed Roadway System, ***Plan for the National Capital***
Source: Gréber 1950

In sharp contrast to the amount of attention he devoted to the automobile, Gréber paid scant attention to modes of public transportation. Indeed, discussion concerning the future role of public transit in Ottawa was limited to only a three-page subsection of a document that contained hundreds of pages (Gréber 1950: 222-224). Moreover, this constituted primarily a condemnation of streetcars for their interference with automobile traffic (Figure 6.9) and the unsightly appearance of the overhead electrical wires that fueled their movement. His proposed solution was as follows:

> In order to combat and alleviate the increasing traffic congestion in central areas of the City, certain existing street car [sic] routes obviously must be rerouted and, in instances, eliminated, their replacement by bus lines being particularly recommended where routes traverse narrow thoroughfares accommodating heavy general traffic […] The substitution of buses will

> release such formerly fixed traffic lanes, and provide, therefore, two running lanes into which buses can be assimilated in common with general vehicular traffic (Gréber 1950: 222).

Although Gréber also commented that there were "sections within the urbanized area which are inadequately served, and for which provision [of public transit service] must be made" (Gréber 1950: 223), it is clear that public transportation would play a subservient role to the automobile in implementing the *Plan for the National Capital.* This is somewhat surprising given Gréber's intentions to promote efficient urban growth. Given today's views on sustainable transportation, it appears that Gréber was working at cross-purposes by encouraging decentralization and advocating widespread accommodation of the automobile, while at the same time expressing major concerns about urban sprawl.

Figure 6.9 Streetcar Traffic, Downtown Ottawa, 1950s
Photo: Dave's Electric Railroads 2003

As yet another means of reducing traffic congestion in downtown Ottawa, Gréber also made a significant recommendation concerning the location of federal government offices. Before World War II, most federal public servants worked within the Ottawa's central business district. Yet, as the size of the civil service rose dramatically through the 1940s, first to assist in the war effort and subsequently to serve Canada's rapidly growing post-war population, the increasing number of commuters was exacerbating the problem of traffic congestion in the downtown core, especially during morning and afternoon peak periods. The *Plan for the National Capital* therefore proposed that, in place of one concentrated node of employment, government office buildings should be dispersed throughout the city. Government departments and national institutions necessary for diplomatic or parliamentary purposes would be situated near Parliament Hill, while functions for which quick and convenient physical access to Parliament was not necessary would be relocated to four suburban office parks situated throughout Ottawa. The purpose of the proposed relocation was threefold. Firstly, by decentralizing government offices the amount of traffic flowing through the downtown core would be reduced. Secondly, Gréber argued that the relocation of federal government facilities would allow public servants to purchase inexpensive suburban homes within a short drive to work. Finally, he noted that this initiative would enable the demolition of many unattractive government buildings that were hastily constructed during World War II to house civil servants, which in turn would provide land for the construction of new national institutions, such as a national library and an art gallery.

In 1951, the *Plan for the National Capital* was tabled in Canada's Parliament and Jacques Gréber returned home to France. Although, interestingly, it was never formally adopted in federal legislation, the *Plan* nonetheless served as the predominant guide for physical planning within the National Capital Region throughout the next two decades (Gordon 2001). Following Gréber's departure, responsibility for implementing the *Plan for the National Capital* fell upon the Federal District Commission (FDC), which in 1959 was renamed the National Capital Commission (NCC). The ease with which the FDC, and later the NCC, was able to implement each element of the Plan depended on the government body or bodies involved. Due to the federal government's lack of constitutional authority over matters related to urban planning, implementation of other elements of the Plan required cooperation of the part of municipal governments. However, levels of cooperation varied considerably between urban and rural municipalities.

The railway and office relocation projects were easily completed because matters related to railroads and the public service lay within the federal government's jurisdictional authority. The FCC began to pursue Gréber's proposed railway relocation project even before the *Plan* was completed. Between 1950 and 1970, most cross-town railway lines were removed, a new train station was built two miles from Ottawa's downtown core (the location of its predecessor), and new rail freight-yards were built on the city's southeast fringe. At the same time, Ottawa civic officials also acted upon Gréber's proposal to remove streetcars and their tracks from city streets, with the last streetcar runs made in 1959 amidst much ceremony (Hendricks and Philpott 1985). Several arterial roads and parkways were subsequently built along the former railway rights-of-way, including the Rockcliffe Parkway, Ottawa River Parkway, and Colonel By Drive. The growing proportion of automobile commuters residing in suburban areas also benefited from the opening of the "Queensway", a multi-lane, cross-town freeway whose construction was funded by a cost-sharing agreement between the federal, provincial and municipal governments (Gordon 2001).

The federal government also followed through on Gréber's recommendation to decentralize its offices. This undertaking involved the mass construction of several office complexes throughout the Ottawa area between 1957 and 1968, many of which are shown in Figure 6.10. In the *Plan for the National Capital,* Gréber had recommended that the federal government's office decentralization project coincide with the development of residential neighbourhoods in order to provide nearby housing opportunities for public servants. This suggestion, however, was not always followed. In some cases the new facilities were indeed constructed near already established neighbourhoods, thus providing workers with the opportunity to walk to work. Such was the case with the Booth Street Complex (Figure 6.11), for example. Many other office facilities, on the other hand, were built on "greenfield" sites that were far removed from housing and public transit (Coleman 1969). Furthermore, many of the government complexes were encircled by large parking lots, thus providing further impetus to the use of private automobiles for commuting purposes. The Confederation Heights employment area (Figure 6.12) is one such example.

The City of Ottawa was generally a willing participant in many initiatives associated with the *Plan for the National Capital* due not only to its interest in promoting orderly urban growth but also to the fact that the federal government would assist in paying for many of these projects. As Taylor has noted:

> The FDC wanted to remove rail-lines from the core; the city wanted a freeway. The result was shared costs (with the province) for the Queensway, basically on the old GTR/CNR right-of-way. The city wanted a bus system; the FDC wanted streetcar lines and wires removed from the Parliament Hill area. The result was a federal contribution in the "Parliamentary Precinct". The city wanted a new Rideau Canal bridge; the FDC wanted truck traffic out of Confederation Square. The result: the Mackenzie King Bridge. The FDC wanted a better connection to proposed office expansion at Confederation Heights and, ultimately, to the airport; the city wanted better access to its southern reaches. The result was shared costs for the Bronson Bridges over the canal and the Rideau River (Dunbar Bridge). The FDC wanted better access to its building clusters in the west of the city; the city wanted a better east-west arterial. The result was the expansion of Carling Avenue (into six lanes) with federal assistance and the provision of federal land (Taylor 1986: 190).

A similar degree of cooperation, however, was not forthcoming from the rural municipalities of Nepean and Gloucester.

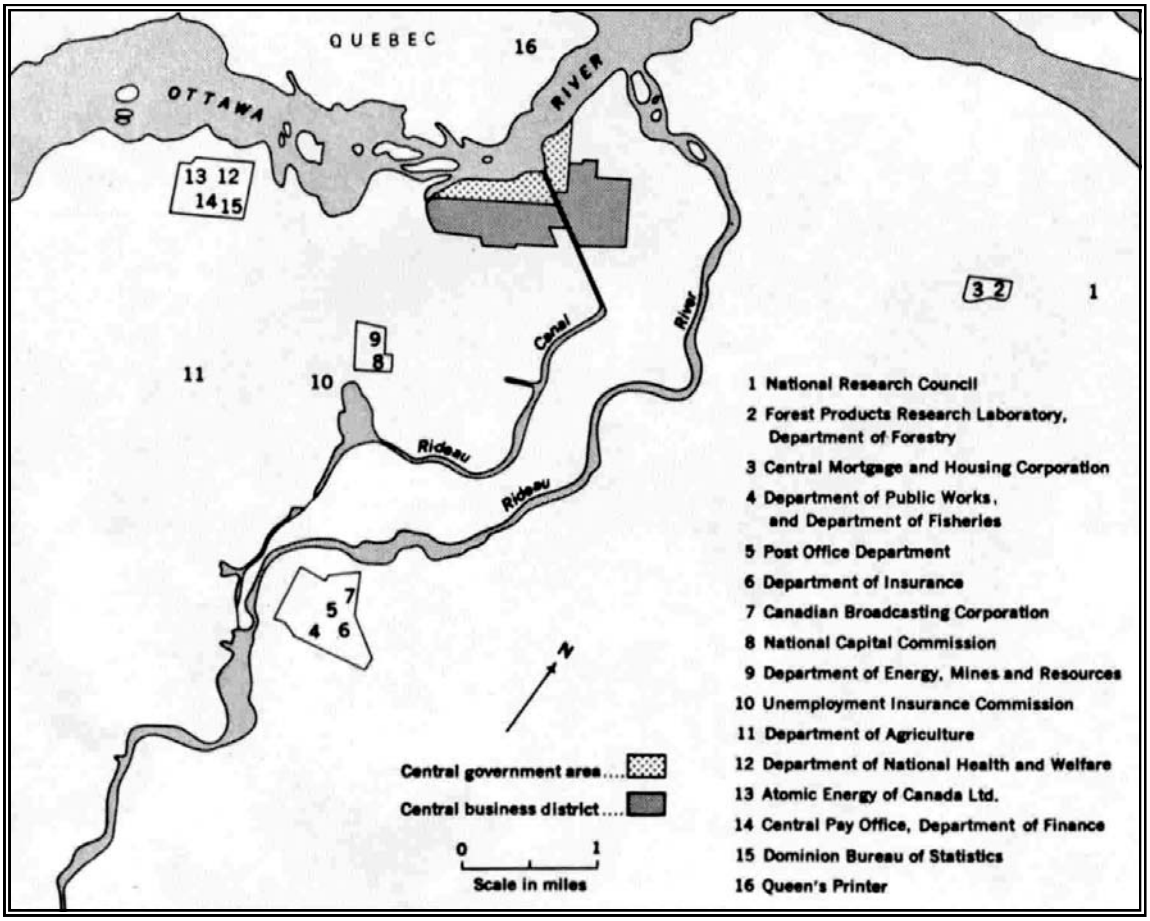

Figure 6.10 Location of Decentralized Federal Government Offices, 1969
Source: Coleman 1969: 53

Figure 6.11 Booth Street Federal Government Complex, 1969
The buildings numbered 9 and 10 coincide with the locations on Figure 6.11.
Source: Coleman 1969

Figure 6.12 Confederation Heights Federal Government Complex, 1969
The buildings numbered 4, 5, 6 and 7 coincide with the locations on Figure 6.11.
Source: Coleman 1969

The federal government also chose to follow through on the greenbelt initiative proposed by Gréber, but implementation did not begin until 1958. The assembly of greenbelt lands was complicated by the fact that the Government of Canada did not have the legal authority to do so through the enactment of zoning bylaws. As noted earlier, constitutional authority over municipal planning legislation rested with Canada's provincial governments, who had then delegated this power to the municipal level. It was therefore up to the FDC, and subsequently the NCC, to seek the cooperation of Nepean and Gloucester Townships. These municipalities, in whose jurisdiction the greenbelt would be located, were vehemently opposed to the idea of restricting development on such large proportions of their land. Already smarting from the City of Ottawa's 1950 annexation, which had taken most of their lands inside the proposed greenbelt's inner boundary, the rural townships were concerned primarily about once again losing substantial shares of their potential tax-base. As a result, Nepean and Gloucester refused to enact the zoning bylaws necessary for the creation of a greenbelt (Gordon 2001; Gyton 1999). The only remaining means by which the federal government could achieve its goal was by taking direct ownership of the necessary lands. Thus, through the purchase of some 20,000 hectares of privately-owned land and amidst considerable controversy, a greenbelt measuring 44.8 kilometres in length and averaging about four kilometres in width was fully in place by 1966 (NCC 1998).[7]

[7] Properties were often expropriated because many landowners were unwilling to sell at the price being offered by the federal government (Elliott 1991).

Despite the federal government's persistent efforts, it was apparent even before the Greenbelt was fully assembled that it would not achieve its primary purpose of containing urban sprawl. On top of their refusal to cooperate in the creation of a greenbelt by means of zoning, Nepean and Gloucester also ignored Gréber's advice about situating extra-Greenbelt development in physically isolated satellite cities. Instead, housing construction was well under way on the Greenbelt's immediate outer edges by the early 1960s (Figure 6.13). In fact, a study conducted by the NCC in 1963 showed that significant urban development was set to unfold along the eastern, southern, and western outer limits of the Greenbelt. One year later, the NCC produced a population projection (cited in Spurr 1976) that predicted the following population levels by the year 2001 if ongoing development trends continued without planning intervention: 65,000 people on the eastern outer edge of the Greenbelt; 120,000 people to the south; and 180,000 along the western edge. This problem was exacerbated by the fact that, by the early 1960s, the population of the National Capital Region had already reached 500,000, almost forty years sooner than Jacques Greber had predicted in developing the *Plan for the National Capital*.

Ironically, it was both the creation of the Greenbelt and the decentralization of federal government offices that did much to induce development outside the Greenbelt. This course of events had been accurately predicted by at least one geographer (Hosse 1960), who argued that the relatively narrow width of the greenbelt would do nothing to dampen urban dwellers' desire to reside in lower-density suburban housing developments. Only two years into assembly of the greenbelt, he wrote:

> It can be concluded that the anticipated effect of the Greenbelt may result neither in the satisfactory establishment of self-contained satellite towns, nor in a satisfactory prevention of urban sprawl. […] In the opinion of the writer, Ottawa's urban growth will ignore the 'five-minute' belt of low density, will jump it and continue its stampede across the countryside. Wherever the physical nature of the land permits, the urban spill will bubble over the two-mile rim and will eventually girdle the girdle (Hosse 1960: 40).

Hosse's prediction was accurate for two reasons. Firstly, although there was still a limited supply of land available inside the Greenbelt during the early 1960s, this was decreasing on an annual basis, thus driving up land prices and prompting further suburban development outside the Greenbelt (Spurr 1976). Secondly, many of the new dwellings constructed outside the Greenbelt were purchased by public servants who were now employed only a short distance away at Government of Canada office complexes that had been built on Greenbelt lands or in close proximity to its inner boundary, rather than in Ottawa's downtown core.[8] As a result, their commute times were not significantly extended, if at all, by the relocation of their households across the Greenbelt.

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[8] Hosse (1978: 96) notes that the greenbelt should be called a "zone of mixed uses", since it is not as free of development as originally conceived. This is primarily because ownership of greenbelt lands prompted the federal government to use substantial portions for public administration purposes, such as agricultural research stations, transportation testing grounds, and airports.

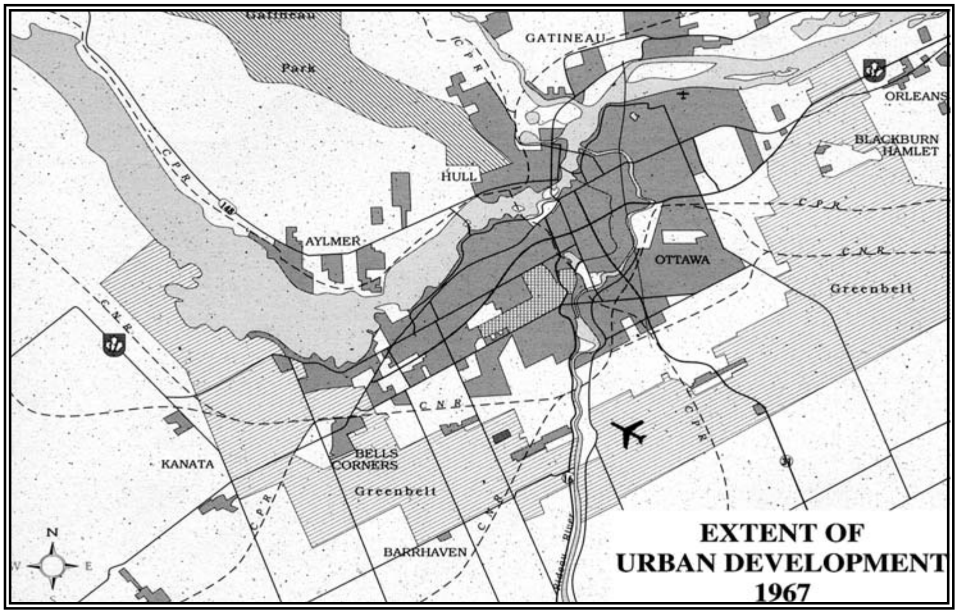

Figure 6.13 Extent of Urban Development, Ottawa, 1967
Source: Adapted from RMOC 1993

6.3.2.3 RMOC *Official Plan*, 1974

In the end, "the satellite towns suggested for development well outside the Greenbelt turned into ordinary suburbs clinging to its edge" (Gordon 2001: 54). It was in response to this continuing lack of *voluntary* inter-municipal cooperation and co-ordination in terms of planning and development that the Government of Ontario once again entered the picture, this time by creating the Regional Municipality of Ottawa-Carleton (RMOC) in 1969. Among the initial tasks set forth for the new RMOC was the creation of an official plan with which, according to the *RMOC Act* of 1968, the official plans and zoning by-laws of all lower-tier municipalities would be *required* to conform once it was adopted. As did the *Plan for National Capital* between 1951 and 1969 (the year in which it was almost completely implemented), the first regional official plan would play the key role in shaping the form and structure of urban development in the Ottawa area throughout the next two decades.

The greatest issue of concern as development of the RMOC's first official plan began in 1969 was how to deal with the Region's future population growth, given that urban development had already begun to leapfrog over the Greenbelt. Several strategies were considered as potential means of guiding future urban development within the RMOC (Figure 6.14). These can be categorized into four groups. The first option (Option I) was to promote the creation of a single, high-density core city by directing all future urban development to the area inside the Greenbelt as a means of containing urban sprawl and allowing the economically efficient provision of municipal services. The second group of options (II and III) entailed the creation of a medium-density central city with a number of satellite communities outside, but adjacent to, the Greenbelt. While these proposals contradicted Jacques Gréber's earlier proposal for the establishment of satellite cities farther away from Ottawa, Wright (1978) has provided two reasons for this decision. First, it was considered unlikely that new satellite cities could become self-contained entities with their own independent economic bases, at least in the short term. For example, the Government of Canada had completed its office decentralization project as presented in the *Plan for the National Capital* and had now adopted a policy of establishing new federal government offices across the Ottawa River in Hull, Quebec, or in different regions of Canada altogether. Second, the RMOC felt that the cost of providing municipal infrastructure, such as sewer and water services, to distant satellite cities would be prohibitive compared to the cost of simply extending such services to communities on the Greenbelt's outer edge.

The third potential means of accommodating future growth was to create a principal medium-density urban centre with fingers of development extending along transportation corridors (Options IV, V, VI on Figure 6.15). In this case the rationale was that infrastructure provision, although less efficient than in Option I, could nonetheless follow the transportation corridors in a linear pattern. Finally, two further options were posited that entailed the development of a medium-density central city along with low-density urban development scattered throughout the regional area (Options VII and VIII), which essentially amounted to the continuation of prevailing growth and development trends at the time.

Several factors were considered in the selection of which option(s) to pursue, including the availability of land for urban development, the cost of providing municipal infrastructure, and the transportation impacts of each option. Options I and II were quickly abandoned because an adequate supply of vacant land was not available inside the Greenbelt for a high-density approach to development. With only a small amount of developable land available, the creation of a compact city with development concentrated inside the Greenbelt would only have been possible through the mass demolition of several already-existing districts. This was not deemed feasible due to the deleterious impacts such drastic measures would have on the lives of local residents, such as the destruction of community cohesion and the loss of historic sites (Taylor 1978). Furthermore, it was argued that such an approach would also require the expansion of transportation routes already in place – especially roadways – in order to accommodate the larger number of travellers moving throughout the central city. Options VII and VIII were also dismissed, in this case due primarily to their low-density nature. The allowance of scattered development was considered unacceptable because it would be very expensive to provide services and facilities. These approaches were also deemed unfavourable because they promoted automobile dependence and would involve the consumption of more farmland and other natural resources.

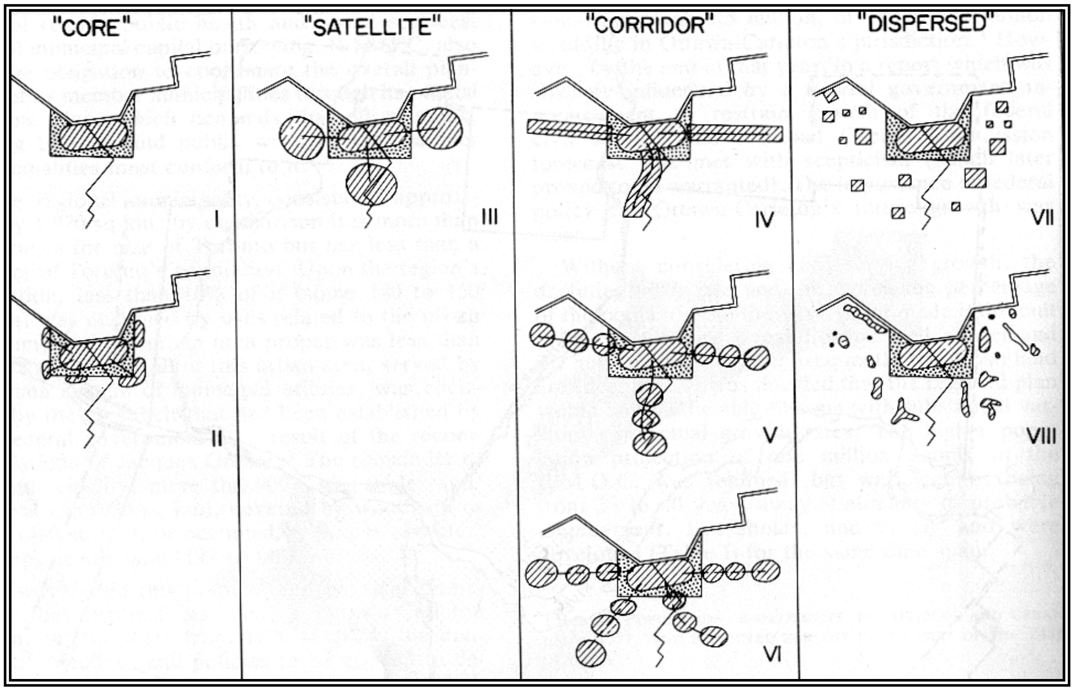

Figure 6.14 Concepts and alternatives considered for first RMOC official plan
Source: Wright 1978: 120

In the end, the RMOC elected to pursue a strategy based on elements of two remaining concepts (Options III and IV), whereby development would occur at medium densities inside the Greenbelt and further growth would be channeled to three or four communities located on the immediate outer edge of the Greenbelt (Figure 6.15). At the same time, however, each of the extra-Greenbelt communities would be separated from the others and from the central city by farmland or open space. Several motivations played a role in these decisions. First, it was argued that if development was channeled only to one extra-Greenbelt community, the cross-Greenbelt traffic flows (e.g. that carrying commuters to downtown workplaces) would have a detrimental impact on the communities located inside the Greenbelt through which they would pass. Second, it was argued that the presence of several extra-Greenbelt communities located in close proximity to one another would enable commuters to travel between these locations without having to enter the central city, thus reducing cross-Greenbelt travel flows once adequate employment bases were developed in each extra-Greenbelt community. Finally, it was also argued that movement between only a small number of extra-Greenbelt communities and the central city, and movement between the small number of extra-Greenbelt communities themselves, would facilitate the provision of an efficient public transit system.

The decision concerning where to locate the few extra-Greenbelt communities was driven primarily by patterns of land speculation. Beyond that farmland already transformed to residential and other uses through the 1950s and 1960s, developers had already begun to assemble land at several points on the outer edge of the Greenbelt. In most cases these purchases came in anticipation of future road and highway expansions; for example, the Queensway – the east-west expressway built in the 1950s on a former railway line – ran from the western, inner boundary of the Greenbelt to its eastern inner boundary. It was therefore assumed that the highway would eventually be extended across the Greenbelt, and it was thus at these points that land speculation was most extensive (Spurr 1978).

On the Greenbelt's western outer edge, Kanata-Glen Cairn (later renamed the "Kanata Urban Centre") was chosen to form the nucleus of a community that would ultimately house up to 100,000 people. The second community (later named the "Orleans Urban Centre") would be developed at Orleans-Queenswood, on the

Greenbelt's eastern edge. This community was slated to house a smaller population of somewhere between 35,000 and 50,000, however, due primarily to its more limited road access to the central city. A third community straddling the Rideau River and located to the immediate south of the Greenbelt would also be developed over time. This was tentatively called the "Southern Urban Community".

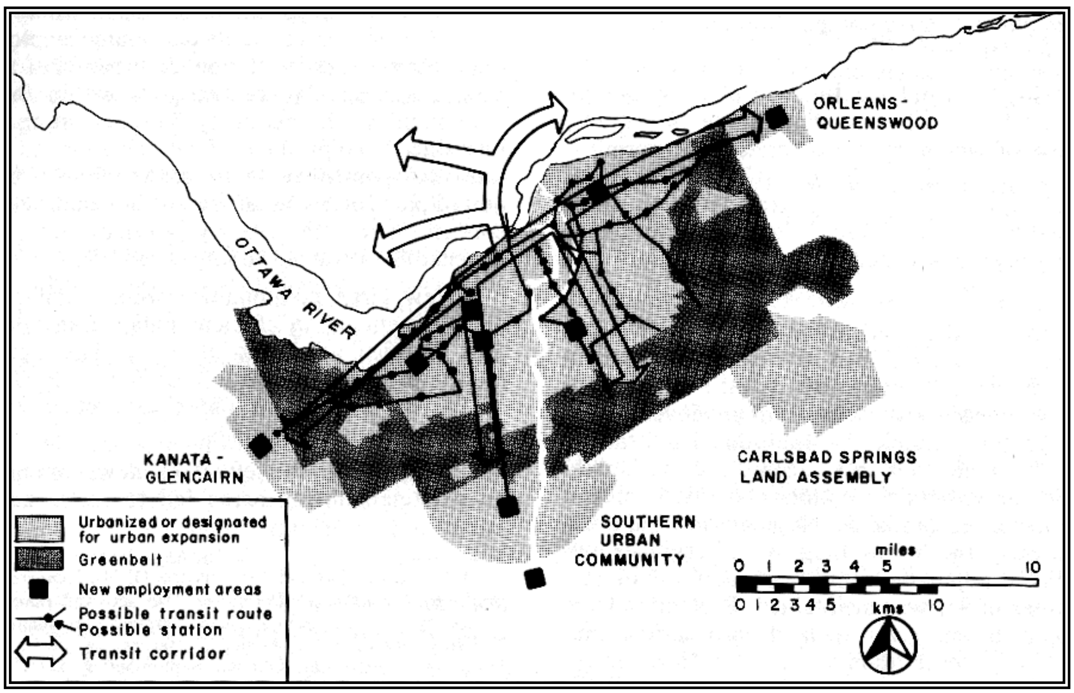

Figure 6.15 Adopted concept and urban structure plan, RMOC *Official Plan*, 1974
Source: Wright 1978: 121

A fourth area, referred to in Figure 6.15 as the Carlsbad Springs Land Assembly, was also demarcated as a potential location for future urban development. This site, located on the Greenbelt's outer edge to the southeast of Ottawa, was deemed suitable because development there would not involve the conversion of productive agricultural land to urban uses and, furthermore, because it was suitably located in relation to current and planned transportation routes (Wright 1978). At the same time, however, subsoil quality within the Carlsbad Springs Land Assembly posed somewhat of a problem. Due to the presence of soft clay with a high water content, as well as a high water table, there was a risk that urbanization of this area could have a detrimental impact on subsoil stability. Thus, although the Carlsbad Springs Land Assembly was identified in the RMOC's 1974 *Official Plan* as a site for future urban development, it ranked far lower in priority compared to the three urban centres discussed above.

It was fully realized that a decentralized approach to urban development would induce greater demands for transportation than would a more centralized approach (Hauser 1985). The RMOC therefore included three important long-term objectives in its official plan as means of mitigating this anticipated problem. Firstly, policies were adopted that sought to encourage the location of workplaces at strategic nodes located *throughout* the Region, especially within the urban centres outside the Greenbelt. It was hoped that this would provide a greater number of employees with the opportunity to reside close to their places of employment and thus to commute shorter distances. Secondly, the RMOC called for the eventual creation of a region-wide rapid transit system that would traverse the Greenbelt and link the three urban centres with the central city (shown in Figure 6.15). This, however, was proposed only in conceptual terms, and no timeline for construction was established as a result. Because the creation of a rapid transit system was a *long-term* objective, the RMOC also sought to accommodate transportation demands over the short-term. In this case, travel between the urban centres and the area inside the Greenbelt would be facilitated in two ways: first, by expanding the current road system to accommodate more automobile traffic, and second, by providing conventional bus-based public transit service. A third and final objective that would be pursued in order to alleviate traffic congestion was to encourage employers, especially the federal government with its large workforce, to stagger their working hours so that commuting trips would be distributed over a wider time frame.

Although the Region's responsibilities did not initially include the provision of public transit service, it had become clear by the early 1970s that this mode of transportation would play a key role in the achievement of region-wide planning goals. In order to provide the RMOC with direct control over public transit throughout the region's urbanized area and thus with greater ability to implement its rapid transit strategy, an amendment to the *RMOC Act* was necessary. After passage of the amendment by the provincial government in 1972, the Ottawa Transportation Commission was dissolved and replaced by the Ottawa-Carleton Regional Transit Commission (marketed as "OC Transpo").[9] The creation of OC Transpo led almost immediately to a number of service enhancements (Bernard *et al.* 1974). Firstly, new buses were purchased, new drivers were hired, and six new routes were established to serve suburban areas not yet receiving public transit service. Secondly, in 1973, a dial-a-bus service was created in three low-density suburban communities where the provision of conventional transit service was not economically feasible.[10] Finally, the RMOC also added exclusive bus lanes on several main thoroughfares in downtown Ottawa in order to grant transit vehicles priority over automobile traffic.

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[9] The Ottawa Transportation Commission was created in 1948 after the City of Ottawa purchased all assets of the Ottawa Electric Railway and assumed responsibility for public transit service within city limits.

The RMOC began to implement its rapid transit project in 1977. The ultimate decision was to construct a buses-only road network, to be called the "Transitway." As Cervero (1986) noted, the decision to rely on buses rather than light-rail vehicles constituted a departure from approaches being followed in other cities at the time but made good sense to local officials for two reasons. First, it would be less expensive to construct and operate than a light-rail system. Second, it was widely agreed that, because the need to transfer between vehicles often acts as a deterrent to the use of public transit, the bus-based system would allow commuters and other travellers residing in suburban communities to travel all the way downtown and to other destinations along the Transitway *on the same vehicle*.

The RMOC approved construction of the Transitway in 1978, and further affirmed its commitment to public transit one year later when it was faced with a funding ultimatum from the provincial government. As noted earlier, the *1974 Official Plan* called for the concurrent extension of public transit services to suburban areas *and* the expansion of existing roadways. Although the Queensway had recently been extended to reach Kanata and Orleans, it had also been proposed to further widen this expressway by adding one lane in each direction. The provincial government, however, informed the RMOC that money was available for only one project: Transitway construction or Queensway expansion (Hauser 1985). Because it was felt that expansion of the Queensway would simply encourage more people to use cars instead of public transit, regional council chose to accept funding for the Transitway project. As planned in 1978,

[10] Several years later, once population densities had sufficiently increased, dial-a-bus service in these areas was replaced by conventional, fixed-route transit service.

the Transitway would ultimately measure over thirty kilometres in length once fully complete. Fortunately, the massive road-building program proposed by Jacques Gréber in the *Plan for the National Capital* had for the most part not been completed and, as a result, regional officials were in many cases able to locate the Transitway along rights-of-way left vacant after the railway relocation initiatives of the 1960s. The first sections of the Transitway, all of which were located inside the Greenbelt's inner boundary, were open by the early 1980s (Figure 6.16).

Figure 6.16 Bus Travelling on Ottawa Transitway
Source: Williams 2003

6.3.2.4 RMOC *Official Plan*, 1988

Following adoption of the 1974 *RMOC Official Plan*, extension of the Queensway to Orleans and Kanata, and the addition of public transit service to suburban communities, an increasing proportion of urban development began to occur outside the

Greenbelt. The pace of activity in the urban centres especially began to accelerate after 1984, the year in which the supply of land designated for urban development *inside* the Greenbelt was virtually exhausted (Figure 6.17) (RMOC 1993). Levels of public transit commuting remained high in Ottawa during the late 1970s and early 1980s despite the increasing pace of housing construction and population growth in communities outside the Greenbelt. Although "the post-1970 development outside the Greenbelt [was largely in the form of] conventional suburban development with few redeeming features" (Gordon 2001: 55), the continuing popularity of public transit as a mode of travel was primarily due to continuing service improvements and the shortening of travel times associated with the opening of the Transitway (Hooper 1995).

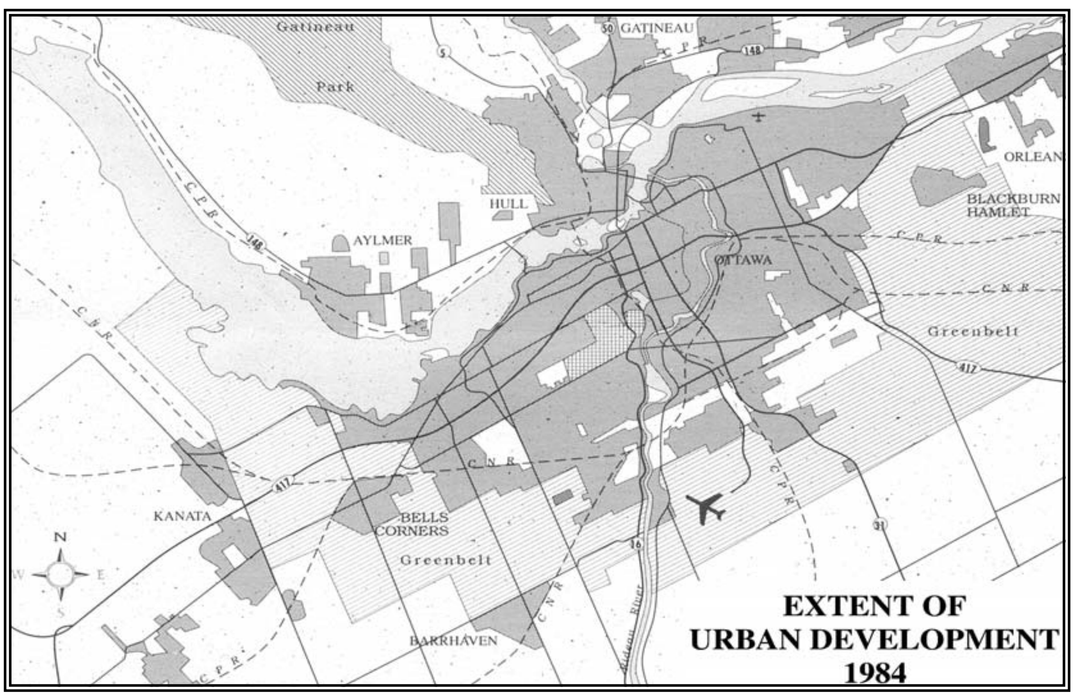
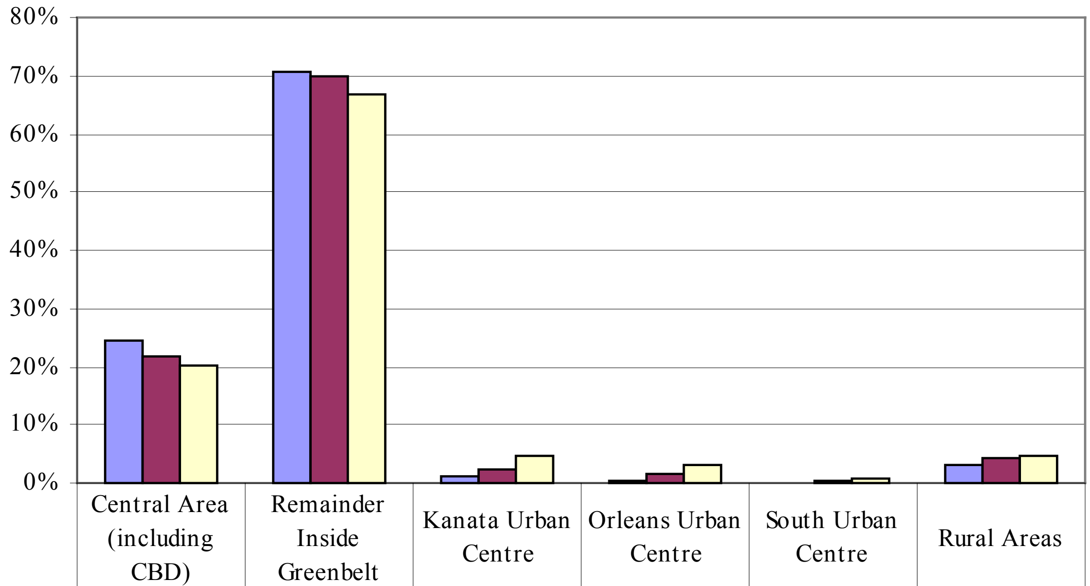


Figure 6.17 Extent of Urban Development, Ottawa, 1984
Note: The remaining unshaded areas lying inside the Greenbelt's inner boundary consisted primarily of industrial-zoned land and federal government holdings.
Source: Adapted from RMOC 1993

During the first half of the 1980s, the central business district remained the focal point of employment activity in Ottawa and, with its focus on the downtown core, the Transitway served commuters well. Public transit ridership in Ottawa reached its peak in 1985, when OC Transpo carried over 85 million passengers. During the latter half of the 1980s, however, the increasing popularity of suburban and rural employment locations began to have a considerable impact on patterns of metropolitan commuting. Between 1976 and 1986, for example, the proportion of employment in the three urban centres outside the Greenbelt rose from only 1.6% of the Ottawa total to 4.0%, while the share of jobs located in rural settings increased from 3.3% to 4.3% (Figure 6.18). At the same time, the proportion of employment located in the Central Business District fell from 24.3% to 21.8%. These shifts brought with them a significant decline in public transit ridership, which stagnated after 1985 and began a slow decline in the early 1990s.



	Central Area (including CBD)	Remainder Inside Greenbelt	Kanata Urban Centre	Orleans Urban Centre	South Urban Centre	Rural Areas
1976	24.3%	70.8%	1.1%	0.4%	0.1%	3.3%
1986	21.8%	69.9%	2.3%	1.5%	0.2%	4.3%
1996	20.3%	66.7%	4.8%	3.0%	0.6%	4.6%

Figure 6.18 Employment Distribution in Ottawa-Carleton, 1976-1996
Source: RMOC 1997a

Just as the first signs of decreasing public transit ridership became evident in the late 1980s, particularly within the context of commuting, the RMOC began the process of updating its O*fficial Plan.* Adopted in 1988, the revised plan introduced a number of new policies that sought to reverse public transit commuting trends. Although the RMOC maintained its policy of directing the bulk of urban development to the Kanata, Orleans and South Urban Centres, new policies were adopted that called for the accelerated extension of the Transitway to the three urban centres. The revised plan also designated several strategic locations at which the establishment of new employment activity would be encouraged. The first of these, Primary Employment Centres, would be located at Transitway stations in order to provide workers with convenient access to the City’s rapid transit network. Further job concentrations would also be encouraged in a series of Secondary Employment Centres. Although not located directly on the Transitway, these employment areas would nonetheless receive all-day transit service in order to ensure that public transit once again represented a viable commuting option.

Dramatic population growth continued through the 1990s. Between 1991 and 1996, for example, the RMOC’s population rose by over 6% to 721,136 (Table 6.3). Not surprisingly, given the RMOC’s continuing policy of channelling development into these areas, most growth continued to flow to the three urban centres outside the Greenbelt (Figure 6.19). For example, Kanata’s population increased by 28% between 1991 and 1996, making it one of Canada’s fastest growing cities during that period. Significant population also continued to occur east of the Greenbelt, in the Orleans Urban Centre. For example, the population of Cumberland Township (in which much of this urban centre was located) rose by 16% over the same five-year period. In contrast, the City of Ottawa’s population grew by only 3%, while the number of residents in Vanier and Rockcliffe Park actually fell by 5% each.

Table 6.3
Population Change, Regional Municipality of Ottawa-Carleton, 1991-1996

Municipality	Area (Km^2)	Population, 1991	Population, 1996	% Change
Village of Rockcliffe Park	2	2,113	1,995	-5.6
City of Vanier	3	18,150	17,247	-5.0
City of Ottawa	110	313,987	323,340	3.0
City of Gloucester	294	101,677	104,022	2.3
City of Nepean	217	107,627	115,100	6.9
City of Kanata	132	37,344	47,909	28.3
Township of Cumberland	316	40,697	47,367	16.4
Township of Rideau	409	11,778	12,444	5.7
Township of Goulbourn	271	16,151	19,267	19.3
Township of West Carleton	623	14,647	16,541	12.9
Township of Osgoode	380	13,976	15,904	13.8
RMOC TOTAL	**2,757**	**678,147**	**721,136**	**6.3**

Source: Statistics Canada 1999b.

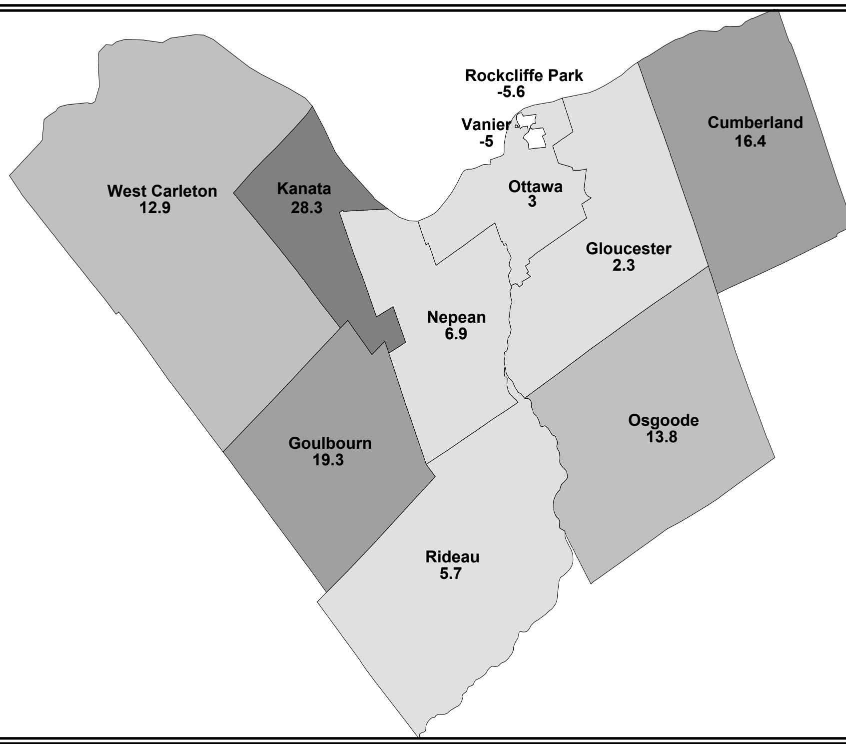


Figure 6.19 Rate of Population Change (%), RMOC, 1991-1996
Source: Table 6.2

The decentralization and dispersal of households and employment in metropolitan Ottawa brought with it a considerable impact on modes of commuting. Table 6.4 shows the 1995 journey to work modal split for several employment areas located throughout the RMOC. In the central area, for example, where parking is both limited and expensive, where public transit service is most frequent, and where all streets have sidewalks, a relatively low proportion of commuters (about 33%) travelled as a car driver. In more dispersed employment areas, most of which were heavily automobile-oriented in nature despite the RMOC's long-standing "transit-first" policies, car drivers and passengers made up very large shares of the modal split, while at the same time public transit was used far less frequently. This is particularly notable in the case of workplaces not located along or near the Transitway, especially those in the "Business and Industrial Parks" category. For example, automobile-based commuting to the Merivale Business Park (Figure 6.20), located in southwest Ottawa, stood at 95.3% in 1995, while 91.4% of workers at Nortel's Carling Avenue Campus (Figure 6.21), located within the Greenbelt, travelled by car.

Table 6.4
Mode of Travel to Work, Selected Employment Locations in Ottawa, 1995

EMPLOYMENT AREA*	MODE OF TRAVEL					
	Car Driver	Car Passenger	Public Transit	Walk	Bicycle	Other
CENTRAL AREA**	32.9%	11.0%	34.9%	18.3%	1.6%	1.3%
PRIMARY EMPLOYMENT CENTRES						
Tunney's Pasture**	52.0%	12.6%	24.3%	8.3%	1.7%	1.0%
Vanier City Centre	69.1%	11.2%	12.4%	5.6%	0.4%	1.3%
South Keys**	74.0%	5.5%	13.7%	5.5%	0.0%	1.4%
Confederation Heights	75.0%	12.7%	7.2%	3.4%	1.4%	0.3%
Gloucester City Centre**	76.6%	7.8%	10.4%	3.9%	0.0%	1.3%
TOWN CENTRES						
Orleans Town Centre**	76.9%	8.2%	12.7%	1.5%	0.0%	0.7%
Kanata Town Centre**	77.1%	6.3%	10.4%	2.1%	0.0%	4.2%
BUSINESS AND INDUSTRIAL PARKS						
National Research Council	75.2%	8.3%	5.5%	1.8%	8.3%	0.9%
South Walkley Industrial	83.7%	8.4%	4.7%	1.8%	1.1%	0.3%
Carling Avenue – Nortel	85.6%	5.8%	5.8%	1.0%	0.3%	1.6%
Kanata South Business Park	88.1%	3.7%	4.4%	3.7%	0.0%	0.0%
Merivale Business Park	88.1%	7.2%	3.5%	0.4%	0.4%	0.4%
Queensway Industrial	92.3%	4.6%	1.5%	1.5%	0.0%	0.0%
MAJOR COMMUNITY FACILITIES						
University of Ottawa**	52.6%	9.8%	14.9%	20.1%	2.1%	0.5%
Ottawa Health Sciences Centre	71.8%	13.0%	8.2%	5.3%	1.3%	0.3%
REGIONAL-SCALE RETAIL						
Bayshore Shopping Centre**	53.3%	13.0%	25.0%	7.6%	0.0%	1.1%
Lincoln Fields Shopping Centre**	60.0%	17.5%	5.0%	17.5%	0.0%	0.0%
St. Laurent Shopping Centre**	67.1%	10.6%	18.6%	3.7%	0.0%	0.0%

*** Location of these employment areas can be seen in Figure 6.23.**
**** Denotes locations adjacent to, or within walking distance of, a Transitway station.**

Source: JACPAT 1995

Figure 6.20 Merivale Business Park, Suburban Ottawa, 2001
Photo: C. Fullerton

Figure 6.21 Nortel Carling Campus, Suburban Ottawa, 2001
Photo: C. Fullerton

6.3.2.5 RMOC *Official Plan*, 1997

The RMOC once again began the process of updating its *Official Plan* – unknowingly for the last time – in 1994. Although this plan was similar to Jacques Greber's *Plan for the National Capital* in that it sought to promote a livable city that was also efficiently organized, it differed considerably from the 1950 plan in terms of how these goals would be pursued. This was especially the case with regard to the priority accorded to various modes of urban transportation, including public transit. Following extensive public consultation, it was agreed that the new Regional plan should promote the development of compact communities in which travel by non-automobile modes would be encouraged. As such, the RMOC's final *Official Plan,* adopted in 1997, was guided by a Regional Development Strategy (RDS) that included the following objectives:

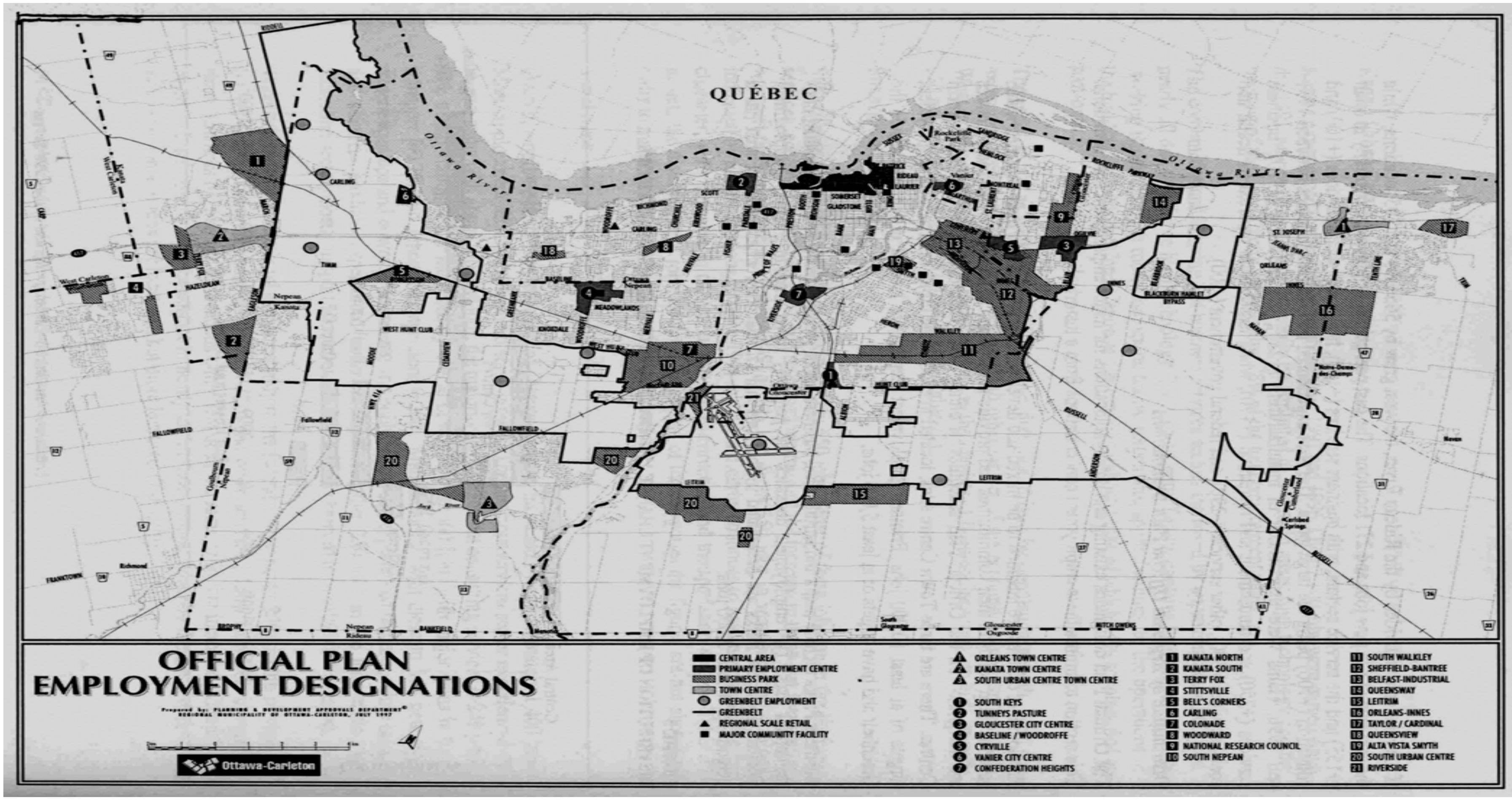
- to encourage denser, more compact and more balanced urban development
- to improve the balance of jobs and housing by encouraging new housing in urban areas outside the Greenbelt with high employment-growth potential, and in the Central and Inner Areas of Ottawa; and
- to implement a walking-, cycling- and transit-first policy as part of a balanced transportation system for auto and non-auto modes of travel that accommodates all users and minimises environmental, social and financial impacts.

In order to achieve these objectives, the *Official Plan* and the subsidiary *Transportation Master Plan* contained a number of important policies regarding both the future location of housing and employment and the provision of transportation infrastructure. With respect to housing, a policy of the *Official Plan* was to increase residential densities. Most notably, and dramatically opposed to policies contained in the

RMOC *Official Plans* of 1974 and 1988, the largest proportion of residential development during the 1997 plan's 25-year time frame was to be channelled to locations *inside* the Greenbelt. Housing construction would still be permitted in the Orleans, Kanata, and South Urban Centres; however, the proportion of dwellings to be constructed in these areas would now be much smaller than had previously been called for.

The 1997 RMOC *Official Plan* also contained numerous objectives related to the distribution of employment. Among these were: to improve the balance of jobs and housing in all areas of Ottawa-Carleton; to increase the proportion of jobs within walking distance of existing and proposed rapid transit stations; and to increase opportunities for residents to work at home. While the location of employment activities throughout Ottawa-Carleton was to be permitted, the *Official Plan* also sought to direct a *majority* of job growth to designated areas, especially the Central Area, Employment Centres and Business Parks (Figure 6.22). Furthermore, it also aimed to ensure that travel to, and within, designated employment areas could be conducted by foot, by bicycle, and by public transit, rather than solely by private automobile.

Figure 6.22
Official Plan Employment Designations, RMOC, 1997



Source: Regional Municipality of Ottawa-Carleton. 1999. *Official Plan*. Ottawa: RMOC Planning and Development Approvals Department.

The plan also sought to ensure that the Central Area remained the focal point of employment by maintaining at least 20% of total Ottawa jobs in this area. Outside the Central Area, a large proportion of job growth would be directed to Primary Employment Centres (PECs) and Town Centres. Seven locations were designated as PECs, each of which would ultimately contain a dense and broad mix of land uses, including offices, housing, shops, services and community facilities. An important objective was for each PEC to have at least 5,000 jobs by 2021. All PECs, except one in Vanier, were located along the Transitway in order to ensure that each was conveniently accessible by public transit. In the case of Town Centres, which were located in the Kanata, Orleans and the South Urban Centres, the planning objective was to create "suburban downtowns" which over time would contain various land use activities at densities higher than those found in adjacent communities. It was hoped that each Town Centre would ultimately house at least 10,000 jobs. The *Official Plan* also sought to concentrate employment at areas designated as Business Parks, which were primarily composed of industrial and office functions. Business Parks would have lower development densities than Employment Centres, but the plan nonetheless sought to ensure that basic goods and services would eventually be available within walking distance of employees' workplaces and that adequate pedestrian infrastructure would be in place to facilitate travel within these settings.

Coinciding with the development of the 1997 *RMOC Official Plan* was the creation of the region's first *Transportation Master Plan* (*TMP*) (RMOC 1997b). The *TMP* included many of the principles outlined in the Transportation Association of Canada's *New Vision for Urban Transportation*, as discussed in Chapter Two.

Accordingly, an important objective of the *TMP* was to increase the proportions of trips made by foot, by bicycle and by public transit (Box 6.1). In order to achieve this objective a guiding principle of the *TMP* was to address transportation issues by looking first at alternatives to the car, including public transit, and only as a last resort to pursue initiatives that might encourage further automobile usage. An important element of the *Transportation Master Plan* was a strategy to increase public transit's share of the modal split. With respect to commuting, the TMP sought to improve the quality of public transit service provided throughout Ottawa-Carleton, particularly to the Central Area, Employment Centres and Business Parks. It also aimed to promote and encourage transit-supportive forms of development at Transitway stations and to develop more Park-and-Ride lots.

Box 6.1
RMOC Transportation Vision and Principles

Transportation Vision

"Ottawa-Carleton will be a model region in promoting effective, affordable and accessible transportation emphasizing an increased use of public transit and other environmentally friendly modes such as walking and cycling."

Supporting Principles

1. Integrate transportation planning and land use planning to ensure that decisions about how and where development occurs within the Region will be made with a full understanding of transportation implications.

2. Evaluate transportation alternatives based on a hierarchy that looks first at alternatives to the automobile and last at increased use of the automobile, thus emphasizing non-auto dependent transportation.

3. Evaluate transportation alternatives considering all aspects of the environment and with the goal of protecting green space such as the Greenbelt, existing communities and ecosystem function.

4. Ensure that the Region's transportation system provides a range of modal choice to accommodate all users.

5. Ensure that OC Transpo [public transit] increases its share of the Regional travel market.

6. Promote policies, such as those affecting parking, that favour modes other than private automobiles.

7. Identify and consider the full costs and benefits of transportation alternatives including the Region's ability to afford them.

8. Design and implement future transportation systems to correct/avoid present problems such as avoiding urban sprawl and encouraging public transit.

9. Ensure maximum efficiency for the movement of goods and people including those related to tourism and economic development compatible with a healthy environment and healthy communities.

10. Adequately consider the relationship between the RMOC, the Outaouais, and Ontario communities adjacent to Ottawa-Carleton in the Region's transportation planning processes.

11. Design and implement transportation systems to accommodate all users.

12. Plan and design the various components of the transportation system to provide convenient integration between regional, provincial and federal transportation facilities and the various modes utilizing them.

13. Fully exploit the potential of emerging transportation technology.

14. Recognize that the RMOC is an assembly of diverse communities, rural and urban, with unique transportation requirements that must be met within the context of overall Regional transportation objectives without unduly harming other communities.

15. Pursue a transportation strategy to contribute to achievement of a region-wide 20% reduction in 1990 greenhouse gas emissions by the year 2007.

Source: RMOC 1997b.

6.3.2.6 Public Transit Commuting at the end of the 20th Century

Although the *Plan for the National Capital* and the RMOC's *Official Plan* both sought to promote efficient urban and regional planning in and around Ottawa after World War II, the proposed means of achieving this goal differed considerably. It is in these differences where the confusion between the notions of *access need* and *transportation demand* that prevailed through the latter half of the 20th century is clearly visible. The *Plan for the National Capital*, as conceived by Jacques Gréber, represents an approach to urban and regional planning that accords superiority to the automobile – and to the servicing of transportation demand – over all other means of addressing urban dwellers' access needs. The *Plan* was created during a period when automobile ownership was increasing at an unprecedented pace and, as a result, Gréber had been especially concerned about mitigating problems associated with traffic congestion. However, rather than seeking to curtail automobile use in Ottawa's downtown core by promoting the provision of a built environment conducive to travel on foot, by bicycle, or by public transportation, the *Plan for the National Capital* sought to accommodate growing demands for automobile transportation by relocating government offices to suburban settings, removing railway and streetcar tracks, and constructing an extensive intra-urban road network. Although Gréber's plan also included the creation of a greenbelt that was intended to act as a physical barrier to urban sprawl, its effectiveness was limited in large part due to a lack of co-ordination between the aforementioned office decentralization project and the development of nearby housing opportunities, and by the unwillingness of rural municipalities to direct extra-greenbelt development to distant satellite cities. With government offices relocated close to the greenbelt's inner boundary or, in some cases, directly on greenbelt lands, public servants were able to buy homes outside the greenbelt and travel short distances to work on the other side – but only by car.

In its 1974, 1988 and 1997 *Official Plans* the Regional Municipality of Ottawa-Carleton also sought to curtail urban sprawl and to prevent automobile traffic congestion. In contrast to the *Plan for the National Capital*, however, the RMOC's approach to urban and regional growth and development made more explicit the distinction between transportation demand and access need. Since its first *Official Plan* was adopted in 1974, the RMOC consistently sought to promote the use of public transit in lieu of the private automobile. By concentrating residential development in three urban centres outside the Greenbelt, by accepting provincial government funding for Transitway construction rather than for Queensway expansion, and by seeking to promote employment growth at only a few nodes that are well served by public transit, the RMOC recognized that the automobile is not the only means by which access needs can be served. The RMOC's planning goals and objectives were not always achieved, however, but this was more often due to its lack of authority at the micro-scale level (e.g. in the design of local streets, in the establishment of building setback requirements, etc.) than due to any policy weaknesses on its part. At the macro-scale level the urban structure and transportation system in place at the end of the 20th century has nonetheless provided the amalgamated City of Ottawa's planners with a suitable template upon which to implement policies related to sustainable transportation.

6.4 *Ottawa 20/20*: Planning for an Amalgamated City

Development of a new official plan for the amalgamated City of Ottawa took place between 2001 and 2003 through a process entitled *Ottawa 20/20*. While the intent at the onset of this process was to create a new document that would essentially represent a synthesis of the RMOC's *Official Plan* (which had been adopted only four years earlier) and the official plans previously in place within the former Region's eleven local municipalities, some modifications were made in order to further promote urban planning and development that reflected principles of sustainable development. The planning process culminated in May 2003 with the adoption of a new City of Ottawa *Official Plan* and a subsidiary *Transportation Master Plan*.

Ottawa's new *Official Plan* places an emphasis on maximizing accessibility. Its primary means of achieving this goal is to "[create] land-use patterns that reduce the need to travel great distances across the city and encourage alternatives to car travel" (City of Ottawa 2003: Section 2.3.1). The essence of the *Official Plan*, which is intended to guide the City's physical development to the year 2021, is perhaps best captured in Section 2.1, which states:

> Ottawa will meet the challenge of […] growth by managing it in ways that support liveable communities and healthy environments. This means that growth will be directed towards key locations with a mix of housing, shopping, recreation and employment - locations that are easily accessible by transit and that encourage walking because destinations are conveniently grouped together (City of Ottawa 2003).

In its effort to foster urban land use patterns that promote accessibility, Ottawa's *Official Plan* calls for most new development to occur in the following locations: the Central Area, Mixed-Use Centres, Employment Areas, Enterprise Areas, Developing

Communities and Mainstreets (City of Ottawa 2003: Section 2.2.3). The Central Area includes the Central Business District and neighbouring districts. The City expects substantial growth to occur in the Central Area and hopes that much of this will result in a diversified land use mix that includes increased residential development. Mixed-Use Centres are higher-density centres with a mix of land-use activities. In this case, the planning goal is to encourage further development beyond that which has already occurred and to better integrate various land use activities so that workers and nearby residents will have greater access to necessary facilities and services. Mixed-Use Centres are also intended to be highly accessible by public transit.

Two other areas designated for future development activity, Employment Areas and Enterprise Areas, are intended to house a wide range of commercial and industrial uses. This will include transportation terminals, heavy manufacturing plants, warehouses, high technology manufacturing, and institutional uses. Retail and commercial services such as restaurants and recreation facilities will also be allowed in order to serve the day-to-day needs of employees. In the case of Enterprise Areas, residential uses will also be allowed. Developing Communities, which include large tracts of undeveloped land, are located both inside and outside the Greenbelt. These sites are designated for the development of new communities or development that complements existing communities. They are also intended to develop at higher densities and with greater land use integration than that witnessed in past development activities. The final areas designated for development in the *Official Plan* are Mainstreets, located along major arterial roads in the inner city and in suburban areas.

The planning goal is to foster the intensification of land use activities in these areas so that a more densely developed form can be achieved.

The newly adopted *Official Plan* also includes a variety of measures aimed at increasing the viability of travelling by non-automobile transportation modes. As stated in Section 2.3.1, "Some residents of Ottawa already have access to quality transit, walking and biking facilities, but these transportation options need to be extended to other areas of the city." The City's desire to improve transportation choice is evident in its 2021 modal split targets for the afternoon peak period.[11] During that year, and at that time of day:

- walking should make up 10% of all person trips, up from 9.6% in 2001;
- cycling should make up 3% of all person trips, up from 1.7% in 2001; and
- public transit should make up 30% of all person trips, up from 17% in 2001.

Given the dramatic increase expected by 2021, it appears that efforts to increase public transit's share of the modal split will perhaps be the most difficult to achieve. As a result, the City of Ottawa has outlined a number of policies in its *Official Plan* and *Transportation Master Plan* that support its objective of increasing public transit ridership, some of which are listed in Box 6.2. Perhaps most importantly for the purposes of this study, many of the City of Ottawa's *Public Transit-Supportive Policies* relate very closely to the "Comprehensive Definition of Public Transit Commuter Needs" developed in Chapter Four. For example, policies have been adopted which seek to facilitate the direct routing of transit services through communities, to ensure that

[11] These targets represent the desired share of the modal split during the fall. Planners have recognized the possibility of seasonal variations, which will be marked especially

public transit users have direct access to stops and stations, to guarantee effective and efficient pedestrian and bicycle access to transit stops, and to make sure that adequate park-and-ride facilities are in place where necessary.

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by lower levels of walking and cycling in winter months and higher levels during the summer.

Box 6.2
Public Transit-Supportive Policies
Section 2.3.1, City of Ottawa *Official Plan* 2003

1. The City will protect corridors for and develop the rapid-transit network and transit-priority network. […] Rapid transit means a convenient, fast, and frequent public transportation service that features a high carrying capacity. Rapid transit operates on its own right-of-way, as a separate system or in shared corridors, and is not delayed in general traffic. […] A transit-priority network is a system of primarily arterial roads upon which transit-priority measures may be implemented to improve the quality of transit service in terms of speed and reliability.

2. The City will introduce rapid-transit quality service at an early stage in the development of new urban communities.

3. The City may acquire lands for transit rights-of-way as a condition of approval for a subdivision, severance, site plan, condominium or minor variance.

4. The City will improve the speed and reliability of transit service by providing transit-priority measures to lessen delays on transit vehicles caused by other traffic and traffic control signals.

5. In new development, the City will require that the layout of the road network be designed to facilitate transit routing and ensure reasonable walking distances to transit stops.

6. In addition to the provision of excellent pedestrian and cycling access to transit stations, the City will ensure, where feasible, the provision of separate multi-use pathways in or adjacent to rapid-transit corridors.

7. The City will pursue partnerships with the private sector to develop lands at or over transit stations and park-and-ride facilities.

8. The City will ensure the provision of park-and-ride facilities to enhance accessibility to rapid-transit services at selected stations and other appropriate sites. In this regard, the City may require that the proponents of major development at existing or planned rapid-transit stations provide sufficient land for park-and-ride facilities, for which the City may enter into agreements for purchase, rent, operation or shared use.

9. The City will work with the City of Gatineau and the federal government to improve transit service between the Cities of Ottawa and Gatineau.

10. At the time of initial development or at a later date, the City in partnership with affected parties may construct pedestrian overpasses to provide improved access to rapid-transit facilities[.]

Source: City of Ottawa 2003: Section 2.3.1

6.5 Conclusion

The viability of commuting by public transit has varied considerably throughout Ottawa's history. Before World War II, the bulk of employment was found in or near the City's downtown core and commuters were provided with an extensive electric streetcar-based public transit system that carried them conveniently between their workplaces and their homes in the central city and streetcar suburbs. Implementation of Jacques Greber's *Plan for the National Capital* through the 1950s and 1960s, along with a lack of willingness on the part of rural municipalities surrounding Ottawa to promote coordinated and efficient urban development, resulted in reduced public transit accessibility to employment for many commuters in the Ottawa metropolitan area. The removal of streetcar lines, the widespread construction of highways and parkways, the decentralization of federal government employment, and the scattered construction of housing subdivisions in the rural Townships of Nepean and Gloucester, all prompted increasing automobile dependency.

Since creation of the Regional Municipality of Ottawa-Carleton in 1969, planners and policy-makers have strived to mitigate the damage caused by these events. As part of this process, considerable efforts have been made to improve the viability of public transit commuting in Ottawa through the delineation of three extra-Greenbelt suburban communities, the construction of a rapid transit network, and the adoption of planning policies that seek to promote the development of a transit-friendly urban built environment. However, market forces have not always coincided with these efforts and, as a result, automobile dependence within the context of the journey-to-work in Ottawa has grown considerably through the 1980s and 1990s. Indications are, however, that many Ottawa residents would like to see a greater role for public transit in the future. This is most recently manifest in the City of Ottawa's adoption of a new official plan rooted in the notion of sustainable development in May 2003.

The *Official Plan*'s stated goal of promoting public transit accessibility makes this municipality a logical study area in which to test the practical utility of the *Public Transit Commuter Accessibility Audit*. The first step in ensuring that the needs of public transit commuters are adequately served is demonstrating a willingness to serve those needs. In its *Official Plan*, which is replete with objectives and policies aimed at improving the viability of commuting by public transit, the City of Ottawa has clearly indicated its desire to reduce automobile dependence within the context of the journey to work. It is hoped that the *Public Transit Commuter Accessibility Audit* will prove useful in determining whether progress is being made towards this goal.

CHAPTER SEVEN:
CASE STUDY #1 – ORLEANS TOWN CENTRE

7.1 Introduction

Conclusions regarding the practical utility of the *Public Transit Commuter Accessibility Audit* could not be drawn without first testing the tool by means of empirical application. As noted earlier in this dissertation, this resulted in the decision to apply the *PTCAA* in the form of two case studies within the City of Ottawa. This metropolitan area was chosen primarily because Ottawa's planners and policymakers have made clear their intentions of improving the viability of public transit as a transportation choice for its commuter population. The purpose of this and the following chapter is therefore to present the results of the case studies through which the practical utility of the *PTCAA* was tested.

In the first trial application of the *PTCAA*, public transit accessibility was evaluated between the communities of Queenswood Heights and Fallingbrook and the Orleans Town Centre employment area. The structure of this chapter generally coincides with the various steps involved in the *PTCAA* process, and thus begins with a brief introduction to the Orleans Town Centre. This is followed by the presentation of working hours at this employment area and, subsequently, brief profiles of the Queenswood Heights and Fallingbrook communities. The *PTCAA* results are then presented and analyzed for each of the two communities, followed finally by recommendations concerning means by which public transit commuter accessibility between the two residential subareas and the Orleans Town Centre might be improved.

7.2 Overview of Orleans Town Centre

The Orleans Town Centre employment area (Figure 7.1) is located in the Orleans Urban Centre, one of the three satellite communities situated on the Greenbelt's outer edge. A long-standing planning goal has been for the Orleans Town Centre to evolve into a suburban downtown, and thus the focal point of activity, within the Orleans Urban Centre. Accordingly, the Orleans Town Centre was classified as a "Town Centre" in the former RMOC's 1997 *Official Plan* and most recently has been designated a "Mixed-Use Centre" in the amalgamated City of Ottawa's recently-adopted official plan. Despite the different terminology, planning objectives and policies related to the Orleans Town Centre generally remain the same. In both cases, a primary objective has been to encourage the location of up to 10,000 jobs within the Orleans Town Centre over the next several decades. Although full attainment of this objective likely remains in the distant future, the Orleans Town Centre is nonetheless well on its way to becoming a major commuter destination. For example, according to the *Ottawa-Carleton Employment Survey*, a total of 3,055 people worked in the Orleans Town Centre employment area in 1996 (RMOC 1997b). (A complete list of employers is provided in Appendix Three.)

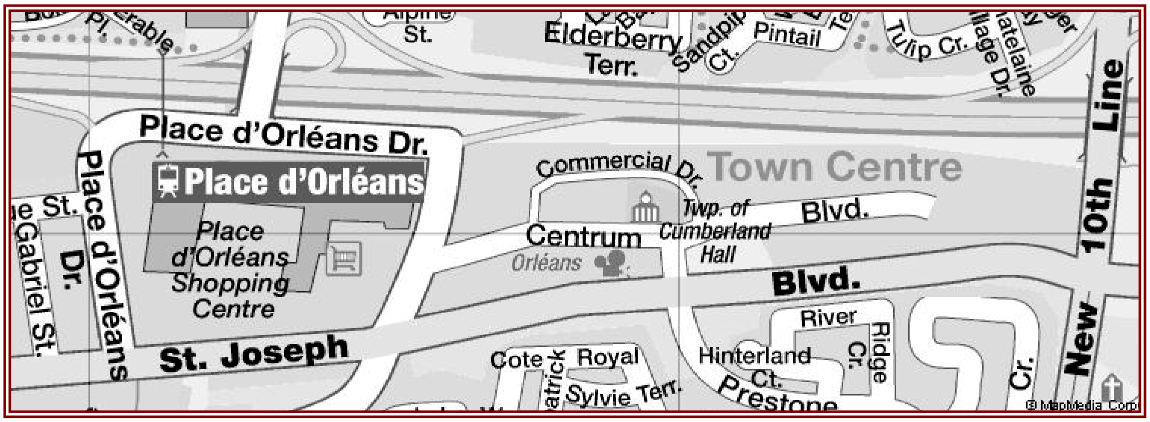

Figure 7.1 Orleans Town Centre Employment Area
Source: MapArt 2001

The largest facility within the Orleans Town Centre is the Place d'Orleans Shopping Centre, which was originally constructed in 1979 as a small community-scale shopping facility. Place d'Orleans has undergone numerous expansions over the past few decades, and today contains over 200 stores and services. It is now classified as a regional-scale shopping centre and is one of the largest retail facilities in Ontario. Apart from the Place d'Orleans Shopping Centre, the Orleans Town Centre also contains three smaller commercial developments – Place Centrum, Place d'Orleans West, and the aptly named Orleans Town Centre – as well as several stand-alone commercial facilities located along St. Joseph Boulevard to the north of Place d'Orleans.

While Place Centrum and Place d'Orleans West can generally be described as typical suburban strip malls, the layout of the smaller Orleans Town Centre shopping centre is somewhat less conventional. In the early 1980s planners and policymakers in what was then the Township of Cumberland sought to utilize the newly-constructed Place d'Orleans Shopping Centre and the impending construction of a new Township Hall as driving forces for further residential, office and commercial development in the immediate vicinity of these facilities. Rather than encouraging automobile-oriented suburban development, however, Cumberland officials sought to create a core area for the Orleans Urban Centre that would resemble a traditional, pedestrian-friendly downtown district. Their plans called for construction of the aforementioned Township Hall, shops, offices and restaurants, a farmer's market, and high-density housing (Orleans Express 1985: 1). In the two decades since this plan was first proposed, many of these ideas have come to fruition. The Cumberland Township Hall[1], several office and commercial facilities, a YMCA sports complex and numerous apartments and condominiums have been built. Several low-rise apartment buildings have also been constructed in this area, and further residential development continues to this day.

7.3 Hours of Work at Orleans Town Centre

Information concerning working hours at the Orleans Town Centre was acquired by means of a storefront survey through which hours of operation posted at the entrances to businesses were recorded. As shown in Table 7.1, employment activities transpire here from early morning to late evening, every day of the week. The storefront survey revealed that businesses open as early as 6:00 a.m. on weekdays, 7:00 a.m. on Saturdays, and 7:30 a.m. on Sundays. At the same time, some businesses close as late as midnight or 1:00 a.m. It was therefore inferred that public transit service to and from the Orleans Town Centre would ideally be provided also between the early morning and the late evening on a daily basis.

[1] This facility later became the Cumberland *City* Hall and, since the municipal amalgamation of 2001 has been used as a City of Ottawa Client Service Centre.

Table 7.1
Hours of Operation, Selected Firms and Facilities
Orleans Town Centre Employment Area, May 2001

Business/Firm	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
CAA North & East Ontario	CLOSED	0900-1730	0900-1730	0900-1730	0900-1730	0900-1730	1000-1600
Cineplex Odeon	1200-2400	1200-2400	1200-2400	1200-2400	1200-2400	1200-2400	1200-2400
City of Ottawa Service Centre	CLOSED	0800-1700	0800-1700	0800-1700	0800-1700	0800-1700	CLOSED
CS Co-op	CLOSED	0930-1700	0930-1700	0930-1700	0930-1800	0930-1700	0930-1400
Farm Boy	0900-1800	0800-2100	0800-2100	0800-2100	0800-2100	0800-2100	0800-1800
Loblaws	0900-1800	0800-2100	0800-2100	0800-2100	0800-2100	0800-2100	0700-2000
Market Fresh	0900-1800	0800-2100	0800-2100	0800-2100	0800-2100	0800-2100	0800-2100
Place d'Orleans Shopping Centre	1100-1700	0930-2100	0930-2100	0930-2100	0930-2100	0930-2100	0930-2100
Subway	1000-2300	1000-2400	1000-2400	1000-2400	1000-2400	1000-0100	1000-0100
The Bay	1100-1800	0900-2100	0900-2100	0900-2100	0900-2100	0900-2100	0800-2100
Tommy and Lefebvre	CLOSED	0900-1800	0900-1800	0900-1800	0900-2100	0900-2100	0900-1800
Wal-Mart	0800-1800	0800-2200	0800-2200	0800-2200	0800-2200	0800-2200	0800-2200
YMCA/YWCA	0730-1930	0600-2300	0600-2300	0600-2300	0600-2300	0600-2300	0730-1930
Earliest Opening Time	**0730**	**0600**	**0600**	**0600**	**0600**	**0600**	**0700**
Latest Closing Time	**2400**	**2400**	**2400**	**2400**	**2400**	**0100**	**0100**

Source: Field Observations

7.4 Residential Subareas: Queenswood Heights and Fallingbrook

7.4.1 Community Overview – Queenswood Heights

The first metropolitan subarea selected for an evaluation of public transit accessibility to the Orleans Town Centre was the community of Queenswood Heights. According to the *NCR Origin-Destination Survey*, just under 10% of Orleans Town Centre workers resided in Queenswood Heights in 1995 (JACPAT 1996). This community, which spans an area of approximately 3.5 km^2, is bordered by St. Joseph Boulevard on the north, Tenth Line Road on the east, Innes Road to the south, and the former Cumberland-Gloucester municipal boundary to the west (Figure 7.2). Although Queenswood Heights' northern boundary lies directly adjacent to the Orleans Town

Centre, the community is physically separated from this employment area by a steep ridge that makes walking between the two points difficult. This, combined with the fact that Queenswood Heights' southern boundary is located over three kilometres away from the Orleans Town Centre, implies that public transit rather than walking would be the most likely alternative to the private automobile for commuter travel between the two points. In 1995, however, no commuters living in Queenswood Heights and working within the Orleans Town Centre reported travelling by public transit; instead, 100% commuted by car as drivers or passengers (JACPAT 1996).

As discussed in Chapter Six, an important goal of the Regional Municipality of Ottawa-Carleton's 1974 *Official Plan* was to curtail urban sprawl outside the Greenbelt by directing population and employment growth to three satellite communities on the Greenbelt's outer edge. Because it had been decided to situate these communities where extra-Greenbelt development had already begun, and because housing construction had occurred in Queenswood Heights as far back as 1961 (QHCA 2001), this community was chosen as a starting point for the Orleans Urban Centre. Subsequent to this policy decision a great deal of residential construction took place between the mid-1970s and the early 1990s. For example, Queenswood Heights was composed of six houses located on a single street in 1961 (QHCA 2001), but by 1996 was home to a population of 13,499 (Statistics Canada 1999).

Queenswood Heights' built environment is similar to that of most Canadian suburban communities (Figure 7.3). The road network consists primarily of crescents and cul-de-sacs that connect to winding collector roads, while land-use patterns are primarily residential in nature. The vast majority of dwelling units in Queenswood

Heights are single-detached houses, while the remainder is primarily in the form of row houses (Statistics Canada 1999). There are also numerous parks and elementary schools dispersed throughout the community.

Figure 7.2 Queenswood Heights
Source: Yahoo! Maps 2002

Figure 7.3 Du Grand Bois Avenue, Queenswood Heights
Photo: C. Fullerton

7.4.2 Community Overview – Fallingbrook

The second metropolitan subarea selected for an evaluation of public transit accessibility to the Orleans Town Centre was the community of Fallingbrook, which is located on the eastern edge of the Orleans Urban Centre and is one of Ottawa's newest suburban communities (Figure 7.4). According to the 1995 *NCR Origin-Destination Survey*, 13.1% of all workers employed within the Orleans Town Centre were found to reside in Fallingbrook (JACPAT 1996). At the same time, however, only 8.4% of these reported commuting by public transit.

Before the new City of Ottawa was created in 2001, this area was located within the City of Cumberland. The community's history dates back only to 1985, the year in which developers began to construct the first of six neighbourhoods that are expected to hold a population of about 30,000 once fully completed (FCA 2001). Initial plans for Fallingbrook called for the provision of parks, elementary schools and local shopping facilities in each of the six neighbourhoods (Orleans Express 1986). A community core was also delineated in which an indoor, community-scale shopping centre, a high school, and a recreation complex would be constructed. Planners and policy-makers also sought to implement a mixed housing policy in Fallingbrook, and thus planned for the provision of low-, medium- and high-density housing as well as a residence for senior citizens.

Today, five of Fallingbrook's six neighbourhoods have been fully built and the sixth is currently under construction. The community's population is quickly moving towards the projected total of 30,000; for example, between 1991 and 1996 the population grew by 42%, from 13,337 to 18,994 (Statistics Canada 1999). Implementation of Cumberland's mixed housing policy has led to the introduction of a wide range of dwelling types. Although the majority of dwellings (63.9%) are single-detached houses (Figure 7.5), close to one-third are in the form of row housing and almost 7% are apartment units (Statistics Canada 1999). Most public facilities proposed in the mid-1980s have also been built. The community currently has eight elementary schools, two high schools, and a multi-purpose community centre that houses a fitness centre, a swimming pool, a daycare centre and a library. One planning objective that has not been achieved, however, relates to the provision of retail facilities. First, none of the neighbourhood-level shopping facilities have materialized and, apart from schools and parks, the community remains homogeneously residential in nature. Second, the Fallingbrook Shopping Centre has not yet been enclosed and has instead become a typical suburban strip mall. More recently, several automobile-oriented "big-box" retail facilities that were not part of the original plan for this area have been built along Fallingbrook's western and southern fringes.

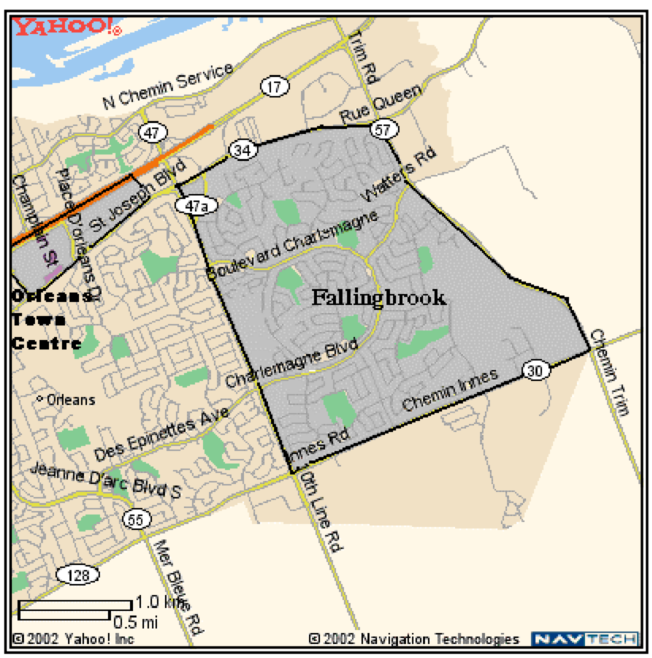

Figure 7.4 Fallingbrook
Source: Yahoo! Maps 2002

Figure 7.5 Varennes Boulevard, Fallingbrook
Photo: C. Fullerton

7.5 Discussion of *PTCAA* Findings – Queenswood Heights

7.5.1 Dimension #1: Availability of Transit Service

Although public transit service is provided between Queenswood Heights and the Orleans Town Centre seven days a week and without the need for transferring, the *PTCAA* identified numerous obstacles and deterrents related to the availability of transit service. These problems include poor route configurations, insufficient hours of service, and inadequate service frequencies. The current configuration of routes operating between Queenswood Heights and the Orleans Town Centre is a potential deterrent to public transit commuting primarily because of their circuitous nature (Figure 7.6). Although two routes *d*o provide Queenswood Heights residents with quick and direct access to and from the Orleans Town Centre (Routes #21 & #27), these operate only during weekday peak periods. Furthermore, they only travel *to* the Orleans Town Centre in the morning peak period and *from* the Orleans Town Centre in the afternoon peak period. The two other routes operate throughout the day and evening on a daily basis, but both also follow circuitous paths. Route #137 follows a one-way loop that begins at the Place d'Orleans Transitway Station, runs in a southbound direction through the eastern half of Queenswood Heights, then travels in a northbound direction through the western section of the community before returning to the Place d'Orleans Transitway Station. As a result, this route provides direct access *to* the Orleans Town Centre solely for those residing in the western half of Queenswood Heights and direct access in the *homebound direction* only for those living in the eastern part of the community. In all other circumstances, the time cost of travelling on this route would likely be unacceptable because commuters must travel *throughout* the community before reaching their intended destinations. The fourth route operating to the Orleans Town Centre, Route #130, is also very circuitous. Although this route provides commuters residing in the northern tier of Queenswood Heights with direct access to and from the Orleans Town Centre, those residing in southern sectors of the community must also travel through the neighbouring community of Fallingbrook – and thus a considerable distance out of their way – in both directions before reaching their destinations. Again, the time cost of travelling on this route would likely fall beyond acceptable levels and would therefore likely prompt anyone who has the option of travelling instead by automobile to do so.

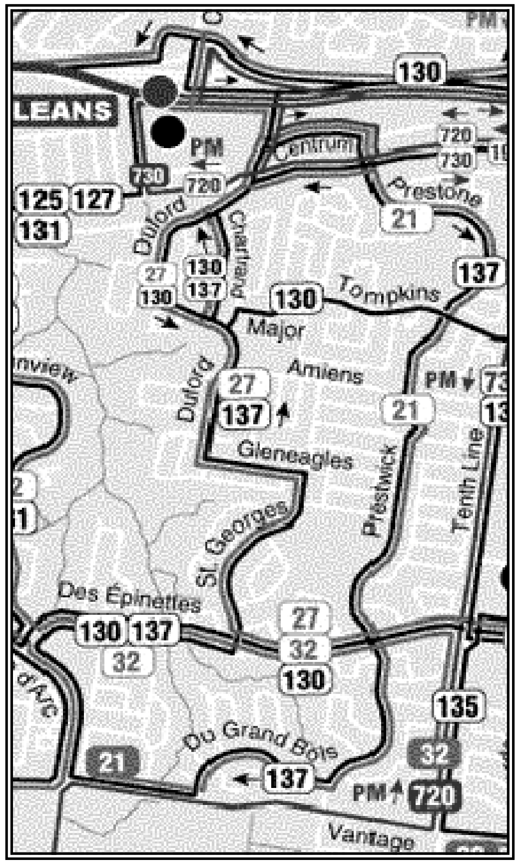

Figure 7.6 Public Transit Routes in Queenswood Heights
Source: OC Transpo 2002

As part of the *PTCAA,* transit schedules were examined in order to determine whether service hours and frequencies meet the needs of Orleans Town Centre employees. Deficiencies were identified in both cases. It was noted earlier that, based on the prevailing hours of business at the Orleans Town Centre, public transit service to and from this employment area should ideally be in place from the early morning until the late evening on a daily basis. Although transit routes' hours of operation are compatible with the working hours of *most* Orleans Town Centre employees, this is not always the case for those who begin their workdays early in the morning or who return home very late at night (Tables 7.2 and 7.3). For example, the first business to open in the Orleans

Town Centre on weekdays (the YM/YWCA) does so at 6:00 a.m. However, the first transit trip to the Orleans Town Centre from the western half of Queenswood Heights does not arrive until 6:09 a.m. and the first bus to arrive from the eastern portion of the community does not do so until 6:20 a.m. Thus, YMCA employees who reside in Queenswood Heights and begin work at 6:00 a.m. would not be able to commute by public transit because they would not be able to arrive on time. Similarly, the YMCA and the Loblaws grocery store open at 7:00 a.m. on Saturdays, but the first bus does not arrive from Queenswood Heights until just after 7:30 a.m. On Sundays, however, service is provided before the first business opens, although the time of arrival at the Orleans Town Centre is only a few minutes before opening time.

Late night workers at the Orleans Town Centre face similar constraints to the use of public transit for commuting purposes. Between Monday and Thursday transit service is available to Queenswood Heights after the last business closes for the day, and transit schedules also provide employees with adequate time to reach their stops. However, from Friday to Sunday service ends well before the last employees leave for home. On Fridays and Saturdays, the Subway restaurant in the Orleans Town Centre is open until 1:00 a.m., but transit service to Queenswood Heights ends about 30 to 45 minutes before this time. On Sundays, the last trip to Queenswood Heights departs at 11:30 p.m., but some businesses at the Orleans Town Centre remain open until midnight.

Table 7.2
Hours of Public Transit Service between Queenswood Heights and Orleans Town Centre,
May 2001

Route #	First Arrival at Orleans Town Centre from Queenswood Heights			Route #	Last Departure from Orleans Town Centre to Queenswood Heights		
	Monday-Friday	Saturday	Sunday		Monday-Friday	Saturday	Sunday
21 Downtown	6:20 a.m.	--	--	21 Orleans	6:31 p.m.	--	--
27 Hull	6:09 a.m.	--	--	27 Orleans	6:33 p.m.	--	--
130 Local North	6:52 a.m.	7:37 a.m.	8:35 a.m.	130 Local South	12:17 a.m.	12:35 a.m.	11:00 p.m.
137 Local South	6:29 a.m.	7:33 a.m.	7:20 a.m.	137 Local South	12:04 a.m.	11:40 a.m.	11:30 p.m.

Source: OC Transpo Transit Route Schedules

Table 7.3
Comparison of Business Hours at Orleans Town Centre with
Hours of Transit Service between Queenswood Heights and Orleans Town Centre,
May 2001

	Earliest Opening Time	Earliest Bus Arrival	Latest Closing Time	Latest Bus Departure
Monday-Thursday	6:00 a.m.	6:09 a.m.	12:00 a.m.	12:17 a.m.
Friday	6:00 a.m.	6:09 a.m.	1:00 a.m.	12:17 a.m.
Saturday	7:00 a.m.	7:33 a.m.	1:00 a.m.	12:35 a.m.
Sunday	7:30 a.m.	7:20 a.m.	12:00 a.m.	11:30 p.m.

Source: Table 7.1 and Table 7.2.

The frequency of public transit service has been cited as an important factor in determining a commuter's ability and/or willingness to travel by public transit, primarily due to the desire for flexibility of travel times. Although hours of transit service between Queenswood Heights and the Orleans Town Centre inadequately serve the needs of only a small proportion of workers, a potential deterrent to public transit commuting that affects a larger proportion of individuals relates to service frequencies (Table 7.4). Workers travelling to the Orleans Town Centre during weekday morning peak periods and/or returning home in weekday afternoon peak periods are well served because they have four routes to choose from at those times, thus providing a high overall frequency of service. In other time periods, however, service is provided only at 30 to 60 minute intervals and, furthermore, only by the two circuitous routes discussed earlier. As a result, many commuters must endure not only long rides on the transit vehicle, but also long waits at the transit stop. The *PTCAA* revealed this to be especially problematic for commuters travelling in the evening. For example, many businesses in the Orleans Town Centre close at 9:00 p.m. on Saturdays, yet both routes serving Queenswood Heights on this day operate only on an hourly basis after 8:30 p.m. As a result, commuters wishing to travel home on these routes must wait until almost 9:30 or later *just to board their bus*. Similarly, several businesses open between 7:30 and 9:00 a.m. on Sundays, yet transit service is provided only on an hourly basis before 10:00 a.m.

Table 7.4
Frequency of Public Transit Service between Queenswood Heights and Orleans Town Centre,
May 2001

Frequency of Service	Route #			
	21	27	130	137
Monday-Friday				
Early Morning (Before 6:00 a.m.)	--	--	--	--
Morning Peak Period (6:00-9:00 a.m.)	5-22	6-23	30	30
Midday (9:00 a.m. to 3:00 p.m.)	--	--	30	30
Afternoon Peak Period (3:00 p.m. to 6:00 p.m.)	9-26	8-32	30	30
Early Evening (6:00 p.m. to 10:00 p.m.)	--	--	30	30
Late Evening (After 10:00 p.m.)	--	--	30	60
Saturday				
Early Morning (Before 9:00 a.m.)	--	--	30	30
Midday (9:00 a.m. to 9:00 p.m.)	--	--	30	30
Late Evening (After 9:00 p.m.)	--	--	60	60
Sunday				
Early Morning (Before 10:00 a.m.)	--	--	60	60
Midday (10:00 a.m. to 9:00 p.m.)	--	--	30	30
Late Evening (After 9:00 p.m.)	--	--	60	60

Source: OC Transpo Transit Schedules

7.5.2 Dimension #2: Travel between Place of Residence and Transit Stop/Station

In examining the built environment through which Queenswood Heights residents must travel between their homes and transit stops, the *PTCAA* also revealed numerous problems that may deter public transit commuting. These included: a lack of necessary shops and services within the community; the absence of sidewalks along side streets; and poor visibility along some pedestrian pathways. As discussed in Chapter Four, a critical factor in the commuter's decision whether or not to travel by public transit concerns the availability of facilities and services required on a day-to-day basis in the vicinity of their homes. Although formal day care services are plentiful in Queenswood Heights (three facilities exist), thus addressing one of commuters' greatest concerns related to the provision of local services, the only other facilities present are a few small stores located in two strip malls. Furthermore, these are both situated near the community's eastern boundary and are therefore accessible on foot only by a small proportion of local residents. As will be discussed later, however, the lack of stores and other businesses locally is compensated somewhat by the wide variety of facilities and services available within the Orleans Town Centre employment area.

In terms of pedestrian accessibility to transit service, the *PTCAA* revealed that most, but not all, public transit commuter needs are met. Transit stops are well distributed throughout the community and can be reached directly by most workers without having to cross major arterial roadways. Access to transit stops in Queenswood Heights is facilitated by the provision of strategically located pathways that enable many commuters to reach local collector streets, where most stops are located, without having to follow the meandering road network (Figure 7.7). More problematic, however, is a lack of sidewalks on side streets. Because on-street parking is allowed and widely utilized (Figure 7.8), pedestrians who must walk along neighbourhood streets for all or part of their journeys to and from transit stops are forced to move laterally into traffic lanes when passing parked cars. Although this is compensated somewhat by low traffic volumes on local streets and a community-wide speed limit of 40 kilometres per hour, the absence of sidewalks may nonetheless be perceived by commuters as a safety concern and may therefore provide a disincentive to commuting by public transit. Where sidewalks *are* provided, they are in generally good condition and all have curb cuts to facilitate wheelchair accessibility. Field observations also revealed that all streets in Queenswood Heights are well lit after dark, thus ensuring that pedestrians are highly visible from neighbouring homes when they walk along the side of streets. This is not the case, however, with regard to the aforementioned off-street pathways. These do not always have lighting, are *not* always easily visible from neighbouring homes and often extend through open parkland, thus potentially providing opportunities for criminal activity.

Figure 7.7 Pedestrian Pathway, Queenswood Heights
Photo: C. Fullerton

Figure 7.8 Lacroix Avenue, Queenswood Heights
Photo: C. Fullerton

7.5.3 Dimension #3: Transit Stops and Stations at/near Place of Residence

There are 91 transit stops situated throughout Queenswood Heights, but no transit stations. Although all transit stops are well distributed, consistently well lighted, and located in areas that are highly visible from neighbouring homes and/or by passing traffic, most lack many amenities that have been shown to be required by commuters. For example, only nine stops have shelters and only 17 have benches; these deficiencies are especially problematic given the low frequency of transit service provided throughout much of the day and evening. Other deficiencies identified in this portion of the *PTCAA* include a lack of newspaper vending boxes (available at 21 of 91 stops) and the frequent absence of trash containers (only eight were recorded); however, when the audit was conducted all stops were found to be clean and free of litter. On the positive side, 53 of the 91 stops were found to display service information, including route maps and scheduled arrival times.

The siting of some transit stops in Queenswood Heights also represents a potential deterrent to their use. Firstly, several stops are located on the front lawns of private residences (Figure 7.9). This forces commuters to choose from two options, neither of which lends itself to a comfortable waiting experience: stand on the grass or stand on the street. Secondly, several transit stops along the southern boundary of Queenswood Heights are located on the gravel shoulder of Innes Road, a major arterial roadway on which the speed limit is 70 kilometres per hour. Not only does the speed of passing traffic and lack of sidewalks create an extremely uncomfortable waiting environment, but commuters waiting at these stops are also inconvenienced in that they cannot displace themselves laterally away from the road, due to the presence of large drainage ditches (Figure 7.10).

Figure 7.9 Transit Stop on Lawn of Private Residence, Queenswood Heights
Photo: C. Fullerton

Figure 7.10 Transit Stop along Innes Road, Queenswood Heights
Photo: C. Fullerton

7.5.4 Dimension #4: On-Vehicle Travel

Several trips were made between Queenswood Heights and the Orleans Town Centre at various times of day and on different days of the week in order to measure the servicing of public transit commuter needs related to on-board travel. Conditions were quite favourable in terms of vehicle design and accessibility, but did not necessarily reflect the circumstances that all commuters would face on a day-to-day basis. For example, on several occasions the trips took place on board low-floor buses; however, the use of low-floor vehicles on routes travelling through Queenswood Heights is not an explicit OC Transpo policy. Instead, whether a transit vehicle serving the community will be a low-floor model is more of a "hit-and-miss" affair. This begs the conclusion that commuters cannot be assured that a low-floor vehicle will arrive at the stop when they travel, and that a person requiring easy access onto the vehicle may therefore be disappointed. When low-floor buses were used, however, they also had large LED displays that clearly indicated the route number and destination. On-board the transit vehicles, conditions were consistently clean and there was never a problem finding a seat. Transit drivers were generally pleasant, and at no time were any fears for personal safety or security experienced on board the transit vehicles.

7.5.5 Dimension #5: Transit Stops and Stations at/near Place of Employment

The availability of required infrastructure, facilities and services at transit stops within the Orleans Town Centre varied considerably from place to place. The needs of Queenswood Heights commuters leaving or boarding public transit vehicles at the Place d'Orleans Transitway Station are well served, but transit stops at most other locations within the employment area lack many amenities. Place d'Orleans Transitway Station is very well lit and has heated shelters, numerous benches, a full range of service information, and a convenience store. It is also patrolled regularly by OC Transpo security personnel and has several emergency call boxes and public telephones. However, there are no public washrooms or baby change facilities in place.

The needs of commuters who must use transit stops at other locations within the Orleans Town Centre employment area are not as well served. Although all stops are well lighted and located on paved boarding areas in high-traffic (and therefore highly visible) areas, only two stops in the entire employment area apart from those at the Place d'Orleans Transitway Station have shelters and service information. All other stops consist only of a sign mounted on a pole (Figure 7.11). Given the low frequency of transit service between the Orleans Town Centre and Queenswood Heights at most times, the absence of shelters, seating, and service information no doubt poses a further deterrent to public transit travel beyond those already mentioned.

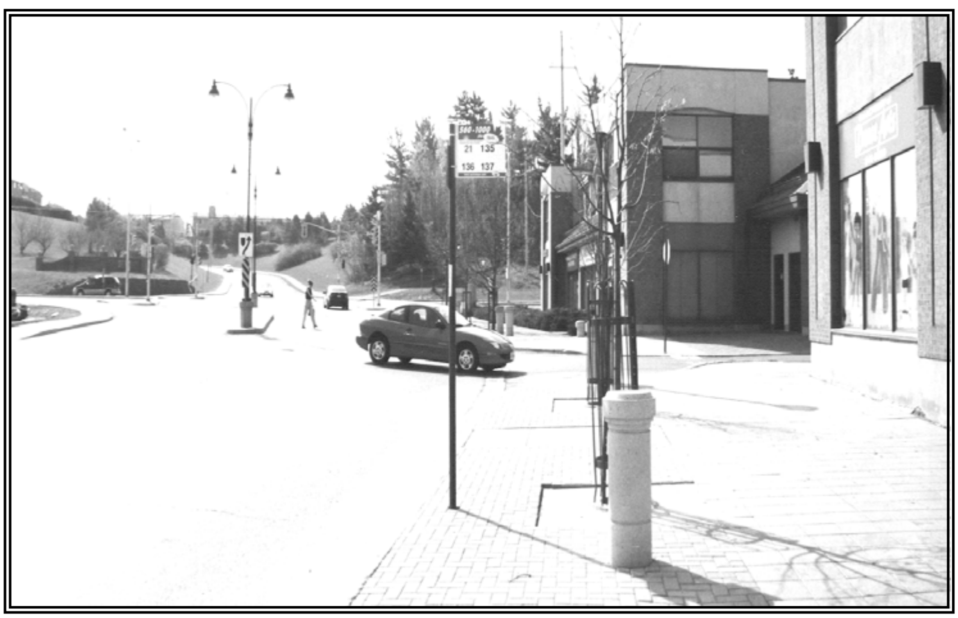

Figure 7.11 Transit Stop at Orleans Town Centre
Photo: C. Fullerton

7.5.6 Dimension #6: Travel between Transit Stop/Station and Place of Employment

The ease with which commuters can travel between transit stops and workplaces within the Orleans Town Centre depends on the specific facility at which they are employed. All public transit routes arriving from Queenswood Heights pass directly through the centre of the employment area before entering the Place d'Orleans Transitway Station and, as a result, most commuters are able to leave transit vehicles within reasonable walking distance of their workplaces. Commuters working at the Place d'Orleans Shopping Centre have the most direct access to their places of employment. The Place d'Orleans Transitway Station is located on the Place d'Orleans Shopping Centre property, and direct access between these two points is provided by a covered pedestrian bridge that can be reached by elevator or by using a well-lighted stairwell that is visible from outside (Figure 7.12).

Figure 7.12 Place d'Orleans Shopping Centre
Photo: C. Fullerton

In the eastern half of the employment area, in the vicinities of the Place Centrum and the (smaller) Orleans Town Centre office-commercial facilities, a continuous sidewalk network is in place that ensures pedestrians can travel between transit stops and workplaces without having to walk directly upon roadways. Transit routes serving this end of the Orleans Town Centre employment area are also configured in a way that prevents most workers from having to cross major thoroughfares when travelling to and from stops. The posted speed limit is 40 kilometres per hour along Centrum Boulevard (the main road passing through these developments), and pedestrian crossings are clearly demarcated with signs and distinctive paving (Figure 7.13). Furthermore, attractive landscaping also provides an aesthetically pleasant walking environment (Figure 7.14).

Figure 7.13 Pedestrian Crossing, Orleans Town Centre
Photo: C. Fullerton

Figure 7.14 Centrum Boulevard, adjacent to Place Centrum
Photo: C. Fullerton

Reaching workplaces from transit stops is not as convenient for workers employed at Place d'Orleans West, which contains a major Loblaws grocery store and several health- and wellness-related facilities. Workers here face a more unpleasant and time-consuming journey than do other Orleans Town Centre employees because they must alight from transit vehicles at the Place d'Orleans Transitway Station, cross the Transitway (Figure 7.15), walk to Place d'Orleans Drive, cross a wide and busy intersection (Figure 7.16), then (in the case of Loblaws workers) cross a large parking lot (Figure 7.17). Not only does this add considerably to the commuter's total travel time, it is also sure to represent for many commuters a very unpleasant walking environment.

Figure 7.15 Bus leaving Place d'Orleans Transitway Station
Photo: C. Fullerton

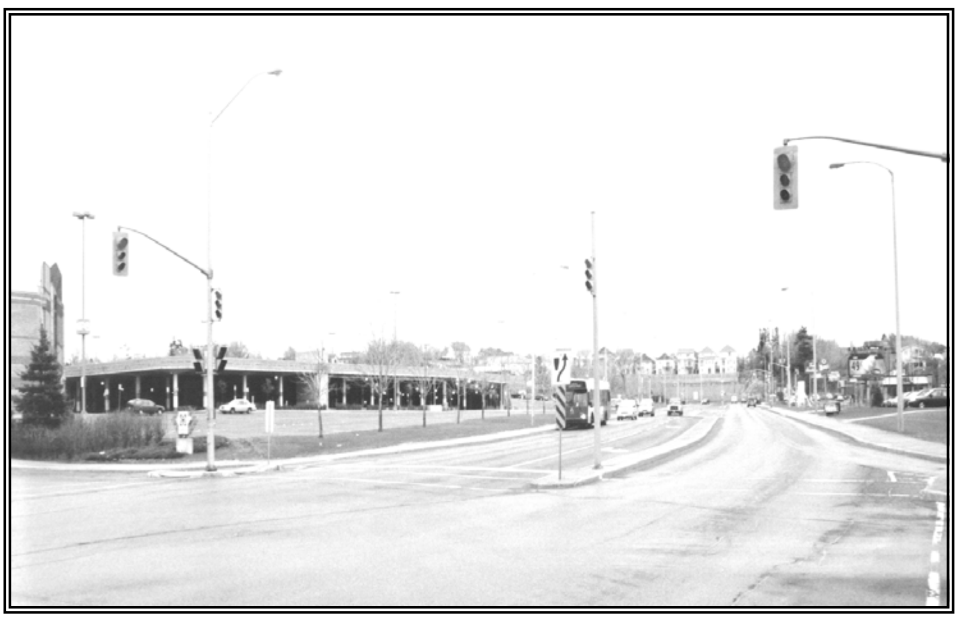

Figure 7.16 Place d'Orleans Drive West
Photo: C. Fullerton

Figure 7.17 Place d'Orleans West
Photo: C. Fullerton

7.5.7 Dimension #7: Employment Area

As noted in Chapter Four, an important function of mixed-use centres is to provide workers with opportunities to complete errands on-site – either before work, after work, or during breaks – so that travel by public transit might be viewed as a more viable commuting option. The Orleans Town Centre's long-standing designation as a mixed-use centre has resulted in the availability of most goods and services required on a day-to-day basis. Due to the large number of firms found here (as shown in Appendix Three), workers have the ability to complete tasks such as, for example, shopping for groceries, visiting physicians, taking children to daycare, or conducting banking transactions, without having to leave the employment area. For commuters residing in Queenswood Heights, this is of critical importance due to the lack of most necessary facilities and services within their home community.

Application of the *PTCAA* within the context of the Orleans Town Centre also involved the examination of facilities required by commuters who wish to combine public transit and bicycle travel. Field observations showed that storage facilities in the form of bicycle racks are provided throughout the employment area and at every major facility. However, a notable weakness is that many bicycle racks are not protected from the elements nor are they highly visible (Figure 7.18). In many cases, racks are situated in locations that cannot be seen from indoors, thus preventing individuals from monitoring their bicycles while at work.

Figure 7.18 Bicycle Rack at Place d'Orleans Shopping Centre
Photo: C. Fullerton

7.6 Public Transit Commuter Accessibility Audit Report Card – Queenswood Heights

The grades assigned to each indicator as they pertain to public transit accessibility are presented on the *PTCAA Report Card* shown on the following pages. As indicated on the *Report Card*, conditions varied considerably from one public transit commuter need to another.

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #1: Availability of Public Transit Service

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Public transit service is available within the subarea.	OC Transpo Route Map	Five transit routes serve Queenswood Heights	√				
2	Public transit service is available at the employment area.	OC Transpo Route Map	Several transit routes serve the Orleans Town Centre employment area	√				
3	Public transit service is provided directly between the subarea and employment area.	OC Transpo Route Map	Four routes travel between the two points		√			
4	If public transit is not provided directly between the subarea and employment area, commuters must only transfer once in order to reach the employment area.	N/A	Not applicable					√
5	If commuters must transfer between transit vehicles, route schedules are efficiently coordinated.	N/A	Not applicable					√
6	Public transit service is provided between the subarea and employment area on days when commuters travel.	OC Transpo Route Schedules	Service provided seven days per week	√				
7	Public transit service is provided between the subarea and employment area before, during and after employees' workdays.	OC Transpo Route Schedules	Service provided during all working hours	√				
8	Public transit service is provided between the subarea and employment area at convenient frequencies.	OC Transpo Route Schedules	Low frequency of service, ranging from 30 to 60 minutes, except during weekday peak periods		√			

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #2: Travel between Homes and Transit Stops/Stations

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Facilities and services required on a day-to-day basis are available within walking distance of homes.	Field Observations	Limited services available within Queenswood Heights at two strip malls			√		
2	Commuters can travel directly between their places of residence and transit stops/stations.	Field Observations	Most commuters have access to transit stops on or at the end of their street; pathways incorporated to provide short-cuts	√				
3	Travel routes between places of residence and transit stops/stations are aesthetically pleasant.	Field Observations	No aesthetically unpleasant surroundings observed; private and public properties well maintained	√				
4	Travel routes between places of residence and transit stops/stations are adequately lighted between dusk and dawn.	Field Observations	All streets lighted, but some pathways are not		√			
5	Travel routes between places of residence and transit stops/stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	Routes along streets are highly visible, but some pathways are not		√			
6	A continuous sidewalk network provides physical access between homes and transit stops/stations.	Field Observations	Sidewalks not provided on many collector streets nor on most cul-de-sacs; most collectors usually have sidewalks on only one side			√		

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #2: Travel between Homes and Transit Stops/Stations (continued)

		Data Source	Findings/Comments	Grade A	Grade B	Grade C	Grade DNA	Grade N/A
7	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.	Field Observations	Where provided, sidewalks are of an adequate width	√				
8	Sidewalks are in good physical condition.	Field Observations	Some cracked sidewalks, but most in good repair		√			
9	Sidewalks are designed to accommodate the needs of wheelchair users.	Field Observations	All sidewalks in place have curb cuts at intersections	√				
10	Sidewalks are promptly cleared of ice and snow.	N/A	Unclear due to conducting of PTCAA during spring				√	
11	Sidewalks are effectively cleared of ice and snow.	N/A	Unclear due to conducting of PTCAA during spring				√	
12	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.	Field Observations	Most sidewalks located immediately adjacent to roadway; only a few buffers in place		√			
13	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.	Field Observations	No obstacles to pedestrian travel observed on sidewalks, but many parked cars on roads without sidewalks		√			

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #2: Travel between Homes and Transit Stops/Stations (concluded)

		Data Source	Findings/Comments	Grade A	Grade B	Grade C	Grade DNA	Grade N/A
14	When they must cross collector and arterial roads, commuters are provided with signalized road crossing opportunities.	Field Observations	No traffic signals present within community; tempered by low traffic volumes, low-speed limits and lack of arterial roads to cross		√			
15	Road-crossing signals can be activated by pedestrians.	N/A	Not applicable					√
16	Road-crossing signals include audible signals.	N/A	Not applicable					√
17	When required to travel along collector and arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.	Field Observations	No bicycle lanes provided along collector roads			√		
18	Bicycle lanes are of an adequate width.	Field Observations	Not applicable					√

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #3: Transit Stops/Stations near the Place of Residence

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit stops and stations are located on pavement.	Field Observations	Several stops located in unpaved areas, including front lawns on private property		√			
2	Transit stops and stations are adequately lighted between dusk and dawn.	Field Observations	All streets with stops are lighted at night	√				
3	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	Most stops visible from neighbouring residences, although some adjacent to open parkland		√			
4	Trash receptacles are provided at transit stops and stations.	Field Observations	Vast majority of stops had no trash receptacle			√		
5	Transit stops and stations are clean.	Field Observations	All transit stops observed to be clean and free of litter	√				
6	Effective shelter from the elements is provided at transit stops and stations.	Field Observations	Only 9 of 82 stops had a shelter			√		
7	Seating is provided at transit stops and stations.	Field Observations	Only 17 of 82 stops had benches			√		
8	Newspaper vending machines are available at transit stops and stations.	Field Observations	Only 21 of 82 stops had newspaper vending boxes			√		
9	Service information is provided at stops and stations.	Field Observations	53 of 82 stops displayed service information		√			

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #3: Transit Stops/Stations near the Place of Residence (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
10	Public telephones are provided at transit stations.	Field Observations	No transit stations in Queenswood Heights					√
11	Emergency telephones or call boxes are provided at transit stations.	N/A	No transit stations in Queenswood Heights					√
12	Public washrooms are provided at transit stations.	N/A	No transit stations in Queenswood Heights					√
13	Baby change facilities are provided in washrooms at transit stations.	N/A	No transit stations in Queenswood Heights					√
14	Bicycle storage facilities (racks or lockers) are provided at transit stops and stations.	N/A	No transit stations in Queenswood Heights					√
15	Convenience stores and/or vending machines are located at transit stations.	N/A	No transit stations in Queenswood Heights					√

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #3: Transit Stops/Stations near the Place of Residence (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
16	When commuters must access public transit by car, park-and-ride facilities are provided at transit stations.	N/A	Access to public transit by automobile not required					√
17	An adequate supply of parking is provided at park-and-ride facilities.	N/A	Use of park-and-ride facilities not required					√
18	Park-and-ride facilities are provided free of charge.	N/A	Use of park-and-ride facilities not required					√
19	Park-and-ride facilities are adequately lighted between dusk and dawn.	N/A	Use of park-and-ride facilities not required					√
20	Park-and-ride facilities are highly visible by passing traffic and/or from adjacent buildings.	N/A	Use of park-and-ride facilities not required					√
21	Park-and-ride facilities are security monitored.	N/A	Use of park-and-ride facilities not required					√
22	Direct pedestrian access is provided between park-and-ride facilities and transit stops or stations.	N/A	Use of park-and-ride facilities not required					√
23	Park-and-ride facilities are easily accessible from adjacent roadways.	N/A	Use of park-and-ride facilities not required					√

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #4: On-Vehicle Travel

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit vehicles are universally accessible.	Field Observations	Some buses used were low-floor models; others were not but lowered to provide easier access		√			
2	Route numbers and destination are clearly visible.	Field Observations	Large-font LED displays on most newer vehicles, but older buses used low-tech signs that were less easily readable		√			
3	Adequate seating is available on transit vehicles.	Field Observations	No shortage of seating observed	√				
4	Commuters' personal safety and security is not compromised on board transit vehicles.	Field Observations	No safety or security risks observed on board vehicles	√				
5	Transit vehicles are clean.	Field Observations	Vehicles were clean and free of litter	√				
6	Transit drivers announce major stops, stations and intersections.	Field Observations	Drivers did not make any announcements			√		
7	Transit drivers are friendly and helpful when asked for assistance.	Field Observations	All drivers said “hello” when greeted, but were not asked for assistance	√				
8	Transit vehicles are equipped with bicycle racks.	Field Observations	None of the transit vehicles ridden was equipped with bicycle racks			√		

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #5: Transit Stops/Stations near the Place of Employment

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit stops/stations are located close to all workplaces in the employment area.	Field Observations	Transit routes travel to all workplaces except Place d'Orleans West and businesses on St. Joseph Blvd. north of the Place d'Orleans Shopping Centre		√			
2	Transit stops and stations are located on pavement.	Field Observations	All stops located along sidewalks	√				
3	Transit stops and stations are adequately lighted between dusk and dawn.	Field Observations	All stops are well lighted	√				
4	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	All stops located in front of buildings and along busy roadways	√				
5	Trash receptacles are provided at transit stops and stations.	Field Observations	Trash receptacles provided only at Place d'Orleans Transitway Station			√		
6	Transit stops and stations are clean.	Field Observations	All transit stops observed to be clean and free of litter	√				
7	Effective shelter from the elements is provided at transit stops and stations.	Field Observations	Shelters provided only at Place d'Orleans Transitway Station and at two other stops			√		
8	Seating is provided at transit stops and stations.	Field Observations	Shelters provided only at Place d'Orleans Transitway Station and at three other stops			√		
9	Service information is provided at transit stops and stations.	Field Observations	Service information provided only at Place d'Orleans Transitway Station and two other stops			√		
10	Newspaper vending machines are available at transit stops and stations.	Field Observations	Newspaper vending boxes provided only at Place d'Orleans Transitway Station and at three other stops			√		

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #5: Transit Stops/Stations near the Place of Employment (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
11	Public telephones are available at transit stations.	Field Observations	Public telephones available throughout Place d’Orleans Transitway Station	√				
12	Emergency telephones or call boxes are provided at transit stations.	Field Observations	Emergency call boxes available throughout Place d’Orleans Transitway Station	√				
13	Public washrooms are provided at transit stations.	Field Observations	No public washrooms available at Place d’Orleans Transitway Station			√		
14	Baby change facilities are provided in washrooms at transit stations.	Field Observations	No public washrooms available at Place d’Orleans Transitway Station			√		
15	Bicycle storage facilities (racks or lockers) are provided at transit stops and stations.	Field Observations	Bicycle racks provided only at Place d’Orleans Transitway Station			√		
16	Convenience stores and/or vending machines are located at transit stations.	Field Observations	A convenience store is located at Place d’Orleans Transitway Station	√				

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #6: Travel from Transit Stops/Stations to the Place of Employment

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Commuters can travel directly between transit stops/stations and their places of employment.	Field Observations	In most cases, yes, but commuters working along St. Joseph Blvd. north of Place d'Orleans Shopping Centre must follow circuitous routes		√			
2	Travel routes between transit stops/stations and workplaces are aesthetically pleasant.	Field Observations	No signs of neglect; buildings well maintained, free of graffiti	√				
3	Travel routes between transit stops/stations and workplaces are adequately lighted between dusk and dawn.	Field Observations	Lighting prevalent throughout employment area	√				
4	Travel routes between transit stops/stations and workplaces are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	Pedestrian routes pass in front of buildings and along busy roadways	√				
5	A continuous sidewalk network provides physical access between transit stops/stations and workplaces.	Field Observations	Sidewalks are provided throughout the OTC employment area	√				
6	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.	Field Observations	Sidewalks observed to be of adequate width	√				
7	Sidewalks are in good physical condition.	Field Observations	Sidewalks appear to be in good repair	√				
8	Sidewalks are designed to accommodate the needs of wheelchair users.	Field Observations	Curb cuts are provided at all intersections	√				

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #6: Travel from Transit Stops/Stations to the Place of Employment (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
9	Sidewalks are promptly cleared of ice and snow.	Field Observations	Unclear due to conducting of PTCAA during spring.				√	
10	Sidewalks are effectively cleared of ice and snow.	Field Observations	Unclear due to conducting of PTCAA during spring.				√	
11	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.	Field Observations	Most sidewalks located immediately adjacent to roadway; some buffers provided		√			
12	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.	Field Observations	No sidewalk obstacles observed	√				
13	When they must cross collector and arterial roads, commuters are provided with signalized road crossing opportunities.	Field Observations	All major intersections within the employment area have traffic and pedestrian signals	√				
14	Road-crossing signals can be activated by pedestrians.	Field Observations	All traffic signals can be activated by pedestrians	√				
15	Road-crossing signals include audible signals.	Field Observations	No audible traffic signals provided			√		
16	When required to travel along collector and arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.	Field Observations	No bicycle lanes provided			√		
17	Bicycle lanes are of an adequate width.	Field Observations	No bicycle lanes provided			√		

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWOOD HEIGHTS TO ORLEANS TOWN CENTRE

Dimension #7: Employment Area

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Facilities and services required on a day-to-day basis are available within walking distance of workplaces in the employment area.	Field Observations	Entire range of goods and services required on a day-to-day basis available within OTC employment area	√				
2	Bicycle storage facilities are provided within the employment area.	Field Observations	Bicycle racks provided throughout OTC employment area	√				
3	Bicycle storage facilities are highly visible by passing traffic and/or from nearby buildings.	Field Observations	Bicycle racks often located in out-of-sight areas away from building entrances		√			
4	Cyclists are provided with shower and change room facilities at workplaces in the employment area.	Field Observations	Not included as part of May 2001 application of PTCAA				√	

7.7 Discussion of *PTCAA* Findings – Fallingbrook

7.7.1 Dimension #1: Availability of Transit Service

Commuters residing in Fallingbrook are provided with direct public transit service to and from the Orleans Town Centre on all days of the week. Three routes operate seven-days-per-week, running from early morning until around midnight from Monday to Saturday, and from mid-morning to mid-evening on Sundays. Three additional routes also provide service from the Orleans Town Centre *to* Fallingbrook during weekday afternoon peak periods only. The *PTCAA* revealed that route configurations between Fallingbrook and the Orleans Town Centre are somewhat more direct than those observed in the Queenswood Heights case study (Figure 7.19). For example, residents residing in the southern tier of the community can board Route #136, which after travelling on a few local collector streets leaves Fallingbrook heads directly for the Orleans Town Centre along Tenth Line Road and St. Joseph Boulevard. This route is similar to that which would be followed by individuals driving a car between the two points, thus ensuring that travel times on this route are fairly competitive with automobile travel times. Similarly, residents residing in the central or northern portions of the community also have the opportunity to travel along transit routes that do not deviate excessively from the most direct route possible.

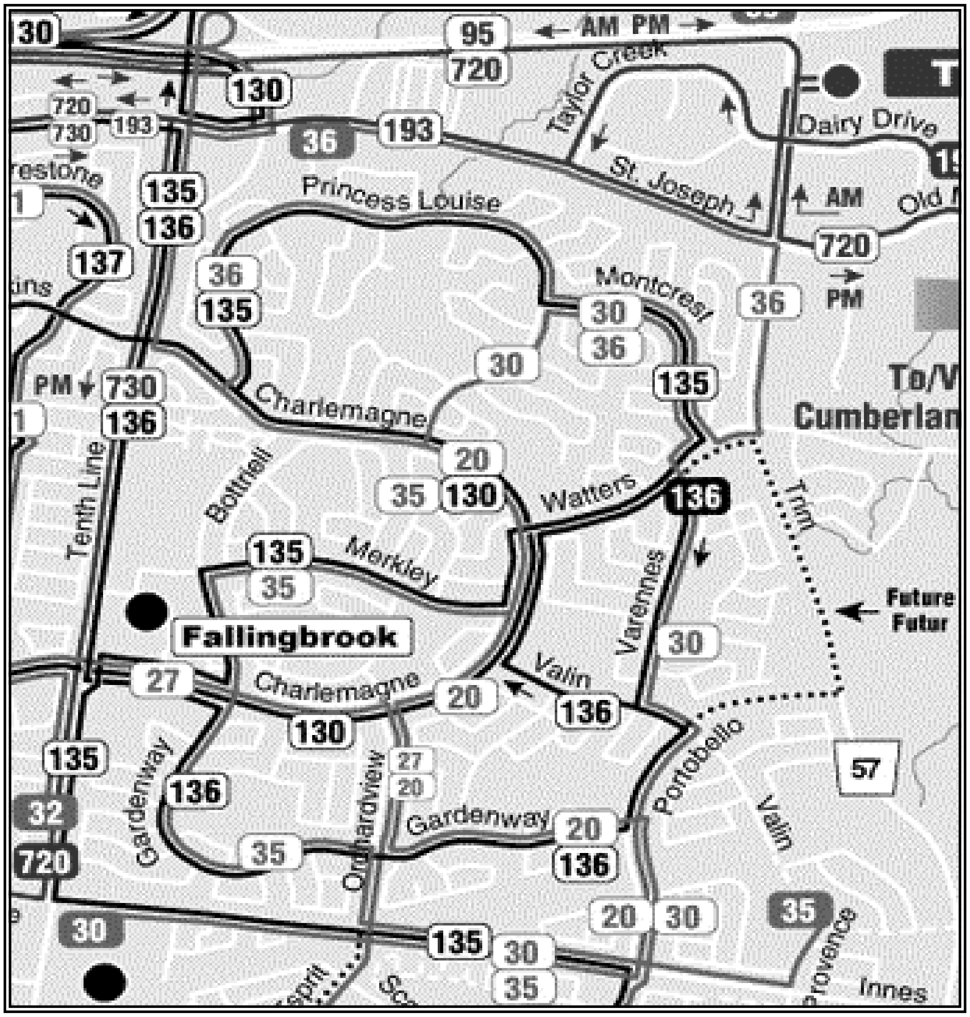

Figure 7.19 Public Transit Routes in Fallingbrook
Source: OC Transpo 2002

The primary weaknesses related to the availability of transit service in Fallingbrook concern hours of service and service frequencies. Hours of service (Table 7.5) are problematic in two ways. First, on a daily basis the first buses do not arrive at the Orleans Town Centre from Fallingbrook until after the first businesses open (Table 7.6). One of the four routes arrives at 6:09 a.m., but this serves only the southern portion of the community. The other three routes travelling to the Orleans Town Centre in the morning do not arrive there until well past 6:30 a.m. As a result, employees beginning their workdays before this time are unable to commute by public transit, at least in the workbound direction. The second problem concerning the availability of transit service is that transit routes stop operating before the last workers leave between Friday and Sunday. On Fridays and Saturdays, businesses are open as late as 1:00 a.m. yet transit service to Fallingbrook ends well before this time – as early as 11:50 p.m. on one route.

Table 7.5
Hours of Public Transit Service between Fallingbrook and Orleans Town Centre, May 2001

Route #	First Arrival at Orleans Town Centre from Fallingbrook			Route #	Last Departure from Orleans Town Centre to Fallingbrook		
	Monday-Friday	Saturday	Sunday		Monday-Friday	Saturday	Sunday
20 Downtown	--	--	--	20 Orleans	6:34 p.m.	--	--
27 Hull	6:09 a.m.	--	--	27 Orleans	6:33 p.m.	--	--
30 Downtown	--	--	--	30 Orleans	6:31 p.m.	--	--
35 Downtown	--	--	--	35 Orleans	6:35 p.m.	--	--
36 Downtown	--	--	--	36 Orleans	6:29 p.m.	--	--
130 Local North	6:52 a.m.	7:37 a.m.	8:35 a.m.	130 Local South	12:17 a.m.	12:35 a.m.	11:00 p.m.
135 Orleans	6:42 a.m.	7:12 a.m.	8:46 a.m.	135 Local South	12:13 a.m.	11:50 p.m.	11:05 p.m.
136 Orleans	6:40 a.m.	7:55 a.m.	8:02 a.m.	136 Local South	12:20 a.m.	12:20 a.m.	10:35 p.m.

Source: OC Transpo Transit Schedules

Table 7.6
Comparison of Business Hours at Orleans Town Centre with Hours of Transit Service between Fallingbrook and Orleans Town Centre, May 2001

	Earliest Opening Time	Earliest Bus Arrival	Latest Closing Time	Latest Bus Departure
Monday-Thursday	6:00 a.m.	6:09 a.m.	12:00 a.m.	12:20 a.m.
Friday	6:00 a.m.	6:09 a.m.	1:00 a.m.	12:20 a.m.
Saturday	7:00 a.m.	7:12 a.m.	1:00 a.m.	12:35 a.m.
Sunday	7:30 a.m.	8:02 a.m.	12:00 a.m.	11:05 p.m.

Source: Tables 7.1 and 7.5.

Table 7.7
Frequency of Public Transit Service between Fallingbrook and Orleans Town Centre, May 2001

Frequency of Service (in minutes)	Route #							
	20	27	30	35	36	130	135	136
Monday-Friday								
Early Morning (Before 6:00 a.m.)	--	--	--	--	--	--	--	--
Morning Peak Period (6:00-9:00 a.m.)	--	6-23	--	--	--	30	30	30
Midday (9:00 a.m. to 3:00 p.m.)	--	--	--	--	--	30	30	30
Afternoon Peak Period (3:00 p.m. to 6:00 p.m.)	18-34	8-32	11-20	5-33	18-26	30	30	30
Early Evening (6:00 p.m. to 10:00 p.m.)	--	--	--	--	--	30	30	30
Late Evening (After 10:00 p.m.)	--	--	--	--	--	30	30-53	60
Saturday								
Early Morning (Before 9:00 a.m.)	--	--	--	--	--	30	30	60
Midday (9:00 a.m. to 9:00 p.m.)	--	--	--	--	--	30	30	30-60
Late Evening (After 9:00 p.m.)	--	--	--	--	--	60	30	60
Sunday								
Early Morning (Before 10:00 a.m.)	--	--	--	--	--	60	60	60
Midday (10:00 a.m. to 9:00 p.m.)	--	--	--	--	--	30	30-60	60
Late Evening (After 9:00 p.m.)	--	--	--	--	--	60	60	60

Source: OC Transpo Transit Schedules

The *PTCAA* also revealed service frequencies to be a potential deterrent to public transit commuting (Table 7.7). Numerous routes travel *from* the Orleans Town Centre *to* Fallingbrook during weekday afternoon peak periods, thus providing commuters with a high frequency of service. At most other times of the day, however, service is provided between the two points only at 30- to 60-minute intervals. As was the case in the Queenswood Heights case study, this is an important concern because many commuters travel between Fallingbrook and the Orleans Town Centre outside of peak hours. Thus, it is the frequency of off-peak service that matters most to these workers. Service frequencies are especially poor on weekends. All three routes operating on Saturday and Sunday travel only on an hourly basis in the early morning and late evening; furthermore, one route (#136) operates only every 60 minutes *all day* on Sunday.

7.7.2 Dimension #2: Travel between Homes and Transit Stops

The needs of public transit commuters residing in Fallingbrook and working at the Orleans Town Centre are generally well served with respect to conditions in place between dwellings and transit stops. Most households in the western half of Fallingbrook are located within walking distance of the Fallingbrook Shopping Centre, where a large variety of facilities and services required on a day-to-day basis is available. Residents in the southwestern corner of Fallingbrook are also within walking distance of the Trinity Common shopping development located across Innes Road. Apart from a single convenience store located on the community's northeastern edge, however, stores and services are not available in close proximity to those living in the eastern half of the community.

Most other conditions related to travel between homes and transit stops in Fallingbrook were similar to those found in neighbouring Queenswood Heights. Once again, commuters travelling to transit stops are provided with quick and direct access along aesthetically pleasant, well-lit, and highly visible routes and, as in Queenswood Heights, this is facilitated by the presence of numerous pathways that allow commuters to reach stops without having to follow the meandering road network. Some residents, however, must walk along roads to reach transit stops and for them an important deficiency is a lack of continuous sidewalk infrastructure. Not only are there no sidewalks on crescents and cul-de-sacs, but they are in most cases in place on only one side of local collector roads. In both instances, this poses a safety threat to commuters because on-street parking is quite common within Fallingbrook. As a result, commuters walking to and from transit stops are forced to move laterally into the roadway when they must pass parked vehicles or other obstacles. This is especially a concern along collector streets where considerable traffic volumes were observed on many occasions. Where sidewalks provided, however, they are in good repair and built to accommodate wheelchairs.

The only collector road on which sidewalks are available *on both sides* is Charlemagne Boulevard, along which buffers are also provided in order to physically separate pedestrians from vehicular traffic (Figure 7.20). This is the most suitable location for buffers, however, because Charlemagne Boulevard also has the highest speed limit found within the community – 60 kilometres per hour. On all other roads in Fallingbrook, the speed limit is 40 kilometres per hour. The low speed limits posted on most streets, along with a prevalence of stop signs, enables commuters to cross roads safely. Commuters who use Route #130 to travel between Fallingbrook and the Orleans Town Centre must cross Charlemagne Boulevard, which has the higher speed limit; however, traffic lights and stop signs are in place at numerous points along the route and near most transit stops. This once again enables commuters to cross the road safely.

7.7.3 Dimension #3: Transit Stops near Place of Residence

All 135 transit stops located in Fallingbrook were examined as part of the PTCAA process. The field observations showed that all of these are well lit and highly visible from neighbouring homes, and the vast majority (113 out of 135) is located on a paved boarding area. With regard to other amenities required by public transit commuters, however, conditions are less satisfactory. Service information is provided at only 50 stops and only 30 have newspaper-vending boxes (Figure 7.21). Perhaps more importantly, especially given the low frequency of transit service provided at most times of the day and week, is a lack of seating and shelter at stops. Only 24 stops have benches, and shelters are provided at only 18 of the 135 stops. As in Queenswood Heights there is also a marked absence of trash receptacles, yet in all cases stops were observed to be clean and free of litter.

Figure 7.20 Charlemagne Boulevard, Fallingbrook
Photo: C. Fullerton

Figure 7.21 Transit Stop, Fallingbrook
Photo: C. Fullerton

7.7.4 Dimension #4: On-Vehicle Travel

Public transit journeys were made between Fallingbrook and the Orleans Town Centre on weekdays, Saturdays, and Sundays, in order to evaluate conditions related to on-vehicle travel. Transit vehicles were in all cases clean and free of litter and were staffed by friendly drivers. As in Queenswood Heights, transit routes serving Fallingbrook are not designated as "low-floor routes", nor as ones on which bicycle racks are provided. However, on most trips taken as part of the *PTCAA*, most transit vehicles were indeed low-floor models that enabled passengers to embark without having to climb stairs. Furthermore, most vehicles were equipped with highly visible LED displays indicating the route number and destination. Finally, on all trips and regardless of the time of day, there was no shortage of seating and no safety or personal security concerns arose.

7.7.5 Dimensions #5, 6 & 7: Conditions in the Employment Area

Dimensions #5, 6, and 7 of the *PTCAA* measured the servicing of public transit commuter needs within the Orleans Town Centre employment area. Accordingly, most conditions experienced by commuters travelling to this employment area from Fallingbrook are identical to those discussed within the context of commuting from Queenswood Heights and are therefore not repeated here. One exception, however, relates to the proximity of transit stops to workplaces. Transit routes travelling between the Orleans Town Centre and Fallingbrook operate along St. Joseph Boulevard and, as a result, employees at the Orleans Town Centre office-commercial development are able to leave transit vehicles directly in front of their workplaces. This differs from the case of commuters travelling from Queenswood Heights to this place of employment, who must walk a short distance from Place d'Orleans Drive East.

7.8 *Public Transit Commuter Accessibility Audit* Report Card - Fallingbrook

Once again, the completed *PTCAA Report Card* – this time concerning public transit accessibility between Fallingbrook and the Orleans Town Centre – is presented on the following pages. The *Report Card* indicates that improvements related to each dimension of public transit commuter needs may be necessary in order to promote public transit commuting between these points.

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #1: Availability of Public Transit Service

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Public transit service is available within the subarea.	OC Transpo Route Map		√				
2	Public transit service is available at the employment area.	OC Transpo Route Map	Several transit routes serve the OTC employment area	√				
3	Public transit service is provided directly between the subarea and employment area.	OC Transpo Route Map		√				
4	If public transit is not provided directly between the subarea and employment area, commuters must only transfer once in order to reach the employment area.	N/A	Not applicable					√
5	If commuters must transfer between transit vehicles, route schedules are efficiently coordinated.	N/A	No transfers necessary to complete trip					√
6	Public transit service is provided between the subarea and employment area on days when commuters travel.	OC Transpo Route Schedules	Service provided seven days per week	√				
7	Public transit service is provided between the subarea and employment area before, during and after employees' workdays.	OC Transpo Route Schedules	Service provided during all working hours	√				
8	Public transit service is provided between the subarea and employment area at convenient frequencies.	OC Transpo Route Schedules	Low frequency of service at most times, ranging from 30 to 60 minutes		√			

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #2: Travel between Homes and Transit Stops/Stations

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Facilities and services required on a day-to-day basis are available within walking distance of homes.	Field Observations				√		
2	Commuters can travel directly between their places of residence and transit stops/stations.	Field Observations	Most commuters have access to transit stops on or at the end of their street; pathways incorporated to provide short-cuts	√				
3	Travel routes between places of residence and transit stops/stations are aesthetically pleasant.	Field Observations	No aesthetically unpleasant surroundings observed; private and public properties well maintained	√				
4	Travel routes between places of residence and transit stops/stations are adequately lit between dusk and dawn.	Field Observations	All streets lighted, but some pathways are not		√			
5	Travel routes between places of residence and transit stops/stations are highly visible by passing traffic and/or from adjacent buildings.	Field Observations	Routes along streets are highly visible, but some pathways are not		√			
6	A continuous sidewalk network provides physical access to transit stops/stations.	Field Observations	Sidewalks not provided on many collector streets nor on most cul-de-sacs; most collectors have sidewalks on only one side			√		

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #2: Travel between Homes and Transit Stops/Stations (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
7	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.	Field Observations	Where provided, sidewalks are of an adequate width	√				
8	Sidewalks are in good physical condition.	Field Observations	Sidewalks observed to be in good repair	√				
9	Sidewalks are designed to accommodate the needs of wheelchair users.	Field Observations	All sidewalks in place have curb cuts at intersections	√				
10	Sidewalks are promptly cleared of ice and snow.	N/A	Unclear due to conducting of PTCAA during spring				√	
11	Sidewalks are effectively cleared of ice and snow.	N/A	Unclear due to conducting of PTCAA during spring				√	
12	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.	Field Observations	Most sidewalks located immediately adjacent to roadway; buffers (grass) only on Charlemagne Blvd.		√			
13	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.	Field Observations	No obstacles to pedestrian travel observed on sidewalks, but many parked cars on roads without sidewalks		√			

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #2: Travel between Homes and Transit Stops/Stations (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
14	When they must cross collector and arterial roads, commuters are provided with signalized road crossing opportunities.	Field Observations	No traffic signals present within community; tempered by low traffic volumes, low-speed limits and lack of arterial roads to cross		√			
15	Road-crossing signals can be activated by pedestrians.	N/A	Not applicable					√
16	Road-crossing signals include audible signals.	N/A	Not applicable					√
17	When required to travel along collector and arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.	Field Observations	No bicycle lanes provided along collector roads			√		
18	Bicycle lanes are of an adequate width.	Field Observations	Not applicable					√

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #3: Transit Stops/Stations near the Place of Residence

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit stops and stations are located on pavement.	Field Observations	113 of 135 stops located on paved boarding areas		√			
2	Transit stops and stations are adequately lighted between dusk and dawn.	Field Observations	All streets with stops are lighted at night	√				
3	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	Most stops visible from neighbouring residences, although some adjacent to open parkland	√				
4	Trash receptacles are provided at transit stops and stations.	Field Observations	Only 20 of 135 stops equipped with trash receptacles			√		
5	Transit stops and stations are clean.	Field Observations	All transit stops observed to be clean and free of litter	√				
6	Effective shelter from the elements is provided at transit stops and stations.	Field Observations	Only 18 of 135 stops had a shelter			√		
7	Seating is provided at transit stops and stations.	Field Observations	Only 24 of 135 stops had benches			√		
8	Newspaper vending machines are available at transit stops and stations.	Field Observations	Only 30 of 135 stops had newspaper vending boxes			√		
9	Service information is provided at transit stops and stations.	N/A	Only 50 of 135 stops had service information					√

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #3: Transit Stops/Stations near the Place of Residence (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
10	Public telephones are available at transit stations.	Field Observations	No transit stations in Fallingbrook					√
11	Emergency telephones or call boxes are provided at transit stations.	N/A	No transit stations in Fallingbrook					√
12	Public washrooms are provided at transit stations.	N/A	No transit stations in Fallingbrook					√
13	Baby change facilities are provided in washrooms at transit stations.	N/A	No transit stations in Fallingbrook					√
14	Bicycle storage facilities are provided at transit stops and stations.	N/A	No transit stations in Fallingbrook					√
15	Convenience stores and/or vending machines are located at transit stations.	Field Observations	No transit stations in Fallingbrook					√

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #3: Transit Stops/Stations near the Place of Residence (concluded)

		Data Source	Findings/Comments	Grade A	Grade B	Grade C	Grade DNA	Grade N/A
16	When commuters must access public transit by car, park-and-ride facilities are provided at transit stations.	N/A	Access to public transit by car not required					√
17	An adequate supply of parking is provided at park-and-ride facilities.	N/A	Use of park-and-ride facilities not required					√
18	Park-and-ride facilities are provided free of charge.	N/A	Use of park-and-ride facilities not required					√
19	Park-and-ride facilities are adequately lighted between dusk and dawn.	N/A	Use of park-and-ride facilities not required					√
20	Park-and-ride facilities are highly visible by passing traffic and/or from adjacent buildings.	N/A	Use of park-and-ride facilities not required					√
21	Park-and-ride facilities are security monitored.	N/A	Use of park-and-ride facilities not required					√
22	Direct pedestrian access is provided between park-and-ride facilities and transit stops or stations.	N/A	Use of park-and-ride facilities not required					√
23	Park-and-ride facilities are easily accessible from adjacent roadways.	N/A	Use of park-and-ride facilities not required					√

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #4: On-Vehicle Travel

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit vehicles are universally accessible.	Field Observations	Some buses used were low-floor models; others were not but lowered to provide easier access		√			
2	Route numbers and destinations are clearly visible.	Field Observations	Large-font LED displays on most newer vehicles, but older buses used low-tech signs that were less easily readable		√			
3	Adequate seating is available on transit vehicles.	Field Observations	No shortage of seating observed	√				
4	Commuters' personal safety and security is not compromised on board transit vehicles.	Field Observations	No safety or security risks observed on board vehicles	√				
5	Transit vehicles are clean.	Field Observations	Vehicles were clean and free of litter	√				
6	Transit drivers announce major stops, stations and intersections.	Field Observations	Drivers did not make any announcements			√		
7	Transit drivers are friendly and helpful when asked for assistance.	Field Observations	All drivers said "hello" when greeted, but were not asked for assistance	√				
8	Transit vehicles are equipped with bicycle racks.	OC Transpo Website	None of the transit vehicles ridden was equipped with bicycle racks			√		

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #5: Transit Stops/Stations near the Place of Employment

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit stops/stations are located close to all workplaces in the employment area.	Field Observations	Transit routes travel to all workplaces except Place d'Orleans West and businesses on St. Joseph Blvd. north of the Place d'Orleans Shopping Centre		√			
2	Transit stops and stations are located on pavement.	Field Observations	All stops located along sidewalks	√				
3	Transit stops and stations are adequately lighted between dusk and dawn.	Field Observations	All stops are well lighted	√				
4	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	All stops located in front of buildings and along busy roadways	√				
5	Trash receptacles are provided at transit stops and stations.	Field Observations	Trash receptacles provided only at Place d'Orleans Transitway Station			√		
6	Transit stops and stations are clean.	Field Observations	All transit stops observed to be clean and free of litter	√				
7	Effective shelter from the elements is provided at transit stops and stations.	Field Observations	Shelters provided only at Place d'Orleans Transitway Station and at two other stops			√		
8	Seating is provided at transit stops and stations.	Field Observations	Shelters provided only at Place d'Orleans Transitway Station and at three other stops			√		
9	Newspaper vending machines are available at transit stops and stations.	Field Observations	Newspaper vending boxes provided only at Place d'Orleans Transitway Station and at three other stops			√		
10	Service information is provided at transit stops and stations.	Field Observations	Service information provided only at Place d'Orleans Transitway Station and two other stops			√		

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #5: Transit Stops/Stations near the Place of Employment (concluded)

		Data Source	Findings/Comments	Grade A	Grade B	Grade C	Grade DNA	Grade N/A
11	Public telephones are available at transit stations.	Field Observations	Public telephones available throughout Place d'Orleans Transitway Station	√				
12	Emergency telephones or call boxes are provided at transit stations.	Field Observations	Emergency call boxes available throughout Place d'Orleans Transitway Station	√				
13	Public washrooms are provided at transit stations.	Field Observations	No public washrooms available at Place d'Orleans Transitway Station			√		
14	Baby change facilities are provided in washrooms at transit stations.	Field Observations	No public washrooms available at Place d'Orleans Transitway Station			√		
15	Bicycle storage facilities (racks or lockers) are provided at transit stops and stations.	Field Observations	Bicycle racks provided only at Place d'Orleans Transitway Station			√		
16	Convenience stores and/or vending machines are located at transit stations.	Field Observations	A convenience store is located at Place d'Orleans Transitway Station	√				

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #6: Travel from Transit Stops/Stations to the Place of Employment

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Commuters can travel directly between transit stops/stations and their places of employment.	Field Observations	In most cases, yes, but commuters working along St. Joseph Blvd. north of Place d'Orleans Shopping Centre must follow circuitous routes		√			
2	Travel routes between transit stops/stations and workplaces are aesthetically pleasant.	Field Observations	No signs of neglect; buildings well maintained, free of graffiti	√				
3	Travel routes between transit stops/stations and workplaces are adequately lighted between dusk and dawn.	Field Observations	Lighting prevalent throughout employment area	√				
4	Travel routes between transit stops/stations and workplaces are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	Pedestrian routes pass in front of buildings and along busy roadways	√				
5	A continuous sidewalk network provides physical access between transit stops/stations and workplaces.	Field Observations	Sidewalks are provided throughout the OTC employment area	√				
6	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.	Field Observations	Sidewalks observed to be of adequate width	√				
7	Sidewalks are in good physical condition.	Field Observations	Sidewalks appear to be in good repair	√				
8	Sidewalks are designed to accommodate the needs of wheelchair users.	Field Observations	Curb cuts are provided at all intersections	√				

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #6: Travel from Transit Stops/Stations to the Place of Employment (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
9	Sidewalks are promptly cleared of ice and snow.	Field Observations	Unclear due to conducting of PTCAA during spring.				√	
10	Sidewalks are effectively cleared of ice and snow.	Field Observations	Unclear due to conducting of PTCAA during spring.				√	
11	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.	Field Observations	Most sidewalks located immediately adjacent to roadway; some buffers provided		√			
12	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.	Field Observations	No sidewalk obstacles observed	√				
13	When they must cross collector and arterial roads, commuters are provided with signalized road crossing opportunities.	Field Observations	All major intersections within the employment area have traffic and pedestrian signals	√				
14	Road-crossing signals can be activated by pedestrians.	Field Observations	All traffic signals can be activated by pedestrians	√				
15	Road-crossing signals include audible traffic signals.	Field Observations	No audible traffic signals provided			√		
16	When required to travel along collector and arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.	Field Observations	No bicycle lanes provided			√		
17	Bicycle lanes are of an adequate width.	Field Observations	No bicycle lanes provided			√		

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: FALLINGBROOK TO ORLEANS TOWN CENTRE

Dimension #7: Employment Area

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Facilities and services required on a day-to-day basis are available within walking distance of workplaces in the employment area.	Field Observations	Entire range of goods and services required on a day-to-day basis available within OTC employment area	√				
2	Bicycle storage facilities are provided within the employment area.	Field Observations	Bicycle racks provided throughout OTC employment area	√				
3	Bicycle storage facilities are highly visible by passing traffic and/or from nearby buildings.	Field Observations	Bicycle racks often located in out-of-sight areas away from building entrances		√			
4	Cyclists are provided with shower and change room facilities at workplaces in the employment area.	Field Observations	Not included as part of May 2001 application of PTCAA				√	

7.9 Recommendations

The first trial application of the PTCAA involved the evaluation of public transit accessibility between the communities of Queenswood Heights and Fallingbrook and the Orleans Town Centre employment area, all of which are located within the Orleans Urban Centre. What follows below is a summary of the audit results, with an emphasis on the public transit commuter needs that have not been adequately addressed in the community planning process.

Availability of Service

With regard to the availability of public transit service, the foremost deficiencies related to travel between the two residential subareas and the Orleans Town Centre are the *frequency* and *directness* of service. The bulk of commuters travelling from Queenswood Heights and Fallingbrook must travel to and from this employment area outside of weekday peak hours, yet service is in most cases provided only at 30 to 60 minute intervals. Based on the extensive body of transportation research which has shown the frequency of service to be an important determinant of commuters' willingness to use public transit, such a low frequency of service between these residential subareas and the Orleans Town Centre is in all likelihood a major deterrent to public transit commuting.

Although residents of Fallingbrook are provided with service that follows relatively direct routes to and from the Orleans Town Centre, commuters residing in Queenswood Heights must travel on lengthy and convoluted routes that further extend travel times. Thus, despite the fact that Queenswood Heights is located quite close to the Orleans Town Centre, travel between the two points by public transit for many Queenswood Heights residents represents an arduous journey that is clearly inferior to travel by automobile. This therefore implies that public transit planners may wish to reconsider the configuration of routes operating between Queenswood Heights and the Orleans Town Centre in an effort to provide more direct service. One way this could be accomplished would be by having Route #137 continue to operate in a one-way loop, but to follow this loop in both directions. Even with 30-minute service, for example, the route could operate in a clockwise direction every hour and in a counter-clockwise direction thirty minutes later. This would potentially provide more residents with the opportunity to choose the more direct of the two options when travelling between home and work.

Hours of transit service between Fallingbrook and Queenswood Heights and the Orleans Town Centre were generally found to coincide with commuters' hours of work. However, notable deficiencies must be addressed in terms of early morning and late evening service if the needs of commuters working or travelling at those hours are to be better served. Because in most cases this involved service starting less than an hour too late or ending less than an hour too early, this problem could easily be solved by the scheduling of one or two additional trips at each end of the day.

Travel between Homes and Transit Stops

In both Queenswood Heights and Fallingbrook, travel conditions between homes and transit stops were for the most part aesthetically pleasant, well lighted, and highly visible. The *PTCAA* did reveal, however, that many pedestrian pathways that provided short cuts to transit stops were *not* well lighted. Accordingly, planners could do much to improve the attractiveness of travelling to and from stops in these communities after dark through the simple addition of lighting. Other notable weakness and deficiencies within this dimension of concern included an inadequate land use mix, especially within

Queenswood Heights, and the absence of sidewalks along side streets. The most pressing of these is the lack of a diverse land use mix. Fallingbrook and Queenswood Heights are home primarily to family households for whom time constraints are likely to play an important role in the modal decision-making process, and the lack of facilities and services required on a day-to-day basis within walking distance of many homes no doubt serves as a deterrent to public transit travel for many commuters. Unfortunately, both communities have been or are close to being fully built-up and there is little room for the addition of required facilities through the infilling process. On the other hand, the Orleans Town Centre employment area *does* have a wide variety of facilities and services on-site, and this may assist in efforts to promote public transit commuting from Fallingbrook and Queenswood Heights if workers are willing and able to run errands at the workplace end of their commuter trips. Finally, a lack of sidewalks on side streets and along the sides of some collector roadways was also deemed to be an important deficiency in this trial application of the *PTCAA*. Local speed limits in both Fallingbrook and Queenswood Heights are generally low; in Queenswood Heights, no internal street had a speed limit higher than 40 kilometres per hour, while in Fallingbrook only one street (Charlemagne Boulevard) had a speed limit higher than this – 60 kilometres per hour. Furthermore, sidewalks along the entire length of Charlemagne Boulevard are separated from the roadway by grass buffers. Nonetheless, efforts to promote public transit commuting should consider the installation of sidewalks to all community streets whenever the reconstruction of any roadways is planned.

Transit Stops near Place of Residence

The *PTCAA* revealed a conspicuous lack of amenities at transit stops within Fallingbrook and Queenswood Heights. This is an important concern because the low frequency of transit service generally provided in both communities implies that waiting times at stops have the potential to be lengthy, especially when the commuter does not know when the bus is scheduled to arrive. Given commuters' aversion to waiting at stops, the promotion of public transit commuting could therefore meet with greater success if more attention was devoted to the provision of service information, shelters, benches, garbage cans, and newspaper vending machines at stops.

Examination of waiting environments also showed that several transit stops were situated in unsuitable locations, including front lawns on private property and along a busy arterial roadway (in the case of Queenswood Heights). Accordingly, waiting experiences at these stops can be improved by adding paved boarding areas such as sidewalks or concrete pads that will enable commuters to wait in comfort, rather than in fear of being hit by a car, of being splashed, or of irritating a homeowner.

On-Vehicle Travel

In terms of on-board travel, few problems were identified in the auditing process. Drivers tended to be friendly, ample seating was consistently available, and transit vehicles were clean and safe. At the same time, however, the fact that a low-floor transit vehicle or one that had highly visible route and destination signage may not be provided could mean that persons with disabilities may experience physical constraints to public transit commuting between the two residential subareas and the Orleans Town Centre. This problem can be remedied by the formal introduction of accessible transit vehicles on all routes serving Fallingbrook and Queenswood Heights.

Transit Stops/Stations near the Place of Employment

As noted in the previous chapter, the availability of required infrastructure, facilities and services varied considerably within the Orleans Town Centre. At the Place d’Orleans Transitway Station virtually all public transit commuter needs were well served, except those for public washrooms and diaper-change facilities. At most other stops, however, conditions were far less favourable. The frequent lack of shelters, benches and other amenities at stops are sure to discourage the use of public transit for commuting purposes. Given that the City of Ottawa aims to encourage public transit commuting to Town Centres such as the Orleans Town Centre, it is essential that transit stop environments located therein be improved by providing necessary amenities.

Travel between Transit Stops/Stations and Places of Employment

While commuters travelling from Fallingbrook and Queenswood Heights can reach their places of employment directly and safely upon arrival at the Orleans Town Centre, some modifications can nonetheless be made in order to better serve public transit commuter needs. This is particularly the case for commuters employed at the Place d’Orleans West development which, as noted in Chapter Seven, is physically isolated from Orleans Town Centre transit stops. Most importantly, it is essential that the pedestrian environment between the Place d’Orleans Transitway Station and Place d’Orleans West businesses be improved through the provision of sidewalks.

Employment Area

Public transit commuters’ need for a diverse land use mix near the place of employment is very well served within the Orleans Town Centre. All facilities and services that have been identified as being important day-to-day destinations are available on site, including daycare centres, grocery and food stores, banking institutions, and medical and dental facilities, for example. One area in need of improvement, however, pertains to the provision of bicycle storage facilities. Although bicycle racks are plentiful throughout the employment area, these are often located in substandard locations that are neither protected from the elements nor highly visible. Efforts to promote the integration of bicycle and public transit travel for commuting purposes must therefore reconsider the location and quality of these facilities. At the very least, these should be placed in covered, high-traffic locations.

7.10 Conclusion

Commuters are generally provided with a high degree of public transit accessibility between Queenswood Heights and the Orleans Town Centre employment area. This is especially true when comparing conditions in and between these locations with those of suburban settings often cited in the transportation research, where public transit accessibility is often far less adequate. Nonetheless, land use, transportation and public transit planners can take a number of initiatives to further improve the viability of commuting to the Orleans Town Centre from Queenswood Heights. Most importantly, service frequencies and configurations must be improved to provide workers with fast and direct service to and from their places of employment at all times of the day. The addition of infrastructure, facilities, and services at transit stops – near places of residence and places of employment – and along routes travelled to and from transit stops and stations can also improve commuter perceptions of comfort, safety and security, and thus their willingness and/or ability to travel by public transit.

CHAPTER EIGHT:
CASE STUDY #2 – LINCOLN FIELDS SHOPPING CENTRE

8.1 Introduction

The third trial application of the *PTCAA* sought to evaluate public transit accessibility between the communities of Britannia-Lincoln Heights and Queensway Terrace South-Redwood and the Lincoln Fields Shopping Centre, a community-scale shopping facility located in Ottawa's west end (Figures 8.1 and 8.2). This chapter follows a structure identical to that of Chapter Seven. It begins with an overview of the Lincoln Fields Shopping Centre in terms of its history, location and the types of employment found therein. This is followed by the presentation of working hours at this employment area, along with a brief introduction to the communities from which public transit accessibility was examined. Again, a discussion of the *PTCAA* findings is presented, along with the completed *PTCAA Report Card* and suggestions as to how public transit accessibility from Britannia-Lincoln Heights and Queensway Terrace South-Redwood to the Lincoln Fields Shopping Centre might be improved.

8.2 Overview of Lincoln Fields Shopping Centre

Originally opened in 1974, Lincoln Fields currently houses a wide range of firms, including retail stores, financial institutions, government offices, and several restaurants. It is surrounded on all sides by major arterial roadways, including Carling Avenue, Richmond Road and the Ottawa River Parkway (Figure 8.3). This facility is also located less than one kilometre from the Lincoln Fields Transitway Station (Figure 8.4). According to the *National Capital Region Origin-Destination Survey*, approximately 819 people were employed at the Lincoln Fields Shopping Centre in 1995.

Figure 8.1 Lincoln Fields Shopping Centre, North Side
Photo: C. Fullerton

Figure 8.2 Lincoln Fields Shopping Centre, South Side
Photo: C. Fullerton

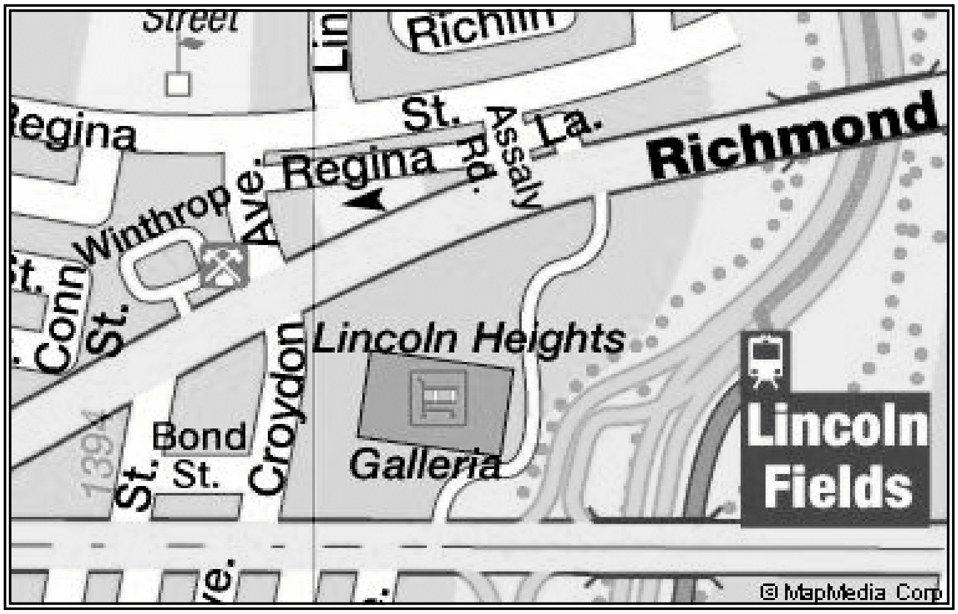

Figure 8.3 Lincoln Fields Shopping Centre (formerly "Lincoln Heights Galleria")
Source: MapArt 2001

Figure 8.4 Lincoln Fields Transitway Station
Photo: C. Fullerton

8.3 Hours of Work at Lincoln Fields Shopping Centre

Because the LFSC contains a wide array of employment types, hours of work within the facility vary considerably (Table 8.1). Although most offices in the LFSC are closed on Sundays and, in some cases, on Saturdays as well, the majority of retail businesses and restaurant facilities operate seven days per week. Most smaller businesses follow regular mall hours, which are: Monday, Tuesday and Saturday - from 9:30 a.m. to 6:00 p.m.; Wednesday, Thursday and Friday - from 9:30 a.m. to 9:00 p.m.; and on Sunday – from noon to 5:00 p.m. The larger facilities located in the mall have extended hours of operation, however. For example, Wal-Mart opens at 8:00 a.m. daily, closes at 10:00 p.m. from Monday to Saturday, and closes at 6:00 p.m. on Sunday. Similarly, the Loeb grocery store operates from 8:00 a.m. to 9:00 p.m. between Monday and Saturday, while on Sundays its hours of business run from 9:00 a.m. to 7:00 p.m. The longest hours of operation on most days are found at Buffalo Charlie's restaurant, which is open from 7:00 a.m. to midnight from Monday to Saturday. Based on these hours of operation, it can be inferred that public transit service to and from the LFSC should ideally be in place between approximately 6:30 a.m. and 12:30 a.m. from Monday to Saturday, and between approximately 7:30 a.m. and 12:30 a.m. on Sundays.

Table 8.1
Hours of Operation, Lincoln Fields Shopping Centre Firms

Business/Firm	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Buffalo Charlie's	1000-2400	0700-2400	0700-2400	0700-2400	0700-2400	0700-2400	0700-2400
TD Canada Trust	Closed	0800-2000	0800-2000	0800-2000	0800-2000	0800-2000	0900-1500
Loeb	0900-1900	0800-2100	0800-2100	0800-2100	0800-2100	0800-2100	0800-2100
Wal-Mart	0800-1800	0800-2200	0800-2200	0800-2200	0800-2200	0800-2200	0800-2200
HRDC (federal government)	Closed	0830-1600	0830-1600	0830-1600	0830-1600	0830-1600	Closed
CAA North & East Ontario	Closed	0900-1730	0900-1730	0900-1730	0900-1730	0900-1730	1000-1600
Moore’s	1200-1700	0930-2100	0930-2100	0930-2100	0930-2100	0930-2100	0930-1800
All Other Retail Stores	1200-1700	0930-1800	0930-1800	0930-2100	0930-2100	0930-2100	0930-1800
Earliest Opening Time	0800	0700	0700	0700	0700	0700	0700
Latest Closing Time	2400	2400	2400	2400	2400	2400	2400

Source: Field Observations

8.4 Residential Subareas: Britannia-Lincoln Heights and Queensway Terrace South-Redwood

8.4.1 Community Overview – Britannia-Lincoln Heights

The first metropolitan subarea from which public transit accessibility was evaluated consists of two adjoining census tracts located to the immediate north and west of the Lincoln Fields Shopping Centre (Figure 8.5). This subarea, hereinafter referred to as “Britannia-Lincoln Heights”, comprises four communities: Lincoln Heights, Britannia, Britannia Village, and Britannia Heights. Residential development first began here in the early 1900s following construction of the Ottawa Electric Railway’s streetcar line from downtown Ottawa to the Britannia-on-the-Bay amusement area on the Ottawa River. Today, Britannia-Lincoln Heights contains a wide range of housing types. Lincoln Heights, located closest to the Lincoln Fields Shopping Centre, is composed primarily of high-rise apartment buildings and single-family detached dwellings, while Britannia Village (Figure 8.6) mostly contains single-family dwellings and privately owned row housing. The community of Britannia contains the broadest array of dwelling types, ranging from a public housing project to high- and low-rise apartment buildings to upscale single-detached houses, the latter of which are found near the Ottawa River. Britannia Heights (Figure 8.7), which is located at the western edge of this metropolitan subarea and farthest away from the Lincoln Fields Shopping Centre, contains mostly high- and low-rise apartment buildings and condominiums, public housing, and semi-detached dwellings. In 1996 the population of Britannia-Lincoln Heights was just over 12,000 (Statistics Canada 1999).

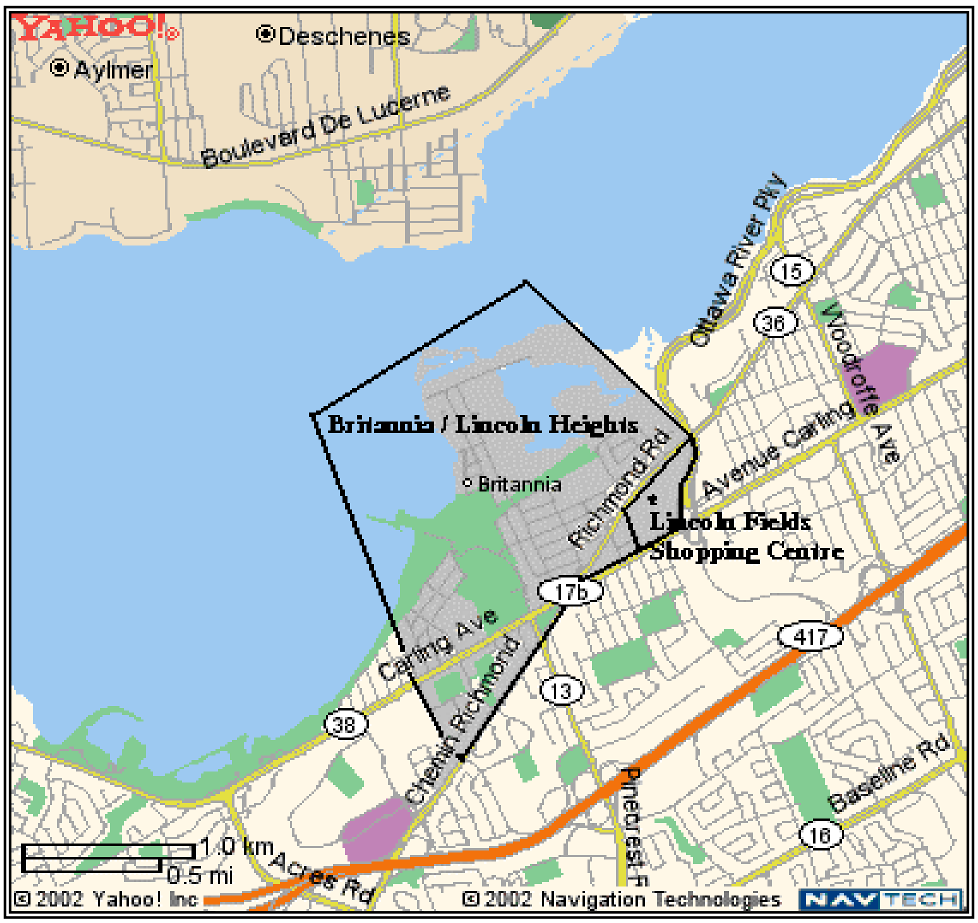

Figure 8.5 Britannia-Lincoln Heights
Source: Yahoo! Maps 2002

Figure 8.6 Britannia Road, Britannia-Lincoln Heights
Photo: C. Fullerton

Figure 8.7 Carling Avenue, Britannia-Lincoln Heights
Photo: C. Fullerton

8.4.2 Community Overview – Queensway Terrace South-Redwood

The second metropolitan subarea from which public transit accessibility to the LFSC was evaluated also consisted of two census tracts, in this case located approximately three kilometres south and southwest of the LFSC (Figure 8.8). This subarea, which will be referred to as "Queensway Terrace South-Redwood", consists of four neighbourhoods. From west to east these are: Redwood Park; Queensway Terrace South; Parkway Park; and Kenson Park. Housing development in Queensway Terrace South-Redwood dates back to the immediate post-World War II period. Just over 28% of all housing units in Queensway Terrace South-Redwood were constructed between 1946 and 1960, while a further 40% were built in the following decade. The three easternmost neighbourhoods are typical post-war suburban developments – they all have a hierarchy of roadways and consist primarily of single-detached houses (Figure 8.9). However, some row housing and a few low-rise apartment buildings are also found in the area. The westernmost neighbourhood, Redwood Park, contains a wide array of housing types, including high-rise apartment buildings, row housing, as well as semi-detached and single-detached houses (Figure 8.10). In 1996 this subarea had a population of 9,801 (Statistics Canada 1999).

Figure 8.8 Queensway Terrace South-Redwood
Source: Yahoo! Maps 2002

Figure 8.9 Cheshire Road, Queensway Terrace South-Redwood
Photo: C. Fullerton

Figure 8.10 Highrise Apartment Buildings, Queensway Terrace South-Redwood
Photo: C. Fullerton

8.5 Discussion of *PTCAA* Findings – Britannia-Lincoln Heights

8.5.1 Dimension #1: Availability of Transit Service

In most cases, Britannia-Lincoln Heights residents working at the Lincoln Fields Shopping Centre receive remarkably high levels of public transit service (Figure 8.11). Direct service is provided to and from this employment area seven days a week and, on some routes, for as many as 22 hours a day (Table 8.2). One exception to these observations, however, is Britannia Village. Not only does the public transit service provided in this area follow meandering routes, but service hours also do not adequately serve public transit commuter needs.

Figure 8.11 Public Transit Routes in Britannia-Lincoln Heights
Source: OC Transpo Route Map

Table 8.2
Hours of Public Transit Service between
Britannia-Lincoln Heights and Lincoln Fields Shopping Centre, May 2001

Route #	First Arrival at LFSC From Britannia-Lincoln Heights			Route #	Last Departure from LFSC to Britannia-Lincoln Heights		
	Monday-Friday	Saturday	Sunday		Monday-Friday	Saturday	Sunday
2 Blair	4:40 a.m.	5:06 a.m.	6:44 a.m.	2 Bayshore	1:40 a.m.	1:04 a.m.	1:26 a.m.
18 St. Laurent	5:53 a.m.	6:41 a.m.	8:08 a.m.	18 Britannia	12:06 a.m.	11:31 p.m.	11:21 p.m.
50 Downtown	6:16 a.m.	--	--	50 Britannia	6:21 p.m.	--	--
59 Downtown	6:34 a.m.	--	--	59 Nepean North	6:35 p.m.	--	--
85 St. Laurent	4:25 a.m.	6:39 a.m.	6:39 a.m.	85 Bayshore	1:05 a.m.	1:33 a.m.	12:44 a.m.
97 Airport	4:48 a.m.	5:18 a.m.	6:10 a.m.	97 Kanata	2:52 a.m.	3:05 a.m.	2:36 a.m.
116 South Keys	3:19 p.m.	--	--	116 Kanata	9:23 a.m.	--	--
182 Lebreton	3:41 p.m.	--	--	182 Kanata	9:12 a.m.	--	--

Source: OC Transpo Transit Schedules

Although the first workers do not begin to arrive at the Lincoln Fields Shopping Centre until just before 7:00 a.m. on weekdays and Saturdays and just before 8:00 a.m. on Sundays, transit service to this employment area begins much earlier (Table 8.3). On weekdays, the first transit trips arrive at Lincoln Fields from all areas of Britannia-Lincoln Heights except Britannia Village between 4:00 and 5:00 a.m., while on Saturdays transit service to the shopping centre is available from these areas as early as 5:00 a.m. Even on Sundays several transit routes make their first stops at Lincoln Fields before 7:00 a.m., and thus well before the first business opens at 8:00 a.m. Transit service is also available beyond the end of the workday for all Lincoln Fields Shopping Centre workers residing in Britannia-Lincoln Heights, again with the exception of those residing in Britannia Village. Although on every day of the week the last business closes at midnight, transit service is provided from Lincoln Fields Shopping Centre for several hours thereafter. Residents living along Richmond Road, for example, can board a bus home until just before 3:00 a.m. from Sunday to Friday, and until just after 3:00 a.m. on Saturdays. Workers living along or near Carling Avenue can travel home by bus until just after 1:00 a.m. from Monday to Saturday, and until just before 1:00 a.m. on Sundays.

Table 8.3
Comparison of Business Hours at Lincoln Fields Shopping Centre with Hours of Transit Service between Britannia-Lincoln Heights and Lincoln Fields Shopping Centre, May 2001

	Earliest Opening Time	Earliest Bus Arrival	Latest Closing Time	Latest Bus Departure
Monday-Friday	7:00 a.m.	4:25 a.m.	12:00 a.m.	2:52 a.m.
Saturday	7:00 a.m.	5:06 a.m.	12:00 a.m.	3:05 a.m.
Sunday	8:00 a.m.	6:10 a.m.	12:00 a.m.	2:36 a.m.

Source: Tables 8.1 and 8.2

Residents of Britannia Village are not as fortunate. Route #18 makes its last trip from the Lincoln Fields Shopping Centre just a few minutes after midnight on weekdays (and thus potentially too soon after the business closes for an employee to make it to the stop), and well before midnight on weekends. As a result, individuals who work until midnight at this employment area and live in Britannia Village are unable to commute by public transit due to a lack of service availability. Similarly, Route #18 does not arrive from Britannia Village for the first time until after 8:00 a.m. on Sundays, and thus not until after the first business opens for the day. Early morning service from Britannia Village is better on weekdays and Saturdays, however, with the first trips arriving well before business opening times on those days.

Public transit service between communities in Britannia-Lincoln Heights and the Lincoln Fields Shopping Centre is also in many cases available at high frequencies (Table 8.4). Workers using transit stops along Carling Avenue and Richmond Road benefit in both cases from the provision of more than one transit route. Two routes travel are available to commuters residing in the vicinity of Richmond Road while, depending on the time of day and day of the week, as many as four routes travel along Carling Avenue. With the high frequencies at which many of these routes travel, commuters can on many occasions arrive at the transit stop confident that they will not have to wait long for a transit vehicle to arrive. This is especially the case during weekday peak periods, when service is provided on some routes as often as every four minutes. Service is less frequent on weekends, although residents using stops along Richmond Road once again have a fairly high level of service. Along Carling Avenue, the only route that operates on weekends is #85, which travels only every 30-40 minutes during the early morning and late evening. The most significant deficiencies related to service frequencies were found in Britannia Village. Service is provided in this area by two routes during weekday peak periods (#18 and #50), and frequencies during these times are quite high. Commuters also receive fairly frequent service during the midday on weekdays, when Route #18 travels every 20 minutes. It is on weekday evenings and during the weekend, however, that service between Britannia Village and the Lincoln Fields Shopping Centre is poorest. At these times, service is available only every 30 to 60 minutes. This, combined with the meandering route that is followed in serving the community, does not lend itself well to the promotion of public transit commuting.

Table 8.4
Frequency of Public Transit Service between
Britannia-Lincoln Heights and Lincoln Fields Shopping Centre, May 2001

Frequency of Service (in minutes)	Route #							
	2	18	50	59	85	97	116	182
Monday-Friday								
Early Morning (Before 6:00 a.m.)	30	19	--	--	15-41	15-30	--	--
Morning Peak Period (6:00-9:00 a.m.)	24	15-20	9-25	27-35	14	4-11	9-11	13-21
Midday (9:00 a.m. to 3:00 p.m.)	24	20	--	--	15	6-15	--	--
Afternoon Peak Period (3:00 p.m. to 6:00 p.m.)	24	15-20	14-24	29-32	12	4-11	6-20	15-30
Early Evening (6:00 p.m. to 10:00 p.m.)	30	60	--	--	20	7-16	--	--
Late Evening (After 10:00 p.m.)	31-45	60	--	--	30	15-30	--	--
Saturday								
Early Morning (Before 9:00 a.m.)	30	30	--	--	30	15-30	--	--
Midday (9:00 a.m. to 9:00 p.m.)	30	30-60	--	--	10-15	15	--	--
Late Evening (After 9:00 p.m.)	30-39	60	--	--	30-40	15-40	--	--
Sunday								
Early Morning (Before 10:00 a.m.)	30	60	--	--	30	15-30	--	--
Midday (10:00 a.m. to 9:00 p.m.)	30	30	--	--	20-30	15	--	--
Late Evening (After 9:00 p.m.)	30	60	--	--	30-32	15-30	--	--

Source: OC Transpo Transit Schedules

8.5.2 Dimension #2: Travel between Homes and Transit Stops

Application of the *PTCAA* in Britannia-Lincoln Heights revealed several problem areas related to the availability of necessary infrastructure, facilities and services between homes and transit stops. There was considerable variation throughout the subarea concerning the presence of shops and services and the presence and quality of pedestrian infrastructure. In order to assess the viability of trip chaining close to home (i.e. en route between the transit stop and dwelling) the *PTCAA* included an examination of the variety of shops and services available in Britannia-Lincoln Heights. Several pockets of mixed-use activity were identified: along Carling Avenue near the western edge of Britannia Heights; at the corner of Richmond Road and Poulin Avenue, and along Carling Avenue, in Britannia; and, along Richmond Road in Lincoln Heights. A wide variety of facilities and services is available in each of these areas, including medical and dental offices, convenience stores, and restaurants and pubs. Local access to required facilities and services was poorest in the southern portion of Britannia Heights (along Richmond Road) and in Britannia Village, where in both cases non-residential functions were virtually non-existent.

The *PTCAA* also examined pedestrian and cyclist accessibility to transit stops. With regard to pedestrian access, the audit revealed that most commuters in Britannia-Lincoln Heights have direct access to transit stops because local roads follow an efficient grid pattern. Some exceptions, however, include the Michele Drive area, from which residents must walk a considerable distance to either Carling Avenue or Richmond Road in order to reach transit stops, and that part of Britannia located near the Ottawa River, where transit stops are again located a sizeable distance away from homes. The availability of sidewalks and other infrastructure required by pedestrians also varies considerably. Sidewalks are in place along both sides of all major arteries and in most cases are physically separated from the road by grass or concrete buffers. However, sidewalks are less frequently present on other streets. They are available on one side of Michele Drive (Figure 8.12) and Ritchie Street (Figure 8.13), two low-income areas in which large proportions of workers are likely dependent on public transit, and along Poulin Avenue, where there is a sizeable senior citizen population. Most other streets are without sidewalks, and instead have gravel shoulders without curbs. Priscilla Street in the community of Britannia, shown in Figure 8.14, provides one such example. In Britannia-Lincoln Heights, as in the other communities in which case studies have been conducted, the presence of parked cars along streets without sidewalks forces pedestrians to walk closer to the middle of the road, thus potentially jeopardizing their personal safety. Where sidewalks are provided, however, they are of an adequate width and in all cases have been designed to facilitate wheelchair access. With only one exception, pedestrian routes to transit stops can generally be described as aesthetically pleasant. The exception relates to the pedestrian environment in the Michele Drive area, where the presence of damaged fencing and abandoned shopping carts did not lend themselves to the creation of an attractive walking environment (Figure 8.15).

Figure 8.12 Michele Drive, Britannia-Lincoln Heights
Photo: C. Fullerton

Figure 8.13 Ritchie Street, Britannia-Lincoln Heights
Photo: C. Fullerton

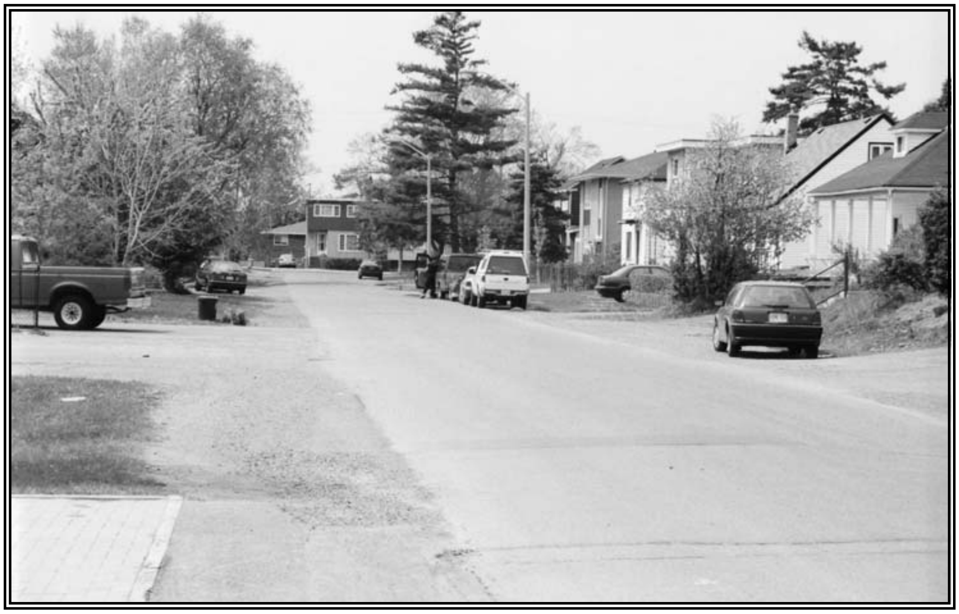

Figure 8.14 Priscilla Street, Britannia-Lincoln Heights
Photo: C. Fullerton

Figure 8.15 Abandoned Shopping Cart, Michele Drive, Britannia-Lincoln Heights
Photo: C. Fullerton

A number of safety and security concerns also emerged in this part of the *PTCAA*. These related to: the quality of street lighting, the poor visibility of some walking routes, and the lack of audible traffic signals. Lighting is in place along most roadways in Britannia-Lincoln Heights. In most areas, the level of lighting appears to be sufficient; however, in at least one area this is not the case. Several streets near the Ottawa River in the community of Britannia suffer from inadequate lighting for two reasons (Figure 8.16). First, they are lined with dense rows of mature trees. Although this adds to the attractiveness of the residential landscape, the trees are so abundant in number and so large in size that they completely cover the streetlights. Second, these same streetlights are more *ornamental* than *functional* in nature. In lieu of the more common and utilitarian light fixtures found along most Ottawa streets, those provided in this area are designed to have an antique appearance that coincides with the community's heritage. As a result, their effectiveness in providing commuters with a safe walking environment between dusk and dawn is seriously compromised.

Figure 8.16 Haughton Avenue, Britannia-Lincoln Heights
Photo: C. Fullerton

The *PTCAA* also revealed several areas in which the safety and security of pedestrians could potentially be compromised due to a lack of visibility. For example, residents of the aforementioned area along the Ottawa River in Britannia have the option of waiting for the bus at Britannia Park. However, movement to and from the bus stop requires travel along the poorly lit roads and through a part of Britannia Park in which there is little traffic after dark. Thus, if a commuter travels by public transit between dusk and dawn, he/she would be poorly visible and is therefore at risk of becoming a victim of crime. Several other locations were also identified as potential problem areas in this regard; in most cases these were at points along pedestrian routes where the neighbouring land use was open parkland (such as that visible in Figure 8.12). A final weakness identified in this stage of the *PTCAA* related to road crossings. Public transit commuters residing in Britannia-Lincoln Heights are provided with ample road crossing opportunities, particularly along the very busy arterial roadways (Carling Avenue and Richmond Road). In many cases the traffic signals are exclusively for the use of pedestrians and will stop traffic immediately after the pedestrian pushes the button (Figure 8.17). One problem, however, is that these do not include audible signals, thus neglecting the needs of persons with visual impairments.

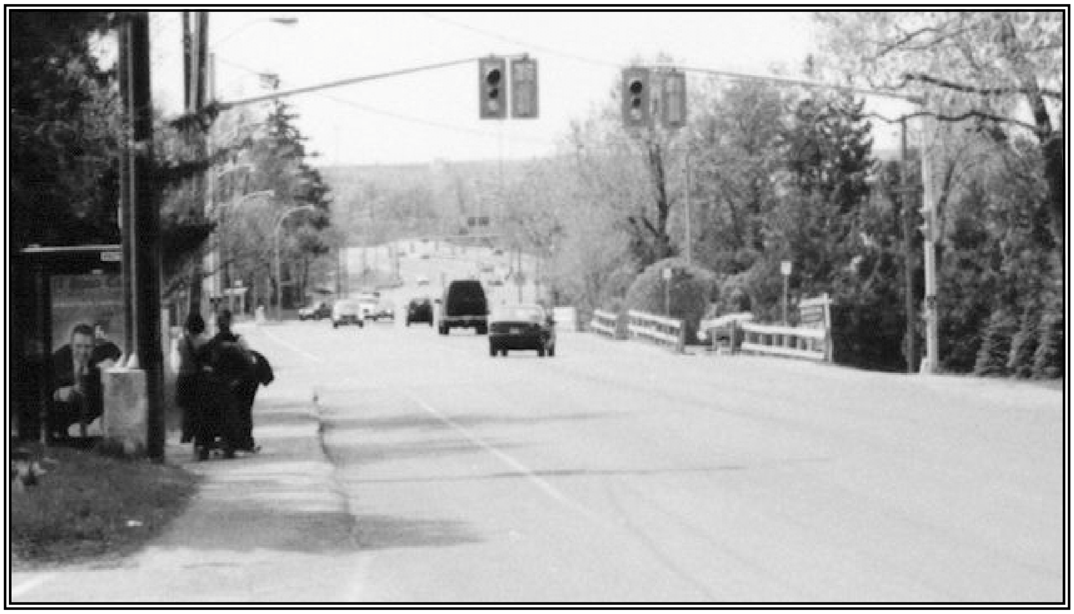

Figure 8.17 Pedestrian Crossing, Richmond Road, Britannia-Lincoln Heights
Photo: C. Fullerton

8.5.3 Dimension #3: Transit Stops near Place of Residence

The quality of transit stop environments varied considerably throughout Britannia-Lincoln Heights, with the most favourable conditions observed along the major arterials and the worst conditions found once again in Britannia Village. A total of 75 transit stops were examined in this stage of the *PTCAA,* most of which are located on either a sidewalk or on a concrete pad. In Britannia Village, however, the lack of sidewalks on local streets means that most commuters are forced to stand on the road while waiting for their transit vehicle to arrive, or on private lawns or driveways (see Figure 8.6, for example). Shelters, benches, and transit service information are provided at most stops along Richmond Road and Carling Avenue, but at other locations such amenities are less frequently available. In total, 57 of the 75 stops have service information displayed, 43 have benches, 35 have shelters, and 16 have garbage cans. The visibility of transit stops ranged from very poor to very good. The most highly visible transit stops, not surprisingly, are located along the major arterial routes. The most poorly visible transit stops are located in Britannia Village, where several stops were found to be adjacent to bushes, vacant lots and even a boatyard (Figures 8.18 and 8.19).

8.5.4 Dimension #4: On-Vehicle Travel

Public transit commuter needs related to on-vehicle travel are very well served within the context of commuting between Britannia-Lincoln Heights and the Lincoln Fields Shopping Centre. All four regular routes serving the two points (those providing all-day service, seven days a week) make exclusive use of low-floor transit vehicles that also have highly-visible large-font LED route number and destination displays (Figure 8.20). Furthermore, most transit vehicles on Routes #2, #85 and #97 are articulated buses that measure 20-feet longer than conventional buses. As a result, although these routes are usually very busy in terms of passenger volumes, the likelihood of getting a seat is quite high. For example, during the trial application of the *PTCAA* several trips were made on these routes and a seat was available on each and every occasion. The needs of public transit commuters wishing to complete part of their journey by bicycle are also well served in that all transit vehicles on Routes #2, #85, and #97 are equipped with bicycle racks as a formal OC Transpo policy.

Figures 8.18 and 8.19 Poor Transit Stops, Britannia Village
Photo: C. Fullerton

Figure 8.20 Low-Floor OC Transpo Bus, Lincoln Fields Shopping Centre
Photo: C. Fullerton

On-board travel experiences were generally positive while the case study was conducted. OC Transpo drivers were consistently friendly, the transit vehicles were always clean and free of litter, and I never felt that my personal safety or security was at risk. One problem, however, was that drivers did not announce stops or major intersections while travelling. This was a notable omission given that announcement of stops was highlighted in Chapter Four as an important determinant of the viability of travelling by public transit for persons who are visually impaired.

8.5.5 Dimension #5: Transit Stops near the Place of Employment

Depending on the transit route used, commuters to the Lincoln Fields Shopping Centre are dropped off either directly in front of the mall entrance or about 100 metres away at stops on Carling Avenue or Richmond Road. In *all* cases their needs are fully served, as each transit stop is equipped with a full range of amenities, including paved boarding areas, benches, shelter, service information, garbage cans, and newspaper vending machines (Figure 8.21). All stops are also highly visible from passing vehicles.

Although many commuters would not likely use these, two stops located on Croydon Avenue, adjacent to the Lincoln Fields Shopping Centre, are worthy of mention as problem areas. Not only are there are no sidewalks in place at these stops, they are also located at the base of a short but steep slope that leads down from an area of the shopping centre parking lot that has fallen into a high degree of disrepair. As shown in Figure 8.22, the fence along the parking lot boundary has been seriously damaged and has not been repaired. These conditions, along with the presence of numerous abandoned and upturned shopping carts, have resulted in the creation of a very unattractive public transit waiting environment that is likely to deter anyone from using it who might otherwise want to do so, such as a Lincoln Fields Shopping Centre employee who has gone across the street to run an errand before catching the bus home after work.

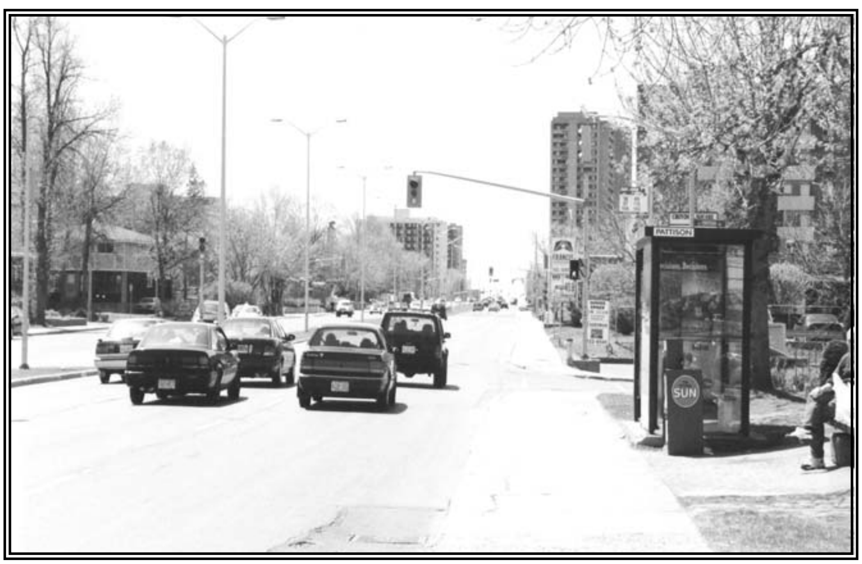

Figure 8.21 Bus Stop, Carling Avenue in Front of Lincoln Fields Shopping Centre
Photo: C. Fullerton

Figure 8.22 Unattractive Waiting Environment, Croydon Avenue adjacent to Lincoln Fields Shopping Centre
Photo: C. Fullerton

8.5.6 Dimension #6: Travel from Transit Stops to the Place of Employment

Commuters using transit stops on Carling Avenue and Richmond Road are provided with pedestrian-activated road crossing signals and with sidewalks that lead almost as far as the shopping centre entrances. However, in both cases problems exist. Firstly, the road crossing signals do not include audible signals. Secondly, the sidewalks leading to the mall (on both the north and south sides) are in poor physical condition and require repair. Thirdly, commuters are also required to cross busy access roads as they walk between transit stops and the shopping centre entrances (Figure 8.23). This is particularly problematic because there are no clear pavement markings that indicate the location of traffic lanes or pedestrian routes. As a result, the movement of traffic along these routes is often both chaotic and congested, thus creating an unpleasant pedestrian (and therefore public transit commuter) travel experience.

Figure 8.23 Parking Lot, Lincoln Fields Shopping Centre
Photo: C. Fullerton

8.5.7 Dimension #7: Employment Area

Finally, in terms of the availability of required facilities and services within the Lincoln Fields Shopping Centre and in its immediate vicinity, public transit commuter needs are also well served. Although Lincoln Fields serves primarily as a community-scale shopping centre, it also contains a vast array of non-retail functions. Accordingly, Britannia-Lincoln Heights residents working at Lincoln Fields benefit from the availability of grocery stores, a major chain department store, clothing stores, a pharmacy, dry cleaners, personal care and aesthetic services, restaurants, medical and dental facilities, banking, financial and investment services, and employment counselling services. (For a complete list, see Appendix Three.) Commuters wishing to combine public transit and bicycle travel are also provided with bicycle storage racks at all mall entrances (Figure 8.24). However, a *sheltered* rack is provided at only one of these locations. Furthermore, although the racks are highly visible to passing pedestrian and automobile traffic, they are not visible from indoors. As a result, employees wishing to monitor their bicycles while at work must come outside in order to do so.

Figure 8.24 Bicycle Rack, Lincoln Fields Shopping Centre
Photo: C. Fullerton

8.6 *Public Transit Commuter Accessibility Audit* Report Card – Britannia-Lincoln Heights

The completed PTCAA Report Card reflecting the assessment of conditions between Britannia-Lincoln Heights and the Lincoln Fields Shopping Centre is presented on the following pages.

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: BRITANNIA-LINCOLN HEIGHTS TO LINCOLN FIELDS S.C.

Dimension #1: Availability of Public Transit Service

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Public transit service is available within the subarea.	OC Transpo Route Map	Several transit routes serve Britannia-Lincoln Heights	√				
2	Public transit service is available at the employment area.	OC Transpo Route Map	Several transit routes serve LFSC	√				
3	Public transit service is provided directly between the subarea and employment area.	OC Transpo Route Map	Several transit routes provide direct access between the two points	√				
4	If public transit is not provided directly between the subarea and employment area, commuters must only transfer once in order to reach the employment area.	OC Transpo Route Map	No transfers necessary					√
5	If commuters must transfer between transit vehicles, route schedules are efficiently coordinated.	N/A	Not applicable					√
6	Public transit service is provided between the subarea and employment area on days when commuters travel.	OC Transpo Route Schedules	Service provided between the two points seven days per week	√				
7	Public transit service is provided between the subarea and employment area before, during and after employees' workdays.	OC Transpo Route Schedules	Service provided at all times of day when employees are working at, or travelling to/from, LFSC	√				
8	Public transit service is provided between the subarea and employment area at convenient frequencies.	OC Transpo Route Schedules	Frequent service available at most times due to large number of transit routes serving LFSC, except in case of Britannia Village		√			

Dimension #2: Travel between Homes and Transit Stops/Stations

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Facilities and services required on a day-to-day basis are available within walking distance of homes.	Field Observations	Residents living near Carling Avenue have access to large variety of facilities and services; those along Richmond Road and within Britannia Village do not		√			
2	Commuters can travel directly between their places of residence and transit stops/stations.	Field Observations	Most commuters can travel directly to stops; however, many must travel long distances		√			
3	Travel routes between places of residence and transit stops/stations are aesthetically pleasant.	Field Observations	Most routes aesthetically pleasant; some abandoned shopping carts and broken fences in Britannia Heights		√			
4	Travel routes between places of residence and transit stops/stations are adequately lighted between dusk and dawn.	Field Observations	All streets have lighting, but fixtures in north end of Britannia more ornamental than functional in nature		√			
5	Travel routes between places of residence and transit stops/stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	Most routes highly visible from neighbouring homes; however, some pass by open parkland and tracts of open space, especially in Britannia and Britannia Village		√			
6	A continuous sidewalk network provides physical access to transit stops/stations.	Field Observations	Many streets without sidewalks or curbs, especially Britannia, Britannia Village, Lincoln Heights			√		

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Dimension #2: Travel between Homes and Transit Stops/Stations (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
7	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.	Field Observations	Where provided, sidewalks are of adequate width	√				
8	Sidewalks are in good physical condition.	Field Observations	Where provided, all sidewalks observed to be in good repair	√				
9	Sidewalks are designed to accommodate the needs of wheelchair users.	Field Observations	Where provided, all sidewalks have curb cuts	√				
10	Sidewalks are promptly cleared of ice and snow.	N/A	Unclear due to conducting of PTCAA during spring months				√	
11	Sidewalks are effectively cleared of ice and snow.	N/A	Unclear due to conducting of PTCAA during spring months				√	
12	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.	Field Observations	Where provided, all sidewalks separated from roadways by grass or concrete buffers	√				
13	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.	Field Observations	No sidewalk obstacles observed	√				

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: BRITANNIA-LINCOLN HEIGHTS TO LINCOLN FIELDS S.C.

Dimension #2: Travel between Homes and Transit Stops/Stations (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
14	When they must cross collector and arterial roads, commuters are provided with signalized road crossing opportunities.	Field Observations	Traffic signals located throughout area provide numerous road crossing opportunities; many provided exclusively for pedestrian use	√				
15	Road-crossing signals can be activated by pedestrians.	Field Observations	All traffic signals can be activated by pedestrians	√				
16	Road-crossing signals include audible signals.	Field Observations	No audible signals provided			√		
17	When required to travel along collector and arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.	Field Observations	No bicycle lanes provided			√		
18	Bicycle lanes are of an adequate width.	Field Observations	No bicycle lanes provided			√		

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: BRITANNIA-LINCOLN HEIGHTS TO LINCOLN FIELDS S.C.

Dimension #3: Transit Stops/Stations near the Place of Residence

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit stops and stations are located on pavement.	Field Observations			√			
2	Transit stops and stations are adequately lighted between dusk and dawn.	Field Observations			√			
3	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations			√			
4	Trash receptacles are provided at transit stops and stations.	Field Observations	Only 16 of 80 stops had a trash receptacle		√			
5	Transit stops and stations are clean.	Field Observations		√				
6	Effective shelter from the elements is provided at transit stops and stations.	Field Observations	37 of 80 stops had a shelter		√			
7	Seating is provided at transit stops and stations.	Field Observations	47 of 80 stops had a bench		√			
8	Newspaper vending machines are available at transit stops and stations.	Field Observations	21 of 80 stops had a newspaper vending machine		√			
9	Service information is provided at transit stops and stations.	Field Observations	60 of 80 stops had service information	√				

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Dimension #3: Transit Stops/Stations near the Place of Residence (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
10	Public telephones are available at transit stations.	N/A	No transit stations in Britannia-Lincoln Heights					√
11	Emergency telephones or call boxes are provided at transit stations.	N/A	No transit stations in Britannia-Lincoln Heights					√
12	Public washrooms are provided at transit stations.	N/A	No transit stations in Britannia-Lincoln Heights					√
13	Baby change facilities are provided in washrooms at transit stations.	N/A	No transit stations in Britannia-Lincoln Heights					√
14	Bicycle storage facilities (racks or lockers) are provided at transit stops and stations.	N/A	No transit stations in Britannia-Lincoln Heights					√
15	Convenience stores and/or vending machines are located at transit stations.	N/A	No transit stations in Britannia-Lincoln Heights					√

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Dimension #3: Transit Stops/Stations near the Place of Residence (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
16	When commuters must access public transit by car, park-and-ride facilities are provided at transit stations.	N/A	Automobile access to transit not required					√
17	An adequate supply of parking is provided at park-and-ride facilities.	N/A	Use of park-and-ride facilities not required					√
18	Park-and-ride facilities are provided free of charge.	N/A	Use of park-and-ride facilities not required					√
19	Park-and-ride facilities are adequately lit between dusk and dawn.	N/A	Use of park-and-ride facilities not required					√
20	Park-and-ride facilities are highly visible by passing traffic and/or from adjacent buildings.	N/A	Use of park-and-ride facilities not required					√
21	Park-and-ride facilities are security monitored.	N/A	Use of park-and-ride facilities not required					√
22	Direct pedestrian access is provided between park-and-ride facilities and transit stops or stations.	N/A	Use of park-and-ride facilities not required					√
23	Park-and-ride facilities are easily accessible from adjacent roadways.	N/A	Use of park-and-ride facilities not required					√

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: BRITANNIA-LINCOLN HEIGHTS TO LINCOLN FIELDS S.C.

Dimension #4: On-Vehicle Travel

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit vehicles are universally accessible.	OC Transpo Route Schedules	Several transit routes travelling between the two points make exclusive use of low-floor vehicles		√			
2	Route numbers and destinations are clearly visible.	Field Observations	Most, but not all, buses observed had large font LED displays		√			
3	Adequate seating is available on transit vehicles.	Field Observations	No shortage of seating observed on any trip	√				
4	Commuters' personal safety and security is not compromised on board transit vehicles.	Field Observations	No safety or security risks observed on board vehicles throughout any trip	√				
5	Transit vehicles are clean.	Field Observations	Vehicles were clean and free of litter on all trips	√				
6	Transit drivers announce major stops, stations and intersections.	Field Observations	Drivers did not make any announcements			√		
7	Transit drivers are friendly and helpful when asked for assistance.	Field Observations	Most drivers said “hello” when greeted, but were not asked for assistance	√				
8	Transit vehicles are equipped with bicycle racks.	OC Transpo Website	Transit vehicles on several routes travelling between the two points are equipped with bicycle racks from Spring to Fall	√				

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: BRITANNIA-LINCOLN HEIGHTS TO LINCOLN FIELDS S.C.

Dimension #5: Transit Stops/Stations near the Place of Employment

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit stops/stations are located in close proximity to the place of employment.	Field Observations	Most stops located at doors to LFSC, or only a short distance away	√				
2	Transit stops and stations are located on pavement.	Field Observations	All stops located on paved boarding areas	√				
3	Transit stops and stations are adequately lighted between dusk and dawn.	Field Observations	All stops very well lighted	√				
4	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	Stops highly visible due to high traffic volumes in area	√				
5	Trash receptacles are provided at transit stops and stations.	Field Observations	Trash receptacles provided at all stops	√				
6	Transit stops and stations are clean.	Field Observations	All stops observed to be clean and free of litter, although some garbage cans were full	√				
7	Effective shelter from the elements is provided at transit stops and stations.	Field Observations	Shelters provided at all stops at/near Lincoln Fields Shopping Centre	√				
8	Seating is provided at transit stops and stations.	Field Observations	Benches provided at all stops at/near Lincoln Fields Shopping Centre	√				
9	Newspaper vending machines are available at transit stops and stations.	Field Observations	Newspaper vending machines available at most stops	√				
10	Service information is provided at transit stops and stations.	Field Observations	Service information displayed at all stops at/near Lincoln Fields Shopping Centre	√				

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: BRITANNIA-LINCOLN HEIGHTS TO LINCOLN FIELDS S.C.

Dimension #5: Transit Stops/Stations near the Place of Employment (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
10	Public telephones are available at transit stations.	N/A	No travel through transit stations involved in journey					√
12	Emergency telephones or call boxes are provided at transit stations.	N/A	No travel through transit stations involved in journey					√
13	Public washrooms are provided at transit stations.	N/A	No travel through transit stations involved in journey					√
14	Baby change facilities are provided in washrooms at transit stations.	N/A	No travel through transit stations involved in journey					√
15	Bicycle storage facilities (racks or lockers) are provided at transit stops and stations.	Field Observations	Bicycle racks not provided at stops			√		
16	Convenience stores and/or vending machines are located at transit stations.	N/A	No travel through transit stations involved in journey					√

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: BRITANNIA-LINCOLN HEIGHTS TO LINCOLN FIELDS S.C.

Dimension #6: Travel from Transit Stops/Stations to the Place of Employment

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Commuters can travel directly between transit stops/stations and their places of employment.	Field Observations	Commuters are either dropped off at doors of LFSC or on Carling Avenue; direct access provided in either case	√				
2	Travel routes between transit stops/stations and workplaces are aesthetically pleasant.	Field Observations	Commuters entering from Carling Avenue must travel beside unattractive parking lot		√			
3	Travel routes between transit stops/stations and workplaces are adequately lighted between dusk and dawn.	Field Observations	Streetlighting is prevalent along the entire route	√				
4	Travel routes between transit stops/stations and workplaces are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	High traffic volumes allow for high visibility	√				
5	A continuous sidewalk network provides physical access between transit stops/stations and workplaces.	Field Observations	Sidewalks are provided between Carling Avenue stops and mall entrance	√				
6	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.	Field Observations	Sidewalks are of an adequate width	√				
7	Sidewalks are in good physical condition.	Field Observations	Sidewalks in poor physical condition		√			
8	Sidewalks are designed to accommodate the needs of wheelchair users.	Field Observations	Curb cuts are provided along sidewalks	√				

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Dimension #6: Travel from Transit Stops/Stations to the Place of Employment (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
9	Sidewalks are promptly cleared of ice and snow.	Field Observations	Unclear due to conducting of PTCAA during spring				√	
10	Sidewalks are effectively cleared of ice and snow.	Field Observations	Unclear due to conducting of PTCAA during spring				√	
11	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.	N/A	Travel along collector or arterial roadways not required					√
12	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.	Field Observations	No obstacles were observed	√				
13	When they must cross collector and arterial roads, commuters are provided with signalized road crossing opportunities.	Field Observations	Many signalized road crossing opportunities available	√				
14	Road-crossing signals can be activated by pedestrians.	Field Observations	Where road crossing signals provided, they may be activated by pedestrians	√				
15	Road-crossing signals included audible signals.	Field Observations	No audible signals provided			√		
16	When required to travel along collector and arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.	Field Observations	Travel along collector or arterial roads not necessary					√
17	Bicycle lanes are of an adequate width.	Field Observations	Not applicable					√

Dimension #7: Employment Area

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Facilities and services required on a day-to-day basis are available within walking distance of workplaces in the employment area.	Field Observations	Most facilities and services required on a day-to-day basis are available at Lincoln Fields Shopping Centre	√				
2	Bicycle storage facilities are provided within the employment area.	Field Observations	Bicycle racks provided adjacent to all building entrances	√				
3	Bicycle storage facilities are highly visible by passing traffic and/or from nearby buildings.	Field Observations	Bicycle racks are highly visible due to their location	√				
4	Cyclists are provided with shower and change room facilities at workplaces in the employment area.	Field Observations	Not included as part of 2001 application of PTCAA				√	

8.7 Discussion of *PTCAA* Findings – Queensway Terrace South-Redwood

8.7.1 Dimension #1: Availability of Transit Service

Unlike their co-workers residing in Britannia-Lincoln Heights, Lincoln Fields Shopping Centre employees living in Queensway Terrace South-Redwood are not able to travel directly between their homes and workplaces by public transit. Instead, service is provided on only one route through Queensway Terrace South-Redwood and the closest this route travels to the Lincoln Fields Shopping Centre is to the Lincoln Fields Transitway Station. Upon reaching this point, workers have two options. They can transfer onto another vehicle to complete their journey by public transit or they can walk the rest of the way, a distance of about one kilometre.

The lack of a direct route is only one of several obstacles and deterrents to public transit commuting between Queensway Terrace South-Redwood and the Lincoln Fields Shopping Centre. Other problems include inadequate hours of service and low service frequencies. As discussed earlier in this case study, public transit service is required to and from the Lincoln Fields Shopping Centre between the early morning and late evening seven days a week. In this regard, the access needs of commuters residing in Queensway Terrace South-Redwood are well served only on *weekday mornings*, when the first public transit trip from this subarea arrives at Lincoln Fields Transitway Station at 6:10 a.m. (Tables 8.5 and 8.6). Given that the first business to open in the shopping centre does not do so until 7:00 a.m., this provides commuters with sufficient time to complete the rest of their journey, either by public transit or on foot. On Saturday and Sunday mornings, on the other hand, the first transit trips from Queensway Terrace South-Redwood do not arrive at the Lincoln Fields Transitway Station until 7:40 a.m.

and 10:09 a.m., respectively. On Saturday, this is 40 minutes after the first business opens, while on Sunday, this is *over two hours* after the first business opens.

Table 8.5
Hours of Public Transit Service between
Queensway Terrace South-Redwood and Lincoln Fields Transitway Station, May 2001

Route #	First Arrival at LFTS from Queensway Terrace South-Redwood			Route #	Last Departure from LFTS to Queensway Terrace South-Redwood		
	Monday-Friday	Saturday	Sunday		Monday-Friday	Saturday	Sunday
152 Carlingwood	6:10 a.m.	7:40 a.m.	10:09 a.m.	152 Bayshore	10:42 p.m.	10:35 p.m.	9:30 p.m.

Source: OC Transpo Transit Schedules

Table 8.6
Comparison of Business Hours at Lincoln Fields Shopping Centre with Hours of Transit Service between Queensway Terrace South-Redwood and Lincoln Fields Transitway Station, May 2001

	Earliest Opening Time	Earliest Bus Arrival	Latest Closing Time	Latest Bus Departure
Monday-Friday	7:00 a.m.	6:10 a.m.	12:00 a.m.	10:42 a.m.
Saturday	7:00 a.m.	7:40 a.m.	12:00 a.m.	10:35 p.m.
Sunday	8:00 a.m.	10:09 a.m.	12:00 a.m.	9:30 p.m.

Source: Table 8.1 and Table 8.5

Workers leaving their place of employment late at night experience similar constraints. Although most businesses at Lincoln Fields close by 9:00 p.m. on weekdays and Saturdays, and by 7:00 p.m. on Sundays, some are open as late as midnight every night. As a result, transit service should ideally be in place to serve commuters until after this time as well. In terms of travel to Queensway Terrace South-Redwood, however, this is not the case. Instead, on every night of the week the last bus departs from the

Lincoln Fields Transitway Station before 11:00 p.m., and as early as 9:30 p.m. on Sundays.

The frequency of transit service between Queensway Terrace South-Redwood and the Lincoln Fields Transitway Station also falls below public transit commuter needs (Table 8.7). During weekday peak periods route #152 travels as far as downtown Ottawa in the peak-hour direction only. As a result, service frequencies are higher during these time periods, *leaving* Queensway Terrace South-Redwood every 10 to 25 minutes in the weekday morning peak period and travelling *to* Queensway Terrace South-Redwood every 14 to 16 minutes in the afternoon peak period. At all other times, however, service frequencies on Route #152 are only in the 30- to 60-minute range. Frequencies are especially low on weekday evenings, Saturday mornings and evenings, and all day Sunday; in each case, this route travels only once every hour.

Table 8.7
Frequency of Public Transit Service between Queensway Terrace South-Redwood Park and Lincoln Fields Shopping Centre, May 2001

Frequency of Service (in minutes)	Route # 152
Monday-Friday	
Early Morning (Before 6:00 a.m.)	--
Morning Peak Period (6:00-9:00 a.m.)	10-25
Midday (9:00 a.m. to 3:00 p.m.)	30
Afternoon Peak Period (3:00 p.m. to 6:00 p.m.)	14-16
Early Evening (6:00 p.m. to 10:00 p.m.)	30
Late Evening (After 10:00 p.m.)	60
Saturday	
Early Morning (Before 9:00 a.m.)	60
Midday (9:00 a.m. to 9:00 p.m.)	30-60
Late Evening (After 9:00 p.m.)	60
Sunday	
Early Morning (Before 10:00 a.m.)	--
Midday (10:00 a.m. to 9:00 p.m.)	60
Late Evening (After 9:00 p.m.)	60

Source: OC Transpo Transit Schedules

8.7.2 Dimension #2: Travel between Homes and Transit Stops

The *PTCAA* revealed several weaknesses related to travel between homes and transit stops within Queensway Terrace South-Redwood. Although pedestrian accessibility to transit stops is quite good in that most public transit commuter needs are met, a lack of required facilities and services in this subarea could deter public transit commuting. None of the four communities comprising Queensway Terrace South-Redwood have daycare centres available within their boundaries, nor do Kenson Park and Redwood Park have any other facilities and services needed by commuters on a day-to-day basis. Parkway Park contains a small strip mall that houses a convenience store, a butcher shop and delicatessen, a bakery, a pizzeria, a Chinese-food restaurant, a beauty salon, and a barber shop (Figure 8.25). Residents of Queensway Terrace South are served best when it comes to the provision of required facilities and services in the vicinity of their homes. This is due primarily to the presence of the Pinecrest Shopping Centre, a former community-scale shopping facility that has been remodelled over the past decade in order to keep up with contemporary retail trends, most notably the rising prominence of big-box retailers. Pinecrest Shopping Centre can now be described best as "part community shopping centre/part regional shopping centre". Among the shops and services aimed primarily at nearby residents are a major grocery store, a pharmacy, a bank, and a do-it-yourself wine-making store. There are also numerous big-box retailers located here, including furniture stores, a shoe store, a bookstore, and a linen store.

Figure 8.25 Colonial Plaza, Queensway Terrace South-Redwood
Photo: C. Fullerton

As far as pedestrian travel between homes and transit stops is concerned, the *PTCAA* found several problem areas. Direct and aesthetically pleasant routes to transit stops are available in all neighbourhoods, and most routes are well lit and highly visible. In terms of lighting, however, night visibility along some stretches of roadway is obscured because the mature foliage covers the streetlights. This is particularly the case along Morrison Drive in Redwood Park (Figure 8.26).

Figure 8.26 Morrison Drive, Queensway Terrace South-Redwood
Photo: C. Fullerton

The main problem related to this dimension of the public transit commuter trip concerns the provision of sidewalks. With only one exception (Lisa Avenue), sidewalks are in place on only one side of collector streets throughout Queensway Terrace South-Redwood, or they are not at all available. Furthermore, most local streets in Queensway Terrace South, Parkway Park and Kenson Park do not have sidewalks either. As a result, public transit commuters are forced to walk on the roadway for much or all of their trips to and from transit stops. Where sidewalks are provided, however, they are wide, in good repair, and conducive to the use of wheelchairs. Occasionally, such as along Morrison Drive and Iris Street, they are also separated from roadways by grass buffers.

The configuration of route #152 through Queensway Terrace South-Redwood is such that all commuters travelling to and from transit stops must cross a collector road in either the homebound or workbound direction. There are no traffic signals provided to aid in this movement; however, there are numerous stop signs in place along all collector roads and speed limits are in all cases only 40 or 50 kilometres per hour. Transit stops in Queensway Terrace South-Redwood are also sited in a way that prevents commuters from having to cross major arterial roadways.

8.7.3 Dimension #3: Transit Stops near Place of Residence

Forty-one transit stops were examined as part of the *PTCAA*. Despite the presence of sidewalks on only one side of most collector streets, the installation of concrete pads has ensured that most commuters are able to board or leave their transit vehicles on paved areas rather than on lawns or gravel road shoulders. In Queensway Terrace South-Redwood, 32 of the 41 transit stops are paved. Conditions are also somewhat satisfactory in terms of the provision of service information, as 25 of the 41 transit stops have route maps and schedules. Where service information is missing it is generally because the transit stop has been mounted on a hydro pole. With regard to the provision of other amenities, however, conditions are less favourable. Only 17 stops have benches and only 12 have shelters. These are important deficiencies because the frequency of transit service in this subarea is at most times very low. Furthermore, only eight transit stops have newspaper vending machines and only two have garbage cans.

8.7.4 Dimension #4: On-Vehicle Travel

Public transit commuter needs related to on-vehicle travel are generally well served, although there are some deficiencies that could hinder public transit commuting for persons with disabilities. Although on several occasions while the *PTCAA* was conducted trips on Route #152 were served by low-floor transit vehicles, OC Transpo *guarantees* the provision of such vehicles only on Sundays. On all other days of the week, commuters cannot be assured that the transit vehicle arriving at their stop will be a low-floor model. As a result, persons who are unable to climb the stairs of a conventional transit vehicle may be discouraged from travelling on this route. The transit vehicles used in completing the *PTCAA* consistently had large-font LED route number and destination signs, thus assisting persons with visual impairments in making sure they are catching the proper vehicle. In all cases there was also no shortage of seating, nor were there any situations in which personal safety or security were felt to be at risk.

8.7.5 Dimension #5: Transit Stops/Stations near Place of Employment

As noted earlier, commuters travelling to the Lincoln Fields Shopping Centre from Queensway Terrace South-Redwood must leave Route #152 at the Lincoln Fields Transitway Station. They must then choose between completing their journey on foot (a distance of about one kilometre) or completing their journey by public transit. The latter option is perhaps the most viable because, depending on the day of the week and the time of day, as many as eight different transit routes operate between the Lincoln Fields Transitway Station and Lincoln Fields Shopping Centre. Although waiting times at the Lincoln Fields Transitway Station would in most cases therefore not be very long, this station is replete with services and amenities required by public transit commuters. There are numerous shelters (including climate-controlled waiting areas), benches, as well as public and emergency telephones. This facility also houses an OC Transpo Information Centre from which passes and tickets may be purchased and printed route maps and schedules may be obtained. An important deficiency, however, is the lack of public washrooms and baby change facilities.

8.7.6 Dimension #6: Travel from Transit Stops/Stations to the Place of Employment

For commuters who proceed from the Lincoln Fields Transitway Station by public transit, the conditions experienced en route between transit stops on Carling Avenue and the Lincoln Fields Shopping Centre are identical to those discussed in Section 8.5.6. For those who opt instead to complete their journeys on foot, travel conditions are much more difficult. The walking trip between Lincoln Fields Transitway Station and Lincoln Fields Shopping Centre can be a harrowing experience for a number of reasons. First, although the distance between the two points is only about 300 metres “as the crow flies”, the presence of the Ottawa River Parkway in between forces pedestrians to follow a circuitous route that involves travelling over two bridges (Figure 8.27). Second, one of these bridges is located along Carling Avenue, a very busy arterial roadway. The sidewalk in place on the bridge is very narrow and is not buffered from the adjacent three lanes of high-speed traffic (Figure 8.28). A third factor that creates an unpleasant walking experience between the Lincoln Fields Transitway Station and Lincoln Fields Shopping Centre is the presence of an off-ramp from the Ottawa River Parkway. Pedestrian crossing of this off-ramp is made difficult by the high speed of traffic and the availability of only a yield sign that is frequently ignored by car drivers. This problem was noted by one survey respondent employed at CAA North and East Ontario. When asked what changes might improve walking conditions around Lincoln Fields, they stated: “[The] exit for the parkway. There is only a yield sign. I feel if there were lights it would be easier for me to get across the street.” Upon crossing the Ottawa River Parkway off-ramp, commuters then face another unpleasant walking experience, as they must travel across the parking lot of the Lincoln Fields Shopping Centre without the benefit of any pedestrian infrastructure. The walking environment here is also aesthetically unattractive due to the presence of upturned shopping carts, broken fencing, and vast amounts of litter (Figure 8.29).

Figure 8.27 Pedestrian Bridge, Lincoln Fields Transitway Station
Photo: C. Fullerton

Figure 8.28 Bridge over Ottawa River Parkway, Carling Avenue
Photo: C. Fullerton

Figure 8.29 Pedestrian Access Point to Lincoln Fields Shopping Centre
Photo: C. Fullerton

8.7.7 Dimension #7: Employment Area

The *PTCAA* results related to this dimension are identical to those for the previous case study (Britannia-Lincoln Heights). Accordingly, they are not repeated here.

8.8 *Public Transit Commuter Accessibility Audit* Report Card

The completed PTCAA Report Card summarizing conditions in place between Queensway Terrace South-Redwood and the Lincoln Fields Shopping Centre is presented on the following pages. This is followed by several recommendations as to how public transit accessibility from this community to this employment area might be improved in order to further promote public transit commuting.

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWAY TERRACE SOUTH-REDWOOD TO LINCOLN FIELDS S.C.

Dimension #1: Availability of Public Transit Service

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Public transit service is available within the subarea.	OC Transpo Route Map	Two transit routes serve Queensway Terrace South-Redwood Park	√				
2	Public transit service is available at the employment area.	OC Transpo Route Map	Several public transit routes serve Lincoln Fields Shopping Centre	√				
3	Public transit service is provided directly between the subarea and employment area.	OC Transpo Route Map	There is no direct public transit service between the two points – a transfer is required; alternatively, commuters may walk between Lincoln Fields Transitway Station and Lincoln Fields Shopping Centre			√		
4	If public transit is not provided directly between the subarea and employment area, commuters must only transfer once in order to reach the employment area.	OC Transpo Route Map	Only one transfer is necessary	√				
5	If commuters must transfer between transit vehicles, route schedules are efficiently coordinated.	OC Transpo Route Schedules	No formal co-ordination of schedules, but high frequency of service between Lincoln Fields Transitway Station and Lincoln Fields Shopping Centre		√			
6	Public transit service is provided between the subarea and employment area on days when commuters travel.	OC Transpo Route Schedules	Service is provided between the two points seven days per week	√				
7	Public transit service is provided between the subarea and employment area before, during and after employees' workdays.	OC Transpo Route Schedules	Monday to Saturday - Service provided early morning to late evening; Sunday – Service provided late morning to early evening only		√			
8	Public transit service is provided between the subarea and employment area at convenient frequencies.	OC Transpo Route Schedules	***Weekdays*** - High frequency **to** Lincoln Fields SC during morning peak period and **from** Lincoln Fields SC during afternoon peak period; otherwise, every 30 minutes ***Saturdays*** – Hourly before 10 a.m. and after 6:30 p.m.; otherwise, every 30 minutes ***Sundays*** – Hourly service			√		

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWAY TERRACE SOUTH-REDWOOD TO LINCOLN FIELDS S.C.

Dimension #2: Travel between Homes and Transit Stops/Stations

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Facilities and services required on a day-to-day basis are available within walking distance of homes.	Field Observations	No required facilities and services available within Redwood Park			√		
2	Commuters can travel directly between their places of residence and transit stops/stations.	Field Observations	Direct routes may be followed to transit stops	√				
3	Travel routes between places of residence and transit stops/stations are aesthetically pleasant.	Field Observations	No aesthetically unpleasant surroundings observed; private and public properties well maintained	√				
4	Travel routes between places of residence and transit stops/stations are adequately lighted between dusk and dawn.	Field Observations	All streets lighted, but foliage blocks out lighting on Morrison Drive and Draper Avenue		√			
5	Travel routes between places of residence and transit stops/stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	Most routes highly visible from neighbouring homes; however, some pass by open parkland and tracts of open space		√			
6	A continuous sidewalk network provides physical access to transit stops/stations.	Field Observations	All streets have sidewalks, except small stretches of Morrison Drive		√			

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Dimension #2: Travel between Homes and Transit Stops/Stations (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
7	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.	Field Observations	Where provided, sidewalks are of adequate width	√				
8	Sidewalks are in good physical condition.	Field Observations	All sidewalks observed to be in good repair	√				
9	Sidewalks are designed to accommodate the needs of wheelchair users.	Field Observations	All sidewalks have curb cuts	√				
10	Sidewalks are promptly cleared of ice and snow.	N/A	Unclear due to conducting of PTCAA during spring months				√	
11	Sidewalks are effectively cleared of ice and snow.	N/A	Unclear due to conducting of PTCAA during spring months				√	
12	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.	Field Observations	Where sidewalks provided, all are separated from roadways by grass or concrete buffers	√				
13	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.	Field Observations	No sidewalk obstacles observed	√				

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Dimension #2: Travel between Homes and Transit Stops/Stations (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
14	When they must cross collector and arterial roads, commuters are provided with signalized road crossing opportunities.	Field Observations	Crossing of arterial roads not necessary; many stop signs along collectors, but no signals		√			
15	Road-crossing signals can be activated by pedestrians.	Field Observations	No traffic signals provided					√
16	Road-crossing signals include audible signals.	Field Observations	No traffic signals provided					√
17	When required to travel along collector and arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.	Field Observations	No bicycle lanes provided			√		
18	Bicycle lanes are of an adequate width.	Field Observations	No bicycle lanes provided			√		

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWAY TERRACE SOUTH-REDWOOD TO LINCOLN FIELDS S.C.

Dimension #3: Transit Stops/Stations near the Place of Residence

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit stops and stations are located on pavement.	Field Observations	stops were located on paved boarding areas		√			
2	Transit stops and stations are adequately lighted between dusk and dawn.	Field Observations	Lighting at stops on Morrison Drive obscured by foliage – conditions very dark at night; otherwise, effective lighting in place		√			
3	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	All stops are located in front of dwellings	√				
4	Trash receptacles are provided at transit stops and stations.	Field Observations	Only 2 of 41 stops had a trash receptacle			√		
5	Transit stops and stations are clean.	Field Observations	All transit stops observed to be clean and free of litter	√				
6	Effective shelter from the elements is provided at transit stops and stations.	Field Observations	Only 12 of 41 stops had a shelter			√		
7	Seating is provided at transit stops and stations.	Field Observations	Only 17 of 41 stops had a bench			√		
8	Newspaper vending machines are available at transit stops and stations.	Field Observations	Only 8 of 41 stops had newspaper vending machines			√		
9	Service information is provided at transit stops and stations.	Field Observations	25 of 41 stops displayed service information		√			

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWAY TERRACE SOUTH-REDWOOD TO LINCOLN FIELDS S.C.

Dimension #3: Transit Stops/Stations near the Place of Residence (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
10	Public telephones are available at transit stations.	N/A	No transit stations in Queensway Terrace South-Redwood					√
11	Emergency telephones or call boxes are provided at transit stations.	N/A	No transit stations in Queensway Terrace South-Redwood					√
12	Public washrooms are provided at transit stations.	N/A	No transit stations in Queensway Terrace South-Redwood					√
13	Baby change facilities are provided in washrooms at transit stations.	N/A	No transit stations in Queensway Terrace South-Redwood					√
14	Bicycle storage facilities (racks or lockers) are provided at transit stops and stations.	N/A	No transit stations in Queensway Terrace South-Redwood					√
15	Convenience stores and/or vending machines are located at transit stations.	N/A	No transit stations in Queensway Terrace South-Redwood					√

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Dimension #3: Transit Stops/Stations near the Place of Residence (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
16	When commuters must access public transit by car, park-and-ride facilities are provided at transit stations.	N/A	Access to transit by automobile not required					√
17	An adequate supply of parking is provided at park-and-ride facilities.	N/A	Use of park-and-ride facilities not required					√
18	Park-and-ride facilities are provided free of charge.	N/A	Use of park-and-ride facilities not required					√
19	Park-and-ride facilities are adequately lit between dusk and dawn.	N/A	Use of park-and-ride facilities not required					√
20	Park-and-ride facilities are highly visible by passing traffic and/or from adjacent buildings.	N/A	Use of park-and-ride facilities not required					√
21	Park-and-ride facilities are security monitored.	N/A	Use of park-and-ride facilities not required					√
22	Direct pedestrian access is provided between park-and-ride facilities and transit stops or stations.	N/A	Use of park-and-ride facilities not required					√
23	Park-and-ride facilities are easily accessible from adjacent roadways.	N/A	Use of park-and-ride facilities not required					√

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWAY TERRACE SOUTH-REDWOOD TO LINCOLN FIELDS S.C.

Dimension #4: On-Vehicle Travel

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit vehicles are universally accessible.	OC Transpo Route Schedules	Low-floor buses not routinely used on weekdays or Saturdays; however, low-floor buses in service all day Sunday…most buses ridden during trial application were low-floor models		√			
2	Route numbers and destination signs are clearly visible.	Field Observations	Most, but not all, buses had large font LED displays		√			
3	Adequate seating is available on transit vehicles.	Field Observations	No shortage of seating observed	√				
4	Commuters' personal safety and security is not compromised on board transit vehicles.	Field Observations	No safety or security risks observed on board vehicles	√				
5	Transit vehicles are clean.	Field Observations	Vehicles were clean and free of litter	√				
6	Transit drivers announce major stops, stations and intersections.	Field Observations	Drivers did not make any announcements			√		
7	Transit drivers are friendly and helpful when asked for assistance.	Field Observations	Most drivers said “hello” when greeted, but were not asked for assistance	√				
8	Transit vehicles are equipped with bicycle racks.	OC Transpo Website	None of the transit vehicles ridden was equipped with a bicycle rack			√		

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWAY TERRACE SOUTH-REDWOOD TO LINCOLN FIELDS S.C.

Dimension #5: Transit Stops/Stations near the Place of Employment

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit stops/stations are located close to all workplaces in the employment area.	Field Observations	Commuters who transfer at Lincoln Fields Transitway Station are dropped off at/near doors to LFSC; those who walk or cycle from Transitway Station must travel approx. 300 metres		√			
2	Transit stops and stations are located on pavement.	Field Observations	All stops located on paved boarding areas	√				
3	Transit stops and stations are adequately lighted between dusk and dawn.	Field Observations	All stops very well lighted	√				
4	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	Stops highly visible due to high traffic volumes in area	√				
5	Trash receptacles are provided at transit stops and stations.	Field Observations	Trash receptacles provided at all stops	√				
6	Transit stops and stations are clean.	Field Observations	All stops observed to be clean and free of litter, although some garbage cans needed to be emptied	√				
7	Effective shelter from the elements is provided at transit stops and stations.	Field Observations	Shelters provided at all stops at/near Lincoln Fields Shopping Centre	√				
8	Seating is provided at transit stops and stations.	Field Observations	All stops at/near Lincoln Fields Shopping Centre had benches	√				
9	Newspaper vending machines are available at transit stops and stations.	Field Observations	Newspaper vending machines available at most stops and at Lincoln Fields Transitway Station	√				
10	Service information is provided at transit stops and stations.	Field Observations	Service information displayed at all stops at/near Lincoln Fields Shopping Centre	√				

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWAY TERRACE SOUTH-REDWOOD TO LINCOLN FIELDS S.C.

Dimension #5: Transit Stops/Stations near the Place of Employment (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
11	Public telephones are available at transit stations.	Field Observations	Public telephones available throughout Lincoln Fields Transitway Station	√				
12	Emergency telephones or call boxes are provided at transit stations.	Field Observations	Emergency call boxes located throughout Lincoln Fields Transitway Station	√				
13	Public washrooms are provided at transit stations.	Field Observations	No public washrooms provided at Lincoln Fields Transitway Station			√		
14	Baby change facilities are provided in washrooms at transit stations.	Field Observations	No public washrooms provided at Lincoln Fields Transitway Station			√		
15	Bicycle storage facilities (racks or lockers) are provided at transit stops and stations.	Field Observations	Bicycle racks provided at Lincoln Fields Transitway Station, but not at individual stops		√			
16	Convenience stores and/or vending machines are located at transit stations.	Field Observations	Convenience store located at Lincoln Fields Transitway Station	√				

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWAY TERRACE SOUTH-REDWOOD TO LINCOLN FIELDS S.C.

Dimension #6: Travel from Transit Stops/Stations to the Place of Employment

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Commuters can travel directly between transit stops/stations and their places of employment.	Field Observations	Commuters walking from Lincoln Fields must follow a circuitous route over two bridges; those transferring to another bus have direct access		√			
2	Travel routes between transit stops/stations and workplaces in the employment area are aesthetically pleasant.	Field Observations	Commuters walking from Lincoln Fields Transitway Station must cross Lincoln Fields Shopping Centre's large parking lot, which is in poor physical condition and replete with litter			√		
3	Travel routes between transit stops/stations and workplaces are adequately lighted between dusk and dawn.	Field Observations	Streetlighting is prevalent along the entire route	√				
4	Travel routes between transit stops/stations and workplaces are highly visible from adjacent buildings and/or by passing traffic.	Field Observations	High traffic volumes allow for high visibility	√				
5	A continuous sidewalk network provides physical access between transit stops/stations and workplaces.	Field Observations	No sidewalks provided to reach shopping centre from Carling Avenue			√		
6	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.	Field Observations	Commuters walking from Lincoln Fields Transitway Station must travel along narrow sidewalk immediately adjacent to very busy roadway			√		
7	Sidewalks are in good physical condition.	Field Observations	Sidewalks in good physical condition; parking lot is not		√			
8	Sidewalks are designed to accommodate the needs of wheelchair users.	Field Observations	Curb cuts are provided along sidewalks	√				

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWAY TERRACE SOUTH-REDWOOD TO LINCOLN FIELDS S.C.

Dimension #6: Travel from Transit Stops/Stations to the Place of Employment (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
9	Sidewalks are promptly cleared of ice and snow.	Field Observations	Unclear due to conducting of PTCAA during spring				√	
10	Sidewalks are effectively cleared of ice and snow.	Field Observations	Unclear due to conducting of PTCAA during spring				√	
11	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.	Field Observations	No buffers separating pedestrians from roadways – dangerous on Carling Avenue due to width and high traffic speeds		√			
12	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.	Field Observations	Commuters must travel around vehicles in Lincoln Fields Shopping Centre parking lot.		√			
13	When they must cross collector and arterial roads, commuters are provided with signalized road crossing opportunities.	Field Observations	No road crossing signals where pedestrians must cross off-ramp from Ottawa River Parkway – high speed of traffic poses danger		√			
14	Road-crossing signals can be activated by pedestrians.	Field Observations	Where road crossing signals provided, they may be activated by pedestrians	√				
15	Road-crossing signals include audible signals.	Field Observations	No audible signals provided			√		
16	When required to travel along collector and arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.	Field Observations	No bicycle lanes provided – very dangerous along Carling Avenue			√		
17	Bicycle lanes are of an adequate width.	Field Observations	No bicycle lanes provided			√		

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT: QUEENSWAY TERRACE SOUTH-REDWOOD TO LINCOLN FIELDS S.C.

Dimension #7: Employment Area

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Facilities and services required on a day-to-day basis are available within walking distance of workplaces in the employment area.	Field Observations	Most facilities and services required on a day-to-day basis are available at Lincoln Fields Shopping Centre	√				
2	Bicycle storage facilities are provided within the employment area.	Field Observations	Bicycle racks provided adjacent to all building entrances	√				
3	Bicycle storage facilities are highly visible by passing traffic and/or from nearby buildings.	Field Observations	Bicycle racks are highly visible due to their location	√				
4	Cyclists are provided with shower and change room facilities at workplaces in the employment area.	Field Observations	Not included as part of 2001 application of PTCAA				√	

8.9 Recommendations

Availability of Service

Analysis of public transit route configurations, hours of service, and service frequencies revealed extreme differences between the two residential subareas. With the exception of those living in Britannia Village, residents of Britannia-Lincoln Heights receive a very high level of public transit service. Direct service is provided on all days, and at all times of the day, when workers are present at the Lincoln Fields Shopping Centre and in most cases at very high frequencies. In Britannia Village, however, transit routes follow meandering paths and service hours often fail to coincide with employees' hours of work. Furthermore, service frequencies are often very inconvenient, especially on weekends when it is offered only every 30 to 60 minutes. Thus, an important means of promoting public transit commuting to the Lincoln Fields Shopping Centre would be to improve service to and from Britannia Village by providing a more direct route, more frequent service and, finally, extended service hours.

The availability of public transit service between Queensway Terrace South-Redwood and the Lincoln Fields Shopping Centre was found to be far less satisfactory. Residents of this metropolitan subarea do not have direct service to and from Lincoln Fields Shopping Centre, and must instead transfer to another bus en route or conduct part of their journey on foot. The inadequacy of transit service between the two points is further exacerbated by low service frequencies at most times of the day and week, and by a large gap between hours of work and hours of transit service. In the most extreme case, service from Queensway Terrace South-Redwood to Lincoln Fields on Sundays is first provided more than two hours after the workday begins for some employees and ends more than two hours before the last business closes. It is therefore very likely that commuters living in Queensway Terrace South-Redwood who have the option of travelling by automobile will do so in lieu of travelling by public transit due to the limited availability of service. Any effort to promote public transit commuting between the two points must therefore include the extension of service hours and improvements to the frequency of service provided.

Travel between Homes and Transit Stops

Travel conditions between homes and transit stops varied considerably within Britannia-Lincoln Heights and Queensway Terrace South-Redwood. In Britannia-Lincoln Heights, many – but not all – residents are provided with a broad land use mix in close proximity to their homes. At the same time, most households in Queensway Terrace South-Redwood are not. Although remedying this omission is important to the promotion of public transit commuting, some difficulty may be presented by the fact that both are mature areas with little infill development potential. Although it might be argued that this problem is made somewhat less critical by the widespread availability of necessary goods and services at the workplace end of the trip, the fact that commuters residing in Queensway Terrace South-Redwood may have to walk to the Lincoln Fields Transitway Station as part of their journeys may make it difficult for many to carry heavy loads on their way home from work.

Another problem identified in both subareas within the context of travel to and from transit stops relates to the presence of trees and their impact on the effectiveness of streetlighting. In Britannia nighttime visibility was found to be hampered by the presence of ornamental streetlighting that was also covered in many cases by mature trees. The problem of trees blocking streetlights was also prevalent in the Redwood Park area of Queensway Terrace South-Redwood. These are important concerns because many workers employed at the Lincoln Fields Shopping Centre travel before dawn or after dusk. As a result, ineffective lighting may prove for some to be a major deterrent to travel by public transit. This suggests that efforts to promote public transit commuting in these areas must consider the trimming of trees and the replacement of ornamental lighting with more utilitarian infrastructure.

Issues related to the provision of sidewalks were also prevalent in the audit results for both subareas. Although all arterial roadways in both areas had sidewalks, this important infrastructure was often lacking along collector roads and local streets. Once again, this represents an important safety concern and should be addressed whenever street reconstruction projects take place within Britannia-Lincoln Heights and Queensway Terrace South-Redwood.

In terms of road crossing opportunities, conditions were generally deemed to be satisfactory in both metropolitan subareas. One problem, however, that can easily be rectified is the lack of audible traffic signals wherever pedestrian signals are in place. As noted in Chapter Four, this is an important piece of infrastructure for persons with visual impairments and must therefore be incorporated into the road-crossing infrastructure as a means of ensuring *equitable* public transit accessibility.

Transit Stops/Stations near the Place of Employment

Transit stop environments in Britannia-Lincoln Heights were satisfactory, once again with the exception of Britannia Village. Along Richmond Road and Carling Avenue, the arterial roadways on which public transit service levels are highest, most stops were replete with all of the amenities required by commuters. In Britannia Village, however, transit stops were often located in unsafe areas, such as adjacent to bushes and vacant lots, while at the same time lacking even the most basic amenities. The quality of transit stop environments also varied throughout Queensway Terrace South-Redwood, whereby the most common deficiencies were a lack of shelters, benches, newspaper vending machines, and garbage cans. It is worthy of note that the areas in which transit stop conditions were poorest were also those that received the lowest frequency of service. Along with improvements to service frequencies, public transit accessibility from these areas can therefore also be improved by the introduction of necessary amenities in order to make the waiting experience more pleasant.

On-Vehicle Travel

All residents of Britannia-Lincoln Heights who are also employed at the Lincoln Fields Shopping Centre have the opportunity to travel on board low-floor transit vehicles. As noted in Chapter Seven, all four regular routes serving these areas make exclusive use of low-floor vehicles that also have highly visible large-font LED route number and destination displays. In Queensway Terrace South-Redwood, on the other hand, low-floor vehicles are not used as a formal policy, and this may therefore pose accessibility constraints for some commuters. Accordingly, the introduction of exclusive, low-floor buses in this community is essential to the promotion of public transit commuting. Another issue that requires the attention of OC Transpo is the fact that drivers do not announce stops. Again, this is especially important to persons with visual impairments who might otherwise become disoriented while travelling on board the transit vehicle.

Transit Stops near the Place of Employment

Transit stops examined in this part of the Lincoln Fields Shopping Centre case study were found to be in exceptional condition. Regardless of location, transit stops at or within the vicinity of the shopping centre had a full range of amenities, were well lighted, and were highly visible from passing vehicles. Commuters travelling from Queensway Terrace South-Redwood must also travel through the Lincoln Fields Transitway Station, where once again all required infrastructure, facilities and services were in place, with the exception of washrooms and diaper-change facilities. However, it is essential that this omission be rectified due to the long waits associated with travelling on Route #152 to Queensway Terrace South-Redwood from this location.

Travel from Transit Stops to the Place of Employment

Several major problems related to the servicing of public transit commuter needs were identified within this dimension, most of which fall under the control of the owners of Lincoln Fields Shopping Centre rather than community planners. Although many commuters travelling to Lincoln Fields Shopping Centre can use transit stops located directly at the mall entrance, other public transit passengers must travel across the shopping centre property en route between transit stops and their workplaces. In this regard, several deficiencies were identified that require improvement. Firstly, the sidewalks leading to the mall from neighbouring roads are in poor physical condition due to the presence of cracked and broken pavement. Secondly, there are no clear indications of where pedestrians may or should cross the roadway, while at the same time there are no lines painted on internal roadways to direct vehicular traffic. As noted earlier in this chapter, this results in traffic chaos on the mall property, which in turn can cause significant stress for pedestrians as they walk. A third problem identified in the *PTCAA* was the disorderly appearance of the Lincoln Fields Shopping Centre parking lot. With broken fences, litter, and abandoned and upturned shopping carts prevalent throughout the parking lot, and thus throughout the pedestrian walking environment, this is certain to create an unpleasant walking experience for commuters travelling to and from transit stops.

In order to properly address public transit commuter needs, the following actions are therefore necessary. Firstly, adequate pedestrian infrastructure must be provided to safely convey commuters (and all other mall visitors) to and from transit stops. Secondly, pavement markings should be utilized to make it clear where pedestrians may safely travel and where automobiles should drive while on mall property. Thirdly, mall management must be urged to clean up their property in order to improve pedestrian comfort levels.

Employment Area

Public transit commuter needs at the Lincoln Fields Shopping Centre are well served, and only a few improvements are required in this regard. Despite its relatively small size as a retail facility, most goods and services required on a day-to-day basis can be procured at the Lincoln Fields Shopping Centre. One exception, however, is a daycare centre. Given the large number of workers at this employment site, there is perhaps the potential for such a service to be added if and when space becomes available.

In terms of facilities required by bicyclists, the provision of more sheltered racks can do much to encourage the integration of bicycle and public transit travel. This is especially the case considering that several transit routes serving the Lincoln Fields Shopping Centre also have bicycle racks mounted on their vehicles. The problem of bicycle racks not being visible from indoors is not one that can easily be rectified, however. Only a few businesses in the mall have windows, and these are located primarily at the mall entrances. As a result, space would not likely be available to provide racks in a more highly visible location. One possible solution, however, might be to provide employees with an indoor bicycle storage facility or bicycle lockers that can be accessed only by mall workers.

8.10 Conclusion

Although the Lincoln Fields Shopping Centre is not defined as a major employment area in the City of Ottawa's newly adopted official plan, nor is it defined as an area where public transit commuting will be encouraged through the application of special planning policies, this location generally receives a very high level of public transit service. Within the context of this case study, this is especially true as it pertains to public transit accessibility from much of Britannia-Lincoln Heights. Commuters who reside in most parts of Britannia-Lincoln Heights and work at the Lincoln Fields Shopping Centre have direct access to transit stops that are replete with necessary amenities, receive frequent public transit service almost twenty-four hours per day, and are provided with direct service to their place of employment. Residents of Britannia Village and Queensway Terrace South-Redwood, on the other hand, face numerous constraints to the use of public transit for commuting purposes. These range from inadequate service levels – in terms of service hours, service frequencies, and route configurations – to problems associated with the quality of pedestrian infrastructure in their home communities and the quality of their waiting environments. Most problems, however, can be easily solved through, for example, the addition of shelters and benches, the trimming of trees, and the construction of sidewalks.

CHAPTER NINE: CONCLUSION AND IMPLICATIONS

9.1 Introduction

The notion of sustainable transportation has become the dominant paradigm in Canadian urban transportation planning circles in recent years. The primary impetus for this event has been growing concern about the need for the global pursuit of sustainable development, which the World Commission on Environment and Development has succinctly defined as “development which meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987: 44). As the notion of sustainable development has become firmly entrenched in academic and political parlance, more attention has been devoted to understanding how cities might be better planned to meet the needs of their citizens in ways that are at once environmentally benign, economically efficient and socially equitable. The implications of such an approach for urban transportation are now widely understood, as it has long been recognized that the environmental, economic and social consequences of automobile-oriented development fall directly into conflict with sustainable development principles.

The provision of viable non-automobile transportation options has become a key component of urban transportation planning in conjunction with the widespread adoption of community plans rooted in the concept of sustainable transportation. Although planners are increasingly concerned with improving pedestrian, bicycle, and public transit accessibility, they have lacked appropriate tools for evaluating the ease of reaching required facilities and services by these modes. Without these, however, it will be very difficult to determine if and where infrastructural, facility and service improvements are needed so that all urban dwellers have the option of addressing their access needs on foot, by bicycle, or through the use of public transit.

The purpose of this thesis has been to address this gap within the context of public transit commuting. As part of their efforts to develop sustainable transportation systems, planners and policymakers throughout Canada are now seeking to improve public transit accessibility to employment in order both to encourage automobile drivers to change their mode of travel and to ensure that the access needs of non-automobile drivers are more equitably served. Achieving this goal will clearly be a great challenge, since current obstacles and deterrents to public transit commuting are numerous and have a multitude of causes. While impediments to public transit commuting have been created primarily by land use and transportation planning policies that have favoured the automobile over all other modes of transportation in the design of urban built environments, these constraints have been further exacerbated by several geographical, sociodemographic, and economic employment trends.

The primary objective of this dissertation has been to provide planners with a straightforward and practical tool for evaluating public transit accessibility to employment. The purpose of this chapter is to present and discuss the conclusions drawn from this research. It begins with a review of the three research stages: the conceptualization of public transit commuter needs; the development of a simple and straightforward public transit accessibility evaluation framework; and trial applications of this tool in the City of Ottawa. In each case, this includes a summary of the methods employed and their strengths, the key findings, and a discussion of the theoretical and/or methodological contributions that have been made. The chapter then discusses the limitations of this research, along with its community planning and research implications.

9.2 Major Findings and Conclusions

9.2.1 The "Comprehensive Definition of Public Transit Commuter Needs"

The development of a practical tool for evaluating public transit accessibility to employment could not be accomplished without first knowing *what to evaluate.* In other words, it was necessary to determine the various factors that influence the commuter's willingness and/or ability to commute by public transit. This step was made necessary by the fact that, up to now, research investigating the accessibility needs of urban dwellers has been conducted on a piecemeal basis. Researchers in a broad range of academic disciplines – from geography to urban planning to gender studies to psychology, for example – have sought to identify factors that promote or discourage the use of individual modes of transportation. However, most studies have focussed on one particular subgroup of the urban population, such as women, persons with disabilities, or low-income earners, or on one specific dimension of intra-urban travel, such as movement within neighbourhoods or across parking lots, waiting at transit stops and stations, or the use of park-and-ride facilities.

The first stage of the research therefore involved an effort to synthesize this information within the context of public transit commuting by creating a

"Comprehensive Definition of Public Transit Commuter Needs". Through a systematic literature review, a survey, and consultations with sustainable transportation advocacy groups, a thorough representation of the facilities, infrastructure, and services required by the contemporary commuter population in order for public transit to represent a viable transportation option has been assembled. The "Comprehensive Definition of Public Transit Commuter Needs" provides planners and policymakers with a clear indication of how the urban built environment and public transit services ought *ideally* to be structured in order to ensure that municipal goals and objectives aimed at enhancing public transit accessibility to employment are more likely to be achieved.

The use of multiple research methods, or triangulation, ensured that public transit commuter needs were identified through a variety of approaches and from a broad range of perspectives. The literature review, the single most important component of the conceptualization process, drew from studies conducted throughout the world using a variety of approaches, including survey questionnaires, focus groups, interviews, and quantitative analyses. At the same time, an effort was made to ensure that the "Comprehensive Definition of Public Transit Commuter Needs" reflected the social equity dimension of the sustainable transportation concept. This was accomplished by including in the literature review numerous studies which have examined the factors that influence public transit accessibility from the point of view of many different population subgroups (e.g. high- and low-income earners, part-time and full-time workers, men and women, and so on).

The survey questionnaire distributed to workers at CAA North & East Ontario in Ottawa also played an important role in defining public transit commuter needs.

Although the small number of completed questionnaires would clearly not allow for the survey results to stand on their own as a definitive representation of public transit commuter needs, much of the data corroborated previous transportation research findings. Furthermore, the open-ended questions included as part of the survey provided respondents with the opportunity to communicate in their own words many of the constraints to public transit commuting, as well as initiatives that could potentially promote travel by this mode. Finally, the informal consultations with three Ottawa-based sustainable transportation advocacy groups added further soundness to the study by providing input concerning the adequacy of a preliminary set of indicators. Participants in these meetings offered a great deal of constructive advice regarding factors that had been overlooked up to that point in the research, as well as further sources of information that could be used to conceptualize public transit commuter needs.

Perhaps the most important finding in the first stage of the research was that the successful enhancement of public transit accessibility to employment will not be easily accomplished in any municipality, due to the very wide and complex range of factors that influence the viability of commuting by public transit. This thesis has shown that public transit commuter needs can be categorized into several dimensions, including: needs related to the availability of transit service; needs while travelling between homes and transit stops or stations; needs at transit stops or stations near the commuter's home; needs while travelling on-board the transit vehicle; needs at transit stops or stations near the workplace; needs while travelling between transit stops or stations and the workplace; and, finally, needs at the employment area. In this regard, this research validates the point made in Chapter Two that the greater the number of weak dimensions, the lesser the likelihood that public transit will be used by a commuter in lieu of the automobile or that a labour force participant who cannot or does not drive will have equitable access to metropolitan employment opportunities. Furthermore, it has also demonstrated that a wide range of players must be involved in the implementation of policies which seek to improve public transit accessibility to employment, ranging from land use, transportation, and public transit planners and policy-makers, to private developers and landowners, to individual employers.

The development of a "Comprehensive Definition of Public Transit Commuter Needs" has contributed to the advancement of knowledge in a number of ways. Perhaps most significantly, it has demonstrated the importance of approaching problems related to sustainable transportation from a multidisciplinary perspective if they are to be properly understood and addressed. The "Comprehensive Definition of Public Transit Commuter Needs" has been developed primarily through a synthesis of information previously gleaned by researchers in several academic disciplines that, historically, have rarely made contact with one another. In so doing, the factors promoting public transit accessibility to employment have now been communicated in a format that is much more accessible to planners and policymakers, and to the academic community, than if the research was to remain in disaggregate form.

At the same time, this research has also shown how land use, social, demographic, and economic trends have played a considerable role in shaping metropolitan commuters' transportation options and, for many, the availability of employment opportunities as well. This once again demonstrates the importance of understanding the root causes of the urban transportation problem, many of which clearly fall outside the traditional scope of transportation planners and researchers. Indeed, in order to understand what infrastructure, facilities and services are required by public transit commuters, we must first understand the general factors that influence public transit accessibility. As noted in Chapter Four, where the "Comprehensive Definition of Public Transit Commuter Needs" was described in detail, this includes consideration for travel time (especially relative to automobile travel time), the availability of shops and services, safety, security, and comfort concerns, as well as factors related to physical accessibility.

Another important contribution of this research has been its strong emphasis on the promotion of social equity in the definition of public transit commuter needs. All too often, discussions about sustainable transportation, and those related to sustainable development in general, have focused primarily on concerns for environmental protection and, to a lesser extent, economic concerns. Social dimensions of the sustainability concept, on the other hand, have received far less attention. However, as noted in Chapter Two, the development of *truly sustainable* transportation systems must include concerns for environmental protection, economic efficiency *and* social equity. By incorporating the concerns of *all* commuter subgroups in the "Comprehensive Definition of Public Transit Commuter Needs" – based not only on their sociodemographic characteristics, but also on their spatio-temporal travel patterns – the importance of providing *equitable* public transit accessibility to employment has been given the attention it rightfully deserves. Indeed, it is just as important to ensure that those without automobile access to employment are able to commute to desired workplaces by public transit in the interest of promoting *social* sustainability as it is to encourage those who currently travel to work by car to make the modal shift to transit in order to promote *environmental* sustainability.

By comprehensively defining public transit commuter needs, this thesis has also implicitly made a notable contribution to the field of urban geography. Hanson and Pratt (1988a) have noted that the advancement of knowledge in this sub-discipline has been impeded by a continuing reliance on an outdated conceptualization of the spatial relationship between home and work. They stated:

> The relationship between home and work […] has been central to urban geography and to the models that both reflect and delineate our vision of the city. [… The] way in which this has been conceptualized has changed relatively little over the years, despite several weaknesses in the prevailing conceptualization – limitations that are particularly severe in light of significant changes in the urban reality we seek to understand. [Urban] geographers have seen both home and work as little more than points in urban space joined by a line that is the journey to work. […] The increased diversity of household types suggests the need to broaden the scope of possible work-home interactions, to recognize the increased complexity of these ties, and to acknowledge the possibility – indeed the likelihood – that these links will function differently for different subgroups of the population. […] We believe, therefore, the links between home and work need to be reexamined and reconceptualized if urban geographers are to be able to understand patterns of women's and men's employment (Hanson and Pratt 1988a: 299-303).

The complexity of the public transit journey to work, as typified in the "Comprehensive Definition of Public Transit Commuter Needs", clearly illustrates the significance of Hanson and Pratt's argument and, thus, the importance of re-examining the ways in which the home-work relationship has been approached and represented in the work of urban geographers.

9.2.2 The *Public Transit Commuter Accessibility Audit*

After addressing the question of *what to evaluate* in the first stage of the research, the second stage addressed the issue of *how to evaluate it*. This involved using the

"Comprehensive Definition of Public Transit Commuter Needs" to develop a practical tool for evaluating public transit accessibility to employment. As discussed in Chapters Two and Three, the usefulness of accessibility measurement tools developed in the past has been hampered by their overly complex structures, their reliance on a single index in the reporting of results, and/or their inadequate attention to the full range of factors that promote accessibility. The latter problem has included a lack of consideration for the accessibility needs of *all* population subgroups, a lack of regard for micro-scale dimensions (such as transit stop and sidewalk conditions, for example), and the absence of spatial and temporal components that take into account the location and time of travel. It has been for these reasons that Handy and Clifton (2001a) have argued for the development of innovative methods for evaluating accessibility. Thus, development of this tool was guided by the desire to provide planners with a consistent and straightforward means of evaluating public accessibility to employment at the small-area level that incorporated the concerns of all commuter subgroups, as well as a spatio-temporal dimension.

The end result was the *Public Transit Commuter Accessibility Audit*, a six-step tool that has been devised to provide planners with a general indication of public transit accessibility between a particular metropolitan subarea and a particular place of employment with full consideration of the temporal commuting patterns between the two points. Completion of the auditing process involves the collection of data that can be obtained from public transit route maps and schedules and by means of extensive field observations. The data is compiled on the *Public Transit Commuter Accessibility Audit Checklist*, which consists of several statements reflecting the individual needs outlined in the "Comprehensive Definition of Public Transit Commuter Needs". The next step involves completion of the *Public Transit Commuter Accessibility Report Card*, whereby a grade is assigned to each statement based on the extent to which it is true. In the reporting of results, each statement and its corresponding grade is left to stand on its own rather than combining the grades to form a single, comprehensive index. This has been done in order to enable planners to immediately determine where strengths and weaknesses exist in terms of the provision of necessary infrastructure, facilities and services.

The *PTCAA* was not designed to provide a *definitive* assessment of the conditions experienced by public transit commuters, but rather a *general indication* of where obstacles and barriers to public transit commuting exist within a specific spatio-temporal context. As a result, it is not intended to *direct* or *guide* policy, but rather to *inform* it. Ideally, planners and policymakers will interpret the findings obtained through formal application of the *PTCAA* as indicators of potential problem areas, which would then provide some direction for further, more thorough assessment of these specific conditions. This information, in turn, could then be used to formulate or modify relevant community planning policies, where necessary.

9.2.3 Public Transit Accessibility to Employment in Ottawa

The third stage of the research involved the trial application of the *PTCAA* in the form of two case studies in the City of Ottawa, where a new *Official Plan* that seeks to enhance public transit accessibility to employment has recently been adopted. As discussed in Chapters Seven and Eight, the trial applications involved the evaluation of public transit accessibility to two employment areas, one located in an older, mature suburban area, the other located in a newer, fast-growing suburban community. In each case study, two residential communities were selected to act as points of origin for the evaluation.

The trial applications are deemed by this researcher to have been a success. In each instance, application of the *PTCAA* was instrumental in identifying both positive and negative conditions pertaining to public transit commuting that warrant the further attention of Ottawa's land use, transportation and public transit planning officials (Table 9.1). For example, serious deterrents to public transit commuting were discovered within the context of travel between homes and transit stops due, for example, to a lack of sidewalks and insufficient lighting. As another example, three of the four trial applications found that transit stop environments lacked numerous amenities required to promote commuters' sense of safety and security (e.g. shelters and lighting) and to ensure that they were adequately informed of transit routes and service schedules. The trial applications demonstrated how commuters working at the same employment site but residing in different communities experienced considerable differences in public transit accessibility. Nowhere was this more apparent than in the Lincoln Fields Shopping Centre case study, which showed that public transit is a far less viable transportation option for residents of Queensway Terrace South-Redwood than it is for those workers living in Britannia-Lincoln Heights. This case presents an ideal example of how the *PTCAA* can be used to gauge social equality as it pertains to public transit accessibility to employment.

Table 9.1
Summary of *Public Transit Commuter Accessibility Audit Report Cards*, Ottawa Case Studies

	A	B	C	DNA	N/A
Dimension #1 - Availability of Transit Service					
Queenswood Heights - Orleans Town Centre	4	2	0	0	2
Fallingbrook - Orleans Town Centre	5	1	0	0	2
Britannia-Lincoln Heights - Lincoln Fields Shopping Centre	5	1	0	0	2
Queensway Terrace South-Redwood - Lincoln Fields Shopping Centre	4	2	2	0	0
Dimension #2 - Travel between Places of Residence and Transit Stops/Stations					
Queenswood Heights - Orleans Town Centre	4	6	3	2	3
Fallingbrook - Orleans Town Centre	5	5	3	2	3
Britannia-Lincoln Heights - Lincoln Fields Shopping Centre	7	5	4	2	0
Queensway Terrace South-Redwood - Lincoln Fields Shopping Centre	7	4	3	2	2
Dimension #3 - Transit Stops/Stations near Place of Residence					
Queenswood Heights - Orleans Town Centre	2	3	4	0	14
Fallingbrook - Orleans Town Centre	3	1	5	0	14
Britannia-Lincoln Heights - Lincoln Fields Shopping Centre	2	7	0	0	14
Queensway Terrace South-Redwood - Lincoln Fields Shopping Centre	2	3	4	0	14
Dimension #4 - On-Vehicle Travel					
Queenswood Heights - Orleans Town Centre	4	2	2	0	0
Fallingbrook - Orleans Town Centre	4	2	2	0	0
Britannia-Lincoln Heights - Lincoln Fields Shopping Centre	5	2	1	0	0
Queensway Terrace South-Redwood - Lincoln Fields Shopping Centre	4	2	2	0	0
Dimension #5 - Transit Stops/Stations near Place of Employment					
Queenswood Heights - Orleans Town Centre	7	1	8	0	0
Fallingbrook - Orleans Town Centre	7	1	8	0	0
Britannia-Lincoln Heights - Lincoln Fields Shopping Centre	10	0	1	0	5
Queensway Terrace South-Redwood - Lincoln Fields Shopping Centre	12	2	2	0	0
Dimension #6 - Travel between Transit Stops/Stations and Place of Employment					
Queenswood Heights - Orleans Town Centre	10	2	3	2	0
Fallingbrook - Orleans Town Centre	10	2	3	2	0
Britannia-Lincoln Heights - Lincoln Fields Shopping Centre	9	2	1	2	3
Queensway Terrace South-Redwood - Lincoln Fields Shopping Centre	4	5	6	2	0
Dimension #7 - Employment Area					
Queenswood Heights - Orleans Town Centre	2	1	0	1	0
Fallingbrook - Orleans Town Centre	2	1	0	1	0
Britannia-Lincoln Heights - Lincoln Fields Shopping Centre	3	0	0	1	0
Queensway Terrace South-Redwood - Lincoln Fields Shopping Centre	3	0	0	1	0

Beyond the Ottawa-specific results, the trial applications also further demonstrated the importance and value of examining micro-scale conditions when evaluating public transit accessibility to employment, despite the time consuming nature of the data collection process. Indeed, it showed that factors which at first seem insignificant, such as the location of a bus stop or the aesthetic environment through which pedestrians must walk, can be an important determinant of the public transit commuter's experience. A larger-scale approach to the evaluation of public transit accessibility, such as at the region-wide level, would have masked many of these important findings.

9.3 Implications

9.3.1 Community Planning Implications

At the most fundamental level, this thesis has demonstrated the monumental challenge facing any Canadian municipality that has elected to promote public transit commuting as a component of its broader sustainable transportation or sustainable development strategies. It clearly illustrates the importance of an integrated approach to community planning, one in which land use and transportation decisions are made simultaneously rather than successively. Furthermore, it also shows that past approaches to measuring and evaluating transportation system quality have been woefully inadequate in that they have given scant attention to the accessibility needs of urban dwellers. By basing transportation planning decisions on revealed behaviour (i.e. expressed demand) rather than latent need, planners and policymakers have only served to exacerbate the numerous obstacles and deterrents to using non-automobile modes of transportation. Indeed, to return to a point drawn in Chapter Two, just because people do not currently use a particular mode does not mean that they would not do so if the quality of associated infrastructure, facilities and/or services better met their needs. The "Comprehensive Definition of Public Transit Commuter Needs" has established what those needs are when it comes to public transit commuting, and the *Public Transit Commuter Accessibility Audit* has provided planners with the ability to evaluate how well those needs are being served. Furthermore, it provides planners with a *consistent* means of evaluating the quality of infrastructure, facilities and services from one place to another. That is, its comprehensive nature (i.e. its concern for the needs of all commuter subgroups) can ensure that all areas within their jurisdiction will be examined using the same criteria. As a result, the *PTCAA* has filled a critical methodological gap, one that desperately needed filling in light of the increasing adoption of municipal planning policies rooted in the notion of sustainable transportation.

In the trial applications of the *PTCAA*, the metropolitan subareas that were chosen from which to evaluate public transit accessibility were those that housed large shares of commuters travelling to one of the two case study employment areas. This demonstrated the usefulness of the *PTCAA* as part of efforts to ensure that high levels of public transit accessibility are provided between residential and employment areas where heavy commuter flows currently exist. In an ideal situation, however, application of the *PTCAA* would involve the evaluation of conditions between *all* metropolitan subareas and the selected employment area so that optimal levels of public transit accessibility can be provided to *all* members of the metropolitan labour force, both those currently working in that employment area and those who may wish to travel to that site in the future. The *PTCAA* results could then be used to compare current levels of accessibility between the different metropolitan subareas and the selected employment area in order to identify the areas where public transit commuter needs are least well served, and thus most in need of improvement.

The extensive fieldwork involved in completing the *PTCAA Checklist* would, of course, likely prevent planners from conducting such exhaustive evaluations. Thus, an alternative approach to conducting a *PTCAA* might also be employed to produce usable results. As done in the Ottawa case studies, planners could begin with the analysis of origin-destination survey data (if this information is available) in order to identify the metropolitan subareas in which large proportions of workers at the selected employment area currently reside. The next step in this approach would be to identify the current modal split between each of these metropolitan subareas and the employment area. The *PTCAA* could then be applied between those areas where 1) a large proportion of commuters currently resides, 2) the automobile makes up a large share of the modal split, *and* 3) public transit holds only a small share of the modal split. The benefits of this approach are twofold. First, the tool could be used to determine whether barriers or deterrents to public transit commuting currently exist at and/or between the two points, thus potentially explaining to some extent the high share of automobile commuters and low share of public transit commuters. Second, any follow-up initiatives aimed at improving public transit accessibility to the employment site could potentially bring about the greatest return on investment, since a large proportion of commuters might benefit from these modifications.

As noted in Chapter Five, another possible use of the *PTCAA* would be to conduct less extensive accessibility evaluations, if desired. The fact that completion of the

PTCAA Report Card does not conclude with the aggregation of the scores assigned for each public transit commuter need, but rather leaves the information in disaggregate form, ensures that planners can conduct the audit even as it pertains to only one of the seven dimensions, such as "Travel between Homes and Transit Stops/Stations". For example, such an approach may be useful when planners are not interested in evaluating public transit accessibility between a residential area and a *specific* employment site, but instead would simply like to examine current pedestrian and cycling conditions within that residential subarea.

9.3.2 Implications for Future Research

Although this thesis has successfully addressed the research questions posed in Chapter One, further refinements are nonetheless required in order for the "Comprehensive Definition of Public Transit Commuter Needs" to more accurately reflect the needs of Canadian public transit commuters and for the *Public Transit Commuter Accessibility Audit* to more effectively evaluate public transit accessibility to employment. With regard to the "Comprehensive Definition of Public Transit Commuter Needs", additional research is necessary as a means of more firmly establishing a Canadian context. Indeed, the primary impetus for this research has been the emergence of sustainable transportation as a framework for community planning in Canadian cities and the lack of practical tools for evaluating accessibility by non-automobile modes of transportation within these settings. The need for further research in this regard stems from the fact that many of the studies examined as part of the literature review were conducted in other countries. This approach was deemed acceptable in that problems of automobile dependence are pervasive throughout the industrialized world, and thus provided a logical starting point for the conceptualization of public transit commuter needs and the subsequent development of a practical tool for evaluating public transit accessibility to employment. However, the nature of Canada's four distinct seasons – most notably its relatively harsh winter climate – suggests that researchers would be well-advised to gather more input from Canadian urban dwellers regarding the factors that influence public transit accessibility from *their* perspectives. This will enable researchers and, ultimately, planners to more accurately understand and serve the needs of Canadian public transit commuters.

Further research is also required both to test the practical utility, and to improve the methodological structure, of the *PTCAA*. In terms of gauging the tool's usefulness in a "real world" context, more case studies are necessary in order to examine conditions that were not explicitly or thoroughly considered in the trial applications. In the Ottawa case studies, for example, the characteristics of park-and-ride facilities were not evaluated and winter travel conditions were not examined. Investigations of this type are required because it is important to gauge whether or not there are any difficulties in applying the *PTCAA* (e.g. the ease of data collection) as it pertains to each of these areas of concern.

Several methodological problems must also be addressed in the continuing development of the *PTCAA*. First, the auditing process must be adjusted to take into account concerns about the validity of the data obtained. The primary consideration here is that many statements in the *PTCAA Checklist* reflect conditions that are dynamic in nature. This is particularly the case within the context of public transit commuter needs related to on-vehicle travel. Listed under this dimension, for example, are needs related to driver friendliness and safety, vehicle accessibility, the availability of adequate seating, and the announcement of stops. All of these conditions are subject to variation with each transit trip. For instance, the driver on one trip may be very friendly and helpful, while the driver on a subsequent journey may be gruff and rude. Similarly, an auditor evaluating vehicle crowding may find that no seats are available on one transit ride, and several empty seats on a separate trip. Accordingly, it is essential that in future applications this potential variability of conditions be taken into account by ensuring that data collection takes place across all days of the week and across different time periods before the assignment of grades is undertaken.

A second methodological issue that must be addressed is how to deal with the labour intensiveness of the auditing process. The primary concern here is that the numerous field observations that must be conducted in completing the *PTCAA* require substantial amounts of time. The risk is therefore that planning agencies may feel that the benefits of conducting a *PTCAA* may not outweigh the time commitment involved in collecting necessary data. However, the various public transit commuter needs identified throughout this dissertation are clearly those that matter most to individuals in making their modal choices. Accordingly, just because it is difficult to gather the necessary data does not mean that it should not be collected. Planning agencies can potentially address this problem in at least two ways. First, they could conduct the *PTCAA* during summer months using planning students as auditors. As an alternative, they could involve community members (and, more specifically, commuters) themselves in the auditing process. While these may do much to address concerns about the labour intensive *PTCAA* process, either approach should first be tested on a small-scale basis in order to ensure that auditors follow a consistent approach in their collection and evaluation of data.

As far as the methodological structure of the PTCAA is concerned, a third and related issue that must be addressed relates to the question of researcher bias. In this case, the issue at hand is how to ensure that data is collected and grades are assigned with consideration for the needs of all commuter groups. Although the "Comprehensive Definition of Public Transit Commuter Needs" and, subsequently, the *Public Transit Commuter Accessibility Audit*, have been designed to reflect the socioeconomic diversity of the contemporary commuter population, there is the possibility that the data collection process will leave out important details due to the primarily qualitative nature of the process. For example, a young adult male's interpretation of what constitutes a safe or aesthetically pleasant walking environment may differ considerably from that of an elderly woman. As another example, the question of what constitutes "sufficient lighting" on a street can be answered in a variety of ways depending on one's age, gender, level of ability or disability, and so on. Thus, an important issue that must be addressed in future research concerning the *PTCAA* is how to ensure that a diversity of viewpoints is reflected in the audit results and, more importantly, in the recommendations that follow. This could potentially involve the development of a process in which several individuals complete the *PTCAA Checklist* for the same geographical area(s) before the results are compiled into a single report for analysis.

On a broader note, two further research avenues might also be addressed in future studies. First, the *PTCAA* examines the level of public transit accessibility that exists between a particular metropolitan subarea and a selected employment area. The results provide an indication of whether or not this mode represents a viable transportation option for commuters travelling between the two points. What it does not show, however, is the level of public transit accessibility *relative to the level of automobile accessibility*. An important task for planners in their efforts to promote public transit commuting in lieu of automobile commuting, as noted throughout this dissertation, is to ensure that public transit accessibility between homes and workplaces is equal to or superior to the level of automobile accessibility. Accordingly, an important issue to address in future urban transportation research would be to devise methods for comparing accessibility to employment by these two modes. This therefore presents an opportunity for researchers to integrate efforts to evaluate public transit accessibility, such as that undertaken in this dissertation, with attempts to measure automobile accessibility to employment. Indeed, a great deal of research has been conducted regarding the latter (e.g. Levinson 1998; Purvis 1994; Vandersmissen *et al.* 2003; Van Hengel 1999; Wachs *et al.* 1993); however, the bulk of these studies have focused primarily on commuting time and distance as indicators of employment accessibility by car. What would therefore be useful is further research similar to that conducted in this study, whereby the *broad* range of factors influencing the ease of commuting by automobile – including not only travel time and distance, but also factors such as pavement conditions, traffic signalization, and the cost and supply of parking (Handy and Clifton 2000), for example – is synthesized and converted to a tool for evaluating automobile accessibility to employment. Once complete, results of a *PTCAA* could be juxtaposed against the results of an automobile accessibility audit in order to determine public transit's position relative to the automobile as it pertains to employment accessibility. This may then provide planners with a further, more accurate sense of the viability of public transit commuting vis-à-vis automobile commuting among those who do have the option of choosing between the two modes.

A second avenue for further research would be to continue with the development of innovative techniques for evaluating accessibility by modes of sustainable transportation. The evaluation of accessibility as it pertains to public transit commuting has represented a logical starting point in the development of innovative accessibility evaluation frameworks for at least two reasons. First, public transit is the one mode of sustainable transportation that over time is most likely to represent an alternative to the automobile in that, unlike walking and cycling, its use is suitable for both short- *and* long-distance travel. Second, as demonstrated in the "Comprehensive Definition of Public Transit Commuter Needs", an evaluation of public transit accessibility cannot be conducted without also considering the viability of travelling by ancillary modes. Thus, the assessment of public transit commuter needs inherently requires at least a partial assessment of pedestrian, cyclist and automobile driver needs. Notwithstanding these justifications, a more defined focus on the evaluation of accessibility within the context of other modes of sustainable transportation and other forms of urban trip-making, such as shopping or travel to social or sporting events, would be most beneficial. In some cases, the infrastructure, facilities, services identified in the "Comprehensive Definition of Public Transit Commuter Needs" have been explicitly identified as needs *by commuters* and further research is required 1) to ascertain whether these also apply in other travel situations and 2) to determine whether other needs not related to commuting exist. Furthermore, by focusing on the accessibility needs of commuters this research has not taken into account the needs of population subgroups who are not active, or are less frequently active, in the metropolitan labour force, such as children, teenagers, and seniors. Thus, a further avenue for research would be to identify and develop tools for evaluating how well the needs of these groups are also served with regard to the accessibility of required facilities and services. Researchers must ensure, however, that studies such as these take into account the strong interdisciplinary nature of the accessibility concept, in terms of its contributing factors and the underlying explanations for each.

9.4 Summary

In conclusion, this thesis has partially filled a notable research gap in the area of accessibility evaluation. Studies conducted by geographers, planners, sociologists, psychologists and members of other academic disciplines have been synthesized and combined with primary research findings in order to develop a "Comprehensive Definition of Public Transit Commuter Needs". This has then been translated into a format amenable to practical use through the creation of the *Public Transit Commuter Accessibility Audit* which, as currently structured, provides planners and policymakers with a means of gauging the viability of public transit as a transportation choice for the metropolitan labour force. Further development of the *Public Transit Commuter Accessibility Audit* will assist in improving its practical utility, which in turn will ensure that it becomes a critical tool in the quest to attain municipal planning goals and objectives related to public transit commuting. At the same time, efforts must also be taken to create further accessibility evaluation tools that can aid in the identification and elimination of obstacles and barriers to pedestrian, bicycle and public transit travel in other intra-metropolitan travel contexts. By employing an interdisciplinary approach to develop straightforward and practical methods for evaluating accessibility, transportation researchers can play a critical role in the creation of truly *sustainable* urban transportation systems.

Appendix One:

Survey Questionnaire

EMPLOYMENT ACCESSIBILITY STUDY
COMMUTER SURVEY

SECTION A: COMMUTING PATTERNS

I would like to begin by asking you a few questions about your current commuting patterns.

1. What is the name of the community/neighbourhood in which you live?

   ____

2. Approximately how far is it (in kilometres) between your home and this workplace?

   _________ kilometres

3. What is your **usual** work shift?

   a. From __________ a.m./p.m. to __________ a.m./p.m.
   b. Varies

4. What days of the week do you **usually** work?

   a. Weekdays
   b. Weekends
   c. Both weekdays and weekends

5. Do you own a car or have regular access to a car?

   a. Yes
   b. No

6. By what mode of transportation do you **usually** travel to and from work?

   a. Drive my own car
   b. As a passenger in a car
   c. As a member of a carpool
   d. Bus
   e. Bicycle
   f. Walk
   g. Other (please specify): _________________________

7. Since you started working here, have you moved in order to be closer to your workplace?

a. Yes → Please continue to question 7b.
b. No → Please skip to the next applicable section.

7 b. By what mode of transportation did you travel to work prior to moving?

a. Drove my own car
b. As a passenger in a car
c. As a member of a carpool
d. Bus
e. Bicycle
f. Walked
g. Other (please specify): ______________________________

IF YOU USUALLY **WALK** TO WORK, PLEASE CONTINUE TO **SECTION B**

IF YOU USUALLY TRAVEL TO WORK BY **BICYCLE**, PLEASE SKIP TO **SECTION C**

IF YOU USUALLY TRAVEL TO WORK BY **BUS**, PLEASE SKIP TO **SECTION D**

IF YOU USUALLY TRAVEL TO WORK BY **CAR** (AS A DRIVER, AS A PASSENGER, OR IN A CARPOOL), PLEASE SKIP TO **SECTION E**

SECTION B: PEDESTRIAN COMMUTERS

PLEASE ANSWER THE QUESTIONS IN THIS SECTION **ONLY IF YOU WALK TO WORK.**

7. What is the primary reason you walk to work?

8. Thinking about your walking trips to and from work, please indicate whether you agree, neither agree nor disagree, or disagree with the following statements. You may do so by checking (√) the most appropriate response.

	Agree	**Neither Agree nor Disagree**	**Disagree**
There are sufficient sidewalks along my route to work.			
Sidewalks are well maintained along my route to work.			
There is adequate street lighting along my walking route to work.			
I feel safe walking to work at all times of day.			
I can safely cross any major roadways along my walking route to work.			

9. Are there any improvements to the walking environment that you feel could be made to improve your experience as a pedestrian commuter (i.e. more sidewalks, safer crosswalks, etc.)?

PLEASE SKIP TO SECTION F

SECTION C: BICYCLE COMMUTERS

PLEASE ANSWER THE QUESTIONS IN THIS SECTION **ONLY IF YOU TRAVEL TO WORK BY BICYCLE.**

10. What is the primary reason you commute by bicycle?

11. Thinking about your journey to work by bicycle, please indicate whether you agree, neither agree nor disagree, or disagree with the following statements. You may do so by checking (√) the most appropriate response.

	Agree	**Neither Agree nor Disagree**	**Disagree**
Car drivers are generally willing to share the road with me as a cyclist.			
There are adequate bicycle lanes along my cycling route to work.			
There is adequate street lighting along my cycling route to work.			
There are adequate bicycle parking facilities at my place of work.			
I feel secure that my bicycle will not be stolen while I am at work.			
I feel safe cycling to work at all times of day.			

12. Are there any improvements to the cycling environment that you feel could be made to improve your experience as a bicycle commuter (i.e. more bicycle lanes, more secure bicycle parking at work, etc.)?

PLEASE SKIP TO SECTION F

SECTION D: BUS COMMUTERS

PLEASE ANSWER THE QUESTIONS IN THIS SECTION **ONLY IF YOU TRAVEL BY BUS** TO WORK.

13. What is the primary reason you commute by bus?

____

____

____

____

14. How many buses do you take to get to work? __________

15. Thinking about your journey to work by bus, please indicate whether you agree, neither agree nor disagree, or disagree with the following statements. You may do so by checking (√) the most appropriate response.

	Agree	**Neither Agree nor Disagree**	**Disagree**
The bus routes between my home and work are convenient.			
The bus is usually on time when I travel to and from work.			
The bus fare is affordable.			
I can usually get a seat on the bus when I travel to and from work.			
I feel safe waiting at bus stops/stations.			
I feel safe riding on the bus to work.			

16. Are there any improvements to public transit service or facilities that you feel could be made to improve your experience as a public transit commuter (i.e. more frequent service, better lighting at bus stops and stations, more convenient routes, etc.)?

____

____

____

____

PLEASE SKIP TO SECTION F

SECTION E: AUTOMOBILE COMMUTERS

PLEASE ANSWER THE FOLLOWING QUESTIONS **ONLY IF YOU TRAVEL TO WORK BY CAR (AS A DRIVER OR PASSENGER).**

17. What is the primary reason you commute by car?

18. Is there bus service available where you live?

a. Yes b. No

19 a. Would you consider travelling to work by walking, cycling or public transit?

b. Yes → Please continue to question 19 b.
c. No → Please skip to question 19 c.

19 b. What improvements would be necessary for you to walk, cycle or use public transit to get to work?

19 c. Why would you not consider walking, cycling or using public transit to get to work?

PLEASE CONTINUE TO SECTION F

SECTION F: DEMOGRAPHIC INFORMATION

In order to explore any differences in commuting patterns and attitudes between demographic groups, your responses to the following questions would be appreciated. These questions are completely optional, but please be assured that this information is sought for statistical purposes only and will be kept completely confidential.

20. What is your gender?
    a. Male   b. Female

21. What is your age?
    a. Less than 20 years old
    b. 20 – 29 years old
    c. 30 – 39 years old
    d. 40 – 49 years old
    e. 51 – 60 years old
    f. Over 60 years old

22. Do you have any dependent children?
    a. Yes → Please continue to question 22 b.
    b. No → Please skip to question 23.

22 b. Do you transport your child(ren) to day care or school on your trips to or from work?
    a. Yes   b. No

23. What is the highest level of education you have attained?
    a. Less than high school
    b. High school diploma
    c. College diploma
    d. University undergraduate degree
    e. University graduate degree

24. What was your gross household income (before taxes) in the year 2000?
    a. Less than $20,000
    b. $20,000 to $49,999
    c. Over $50,000

25. How long have you worked with CAA North and East Ontario (in this office)?

    _____ years, _____ months

**THANK YOU VERY MUCH FOR YOUR PARTICIPATION IN THIS STUDY.
YOUR VALUABLE INPUT IS APPRECIATED!**

Appendix Two:

Public Transit Commuter Accessibility Audit Checklist

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT CHECKLIST

Link #1: Home Community

		COMMENTS
1	Public transit service is available within the subarea.	
2	Public transit service is available at the employment area.	
3	Public transit service is provided directly between the subarea and employment area.	
4	If public transit is not provided directly between the subarea and employment area, commuters must only transfer once in order to reach the employment area.	
5	If commuters must transfer between transit vehicles, route schedules are efficiently coordinated.	
6	Public transit service is provided between the subarea and employment area on days when commuters travel.	
7	Public transit service is provided between the subarea and the employment area before, during and after the employees' workdays.	
8	Public transit service is provided between the subarea and the employment area at convenient frequencies.	

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT CHECKLIST

Link #2: Travel between Place of Residence and Transit Stop/Station

		COMMENTS
1	Facilities and services required on a day-to-day basis are available within walking distance of homes.	
2	Commuters can travel directly between their places of residence and transit stops/stations.	
3	Travel routes between places of residence and transit stops/stations are aesthetically pleasing.	
4	Travel routes between places of residence and transit stops/stations are adequately lit between dusk and dawn.	
5	Travel routes between places of residence and transit stops/stations are highly visible from adjacent buildings and/or by passing traffic.	
6	A continuous sidewalk network provides physical access between places of residence and transit stops/stations.	
7	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.	
8	Sidewalks are in good physical condition.	
9	Sidewalks are designed to accommodate the needs of wheelchair users.	

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT CHECKLIST

Link #2: Travel between Place of Residence and Transit Stop/Station (continued)

		COMMENTS
10	Sidewalks are promptly cleared of ice and snow.	
11	Sidewalks are effectively cleared of snow and ice.	
12	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.	
13	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.	
14	When they must cross collector and arterial roads, commuters are provided with formal road crossing opportunities.	
15	Road crossing signals can be activated by pedestrians.	
16	Road crossing signals include audible signals.	
17	When required to travel on collector and arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.	
18	Bicycle lanes are of an adequate width.	

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT CHECKLIST

Link #3: Transit Stops and Stations at/near Place of Residence

		COMMENTS
1	Transit stops and stations are located on pavement.	
2	Transit stops and stations are adequately lit between dusk and dawn.	
3	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.	
4	Trash receptacles are provided at transit stops and stations.	
5	Transit stops and stations are clean.	
6	Effective shelter from the elements is provided at transit stops and stations.	
7	Seating is provided at transit stops and stations.	
8	Newspaper vending machines are available at transit stops and stations.	
9	Service information is provided at transit stops and stations.	
10	Public telephones are available at transit stations.	
11	Emergency telephones or call boxes are provided at transit stations.	
12	Public washrooms are provided at transit stations.	
13	Baby change facilities are provided in washrooms at transit stations.	
14	Bicycle storage facilities are provided at transit stops and stations.	
15	Convenience stores and/or vending machines are located at transit stations.	

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT CHECKLIST

Link #3: Transit Stops and Stations at/near Place of Residence (continued)

		COMMENTS
16	When commuters must access transit by car, park-and-ride facilities are provided at transit stations.	
17	An adequate supply of parking is provided at park-and-ride facilities.	
18	Park-and-ride facilities are provided free of charge.	
19	Park-and-ride facilities are adequately lit between dusk and dawn.	
20	Park-and-ride facilities are highly visible from adjacent buildings and/or by passing traffic.	
21	Park-and-ride facilities are security monitored.	
22	Direct pedestrian access is provided between park-and-ride facilities and transit stops/stations.	
23	Park-and-ride facilities are easily accessible by car from adjacent roadways.	

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT CHECKLIST

Link #4: On-Vehicle Travel

		COMMENTS
1	Transit vehicles are universally accessible.	
2	Route numbers and destinations are clearly visible.	
3	Adequate seating is available on transit vehicles.	
4	Commuters' personal safety and security is not compromised on board transit vehicles.	
5	Transit vehicles are clean.	
6	Transit drivers announce major stops, stations and intersections.	
7	Transit drivers are friendly and helpful when asked for assistance.	
8	Transit vehicles are equipped with bicycle racks.	

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT CHECKLIST

Link #5: Transit Stops and Stations at/near Place of Employment

		COMMENTS
1	Transit stops/stations are located close to all workplaces in the employment area.	
2	Transit stops and stations are located on pavement.	
3	Transit stops and stations are adequately lit between dusk and dawn.	
4	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.	
5	Trash receptacles are provided at transit stops and stations.	
6	Transit stops and stations are clean.	
7	Effective shelter from the elements is provided at transit stops and stations.	
8	Seating is provided at transit stops and stations.	
9	Newspaper vending machines are available at transit stops and stations.	
10	Comprehensive service information is provided at transit stops and stations.	
11	Public telephones are available at transit stations.	
12	Emergency telephones or call boxes are provided at transit stations.	
13	Public washrooms are provided at transit stations.	
14	Baby change facilities are provided in washrooms at transit stations.	
15	Bicycle storage facilities are provided at transit stops and stations.	
16	Convenience stores and/or vending machines are located at transit stations.	

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT CHECKLIST

Link #6: Travel between Transit Stop/Station and Place of Employment

		COMMENTS
1	Commuters can travel directly between transit stops/stations and their places of employment.	
2	Travel routes between transit stops/stations and workplaces are aesthetically pleasing.	
3	Travel routes between transit stops/stations and workplaces are adequately lit between dusk and dawn.	
4	Travel routes between transit stops/stations and workplaces are highly visible from adjacent buildings and/or by passing traffic.	
5	A continuous sidewalk network provides physical access between transit stops/stations and workplaces.	
6	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.	
7	Sidewalks are in good physical condition.	
8	Sidewalks are designed to accommodate the needs of wheelchair users.	
9	Sidewalks are promptly cleared of ice and snow.	

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT CHECKLIST

Link #6: Travel between Transit Stop/Station and Place of Employment (continued)

		COMMENTS
10	Sidewalks are effectively cleared of ice and snow.	
11	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.	
12	Travel along sidewalks is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.	
13	When they must cross collector and arterial roads, pedestrians are provided with signalized road crossing opportunities.	
14	Road crossing signals can be activated by pedestrians.	
15	Road crossing signals include audible traffic signals.	
16	When required to travel along collector and arterial roads, commuters accessing transit stops/stations by bicycle are provided with *clearly demarcated bicycle lanes*.	
17	Bicycle lanes are of an adequate width.	

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT CHECKLIST

Link #7: Employment Area

		COMMENTS
1	Facilities and services required on a day-to-day basis are available within walking distance of workplaces in the employment area.	
2	Bicycle storage facilities are provided within the employment area.	
3	Bicycle storage facilities are highly visible from nearby buildings and/or by passing traffic.	
4	Cyclists are provided with shower and change room facilities at workplaces in the employment area.	

Appendix Three:

Public Transit Commuter Accessibility Report Card

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #1: Availability of Public Transit Service

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Public transit service is available within the subarea.							
2	Public transit service is available at the employment area.							
3	Public transit service is provided directly between the subarea and employment area.							
4	If public transit is not provided directly between the subarea and employment area, commuters must only transfer once in order to reach the employment area.							
5	If commuters must transfer between transit vehicles, route schedules are efficiently coordinated.							
6	Public transit service is provided between the subarea and employment area on days when commuters travel.							
7	Public transit service is provided between the subarea and employment area before, during and after employees' workdays.							
8	Public transit service is provided between the subarea and employment area at convenient frequencies.							

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #2: Travel between Homes and Transit Stops/Stations

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Facilities and services required on a day-to-day basis are available within walking distance of homes.							
2	Commuters can travel directly between their places of residence and transit stops/stations.							
3	Travel routes between places of residence and transit stops/stations are aesthetically pleasant.							
4	Travel routes between places of residence and transit stops/stations are adequately lit between dusk and dawn.							
5	Travel routes between places of residence and transit stops/stations are highly visible from adjacent buildings and/or by passing traffic.							
6	A continuous sidewalk network provides physical access between homes and transit stops/stations.							

Continued on next page

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #2: Travel between Homes and Transit Stops/Stations (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
7	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.							
8	Sidewalks are in good physical condition.							
9	Sidewalks are designed to accommodate the needs of wheelchair users.							
10	Sidewalks are promptly cleared of ice and snow.							
11	Sidewalks are effectively cleared of ice and snow.							
12	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.							
13	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.							

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PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #2: Travel between Homes and Transit Stops/Stations (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
14	When they must cross collector and arterial roads, commuters are provided with signalized road crossing opportunities.							
15	Road-crossing signals can be activated by pedestrians.							
16	Road-crossing signals include audible signals.							
17	When required to travel on collector or arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.							
18	Bicycle lanes are of an adequate width.							

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #3: Transit Stops/Stations near the Place of Residence

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit stops and stations are located on pavement.							
2	Transit stops and stations are adequately lit between dusk and dawn.							
3	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.							
4	Trash receptacles are provided at transit stops and stations.							
5	Transit stops and stations are clean.							
6	Effective shelter from the elements is provided at transit stops and stations.							
7	Seating is provided at transit stops and stations.							
8	Newspaper vending machines are provided at transit stops and stations.							
9	Service information is provided at transit stops and stations.							

Continued on next page

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #3: Transit Stops/Stations near the Place of Residence (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
10	Public telephones are available at transit stations.							
11	Emergency telephones or call boxes are provided at transit stations.							
12	Public washrooms are provided at transit stations.							
13	Baby change facilities are provided in washrooms at transit stations.							
14	Bicycle storage facilities are provided at transit stops and stations.							
15	Convenience stores and/or vending machines are located at transit stations.							

Concluded on next page

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #3: Transit Stops/Stations near the Place of Residence (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
16	When commuters must access public transit by car, park-and-ride facilities are provided at transit stations.							
17	An adequate supply of parking is provided at park-and-ride facilities.							
18	Park-and-ride facilities are provided free of charge.							
19	Park-and-ride facilities are adequately lit between dusk and dawn.							
20	Park-and-ride facilities are highly visible by passing traffic and/or from adjacent buildings.							
21	Park-and-ride facilities are security monitored.							
22	Direct pedestrian access is provided between park-and-ride facilities and transit stops or stations.							
23	Park-and-ride facilities are easily accessible by car from adjacent roadways.							

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #4: Transit Vehicle and On-Board Travel

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit vehicles are universally accessible.							
2	Route numbers and destinations are clearly visible.							
3	Adequate seating is available on transit vehicles.							
4	Commuters' personal safety and security is not compromised on board transit vehicles.							
5	Transit vehicles are clean.							
6	Transit drivers announce major stops, stations and intersections.							
7	Transit drivers are friendly and helpful when asked for assistance.							
8	Transit vehicles are equipped with bicycle racks.							

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #5: Transit Stops/Stations near Place of Employment

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Transit stops/stations are located close to all workplaces in the employment area.							
2	Transit stops and stations are located on pavement.							
3	Transit stops and stations are adequately lit between dusk and dawn.							
4	Transit stops and stations are highly visible from adjacent buildings and/or by passing traffic.							
5	Trash receptacles are provided at transit stops and stations.							
6	Transit stops and stations are clean.							
7	Effective shelter from the elements is provided at transit stops and stations.							
8	Seating is provided at transit stops and stations.							
9	Newspaper vending machines are provided at transit stops and stations.							
10	Service information is provided at stops and stations.							

Concluded on next page

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #5: Transit Stops/Stations near Place of Employment (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
11	Public telephones are available at transit stations.							
12	Emergency telephones or call boxes are provided at transit stations.							
13	Public washrooms are provided at transit stations.							
14	Baby change facilities are provided in washrooms at transit stations.							
15	Bicycle storage facilities (racks or lockers) are provided at transit stops and stations.							
16	Convenience stores and/or vending machines are located at transit stations.							

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #6: Travel from Transit Stops/Stations to the Place of Employment (concluded)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Commuters can travel directly between transit stops/stations and their places of employment.							
2	Travel routes between transit stops/stations and workplaces are aesthetically pleasant.							
3	Travel routes between transit stops/stations and workplaces are adequately lit between dusk and dawn.							
4	Travel routes between transit stops/stations and workplaces are highly visible from adjacent buildings and/or by passing traffic.							
5	A continuous sidewalk network provides physical access between transit stops/stations and workplaces.							
6	Sidewalks are wide enough to accommodate pedestrians travelling in both directions.							
7	Sidewalks are in good physical condition.							
8	Sidewalks are designed to accommodate the needs of wheelchair users.							

Concluded on next page

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #6: Travel from Transit Stops/Stations to the Place of Employment (continued)

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
9	Sidewalks are promptly cleared of ice and snow.							
10	Sidewalks are effectively cleared of ice and snow.							
11	Along collector and arterial roads, sidewalks are separated from vehicular traffic by buffers.							
12	Travel to and from transit stops/stations is not hindered by obstacles such as street furniture, parked motor vehicles or snowbanks.							
13	When they must cross collector and arterial roads, commuters are provided with signalized road crossing opportunities.							
14	Road-crossing signals can be activated by pedestrians.							
15	Road-crossing signals include audible signals.							
16	When required to travel on collector or arterial roads, commuters accessing transit stops/stations by bicycle are provided with clearly demarcated bicycle lanes.							
17	Bicycle lanes are of an adequate width.							

PUBLIC TRANSIT COMMUTER ACCESSIBILITY AUDIT REPORT CARD

Dimension #7: Employment Area

		Data Source	Findings/Comments	Grade				
				A	B	C	DNA	N/A
1	Facilities and services required on a day-to-day basis within walking distance of workplaces in the employment area.							
2	Bicycle storage facilities are provided within the employment area.							
3	Bicycle storage facilities are highly visible by passing traffic and/or from nearby buildings.							
4	Cyclists are provided with shower and change room facilities at workplaces in the employment area.							

<u>Grading Scheme</u>

A = Statement completely true; needs fully satisfied
B = Statement partially true; some deficiencies exist
C = Statement mostly or completely false; needs not satisfied
DNA = Data not available
N/A = Not applicable

Appendix Four:

List of Employers
Case Study Employment Areas

Case Study #1: Orleans Town Centre

Place d’Orleans Shopping Centre

A Buck or Two
A&W
A/E Sport & Co
Accent Decor
Access
Addition-Elle
Administration Office
Aldo
Algonquin Travel
Alia
American Eagle Outfitters
Ardene
Armstrong & Richardson
Armstrong & Richardson
Clearance Centre
Artworks
Athletes World Superstore
Back World
Bank of Montreal
Barber Shop
Baskin Robbins
Bata
Bateman House
Battery Plus
Beddington's
Beef n' Brand Restaurant
Bell World
Bentley
Blacks
Bluenotes
Bombay Company
Bouclair
Campus Crew
Capital Optical
Carlton Cards
Cazza
Century 21
Cinnabon
Claire France
Claire's Accessories
Cleo / Ricki's
Coiffure Charisma
Coles the Book People!
Compucentre
Cotton Ginny
Dalida Jewellers
D'Allaird
Dans un Jardin
Doucet
Dynamite
Eddie Bauer
Electronics Boutique
Emil of Switzerland
English Butler
Entertainment Ink!
Eye Exam Centre
Eye Exam Clinic
Fairweather
Fantastic Needle
Fine Gold Jewellwers
Flight Centre
Foot Locker
Franx Supreme
Fraser Cleaners
FX LaSalle
Gap
General Nutrition Centre
Grand & Toy
Growing Kids
Hallmark Davis Agency
HMV
Hola
Info Place
International Clothiers
Jack Fraser
Jacob
Japan Camera
Jerome
Joe's Nevada
Joggers/Joggers Kids
Kernels
KFC
Kiddie Kobbler
Kitchensense
La Cremiere
La Maison D'Or
La Senza
Laura
Laura Petites
Laura Secord
Laurier Optical
Le Chateau
Le jean bleu
Le Muffin Plus
Lenscrafters
Lewiscraft
Lyn Novak Flowers & Gifts
Made In Japan
Marie Claire
Market Fresh
McIntosh & Watts
Modern Nail
Moneysworth & Best
Monograms Plus
Mrs. Tiggy Winkle's
Mrs. Vanelli's
Music World
Naturalizer
New York Fries
Northern Getaway
Northern Reflections
Nutrition House
Pantorama
Payless ShoeSource
Peoples
Pharma Plus
Place d’Orleans Guest Services
Place d'Orleans Dental Clinic
Please Mum
Radio Shack
Randy River
Regis Hair Salon
Reitmans
Rogers AT&T
Roots
San Diego
Scotiabank
Service Ontario Kiosk
Shefield & Sons Tobacconists
Showcase
Silk & Satin
Smart Set
Sport Chek
St. Matthew Storefront School
Stitch It
Stitches
Stokes
Subway
Sunglass Hut International
Suzy Shier
Tabi International
Tan Jay
Telus
The Bay
The Bay Home Store
The Body Shop
The Children's Place
The Garage Clothing Co.
The Home Company
The Leather Ranch
The Leather Ranch
The Second Cup
The Silver Dollar
The Tropical Kitchen
Things Engraved
Thomas Cook Travel
Tiki Ming
Tim Horton’s
Tip Top
Transit
Treats
Tristan/America
Urban Planet
Wal-Mart
West 49º
Wine Rack
Wireless Wave
Woolaine
YM/YWCA Mini Port
Yves Rocher

Place Centrum

Centrum Chiropractic Clinic
Centrum Pharmacy
CS Co-op
Edward Jones
Lexus Resto-Bar
Orleans Acupuncture Clinic
Orleans Family Health Clinic
Royal Bank

Orleans Town Centre

Academy of Dance Arts
Au Vieux Duluth Restaurant
Bagel Run
CAA North & East Ontario
City of Ottawa Service Centre
Cumberland Arms Pub
East Side Mario's
Farm Boy
First Choice Haircutters
Microplay
Orleans-Cumberland Dental Centre
Orleans Financial Services
Orleans Theatres
Pet Valu
Royal Lepage
Subway
Tommy & Lefebvre
Wine Kitz
YM/YWCA

Place d'Orleans West

Loblaws
Orleans Family Dentistry
Orleans Holistic Massage Clinic
Orleans Optometry Clinic
Orleans Urgent Care Clinic
Orleans Vein Clinic

St. Joseph Blvd.

Orleans Auto Parts Ltd.
Orleans Autotech
Petro-Canada
Place d'Orleans Family Chiropractic & Health Centre
Shell

Case Study #2: Lincoln Fields Shopping Centre

A Buck or Two
Access Medical Centre
Adam's Men's Wear
Arts & Frames
Bata Athlete's World
Boutique De Mes Fantaisies
Boutique Rani
Britz Fine Foods
Bulk Foods
Buffalo Charlie's Bar & Grill
CAA North and East Ontario
Coldwell Banker Sarazen
Craig and Taylor Associates
CS CO-OP
Lincoln Fields Dental Centre
Employment Resources
First Choice Rent-to-Own
Francis Italiano
Gateway Newstand
Golden Rock Jewellers
Human Resources Development Centre
Il Paradiso Spa & Tanning
Information Booth
Japan Camera
Jewellery Encounters
Kids Rainbow Boutique
K O Fashions
Legends Records
Lincoln Fields Shoe Repair
Lincoln Heights Jewellers
LOEB Lincoln Heights
Majestic Pizza
Master Stitch Up
Moore's Clothing for Men
New Nails
Ottawa Magic Cleaners
PAM's Coffee and Tea Company
Peter's Health Food
Pharma Plus Drugstore
Strandz Hair Design
Subway
Tescuit
Treats
Truffles and Nuts
Tweezers Unisex Hair Design
Vezina Opticians
The Wine Rack
Waldo's Donair
Wal-Mart
Wendy's
West End Hair Academy
Young Drivers of Canada

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