The Implementation of Exclusive Transit Facilities at Regional Shopping Malls:

Linking Transit and Land Use Planning

by
Alex Phillip Regiec

A Practicum Submitted to the
Faculty of Graduate Studies
in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF CITY PLANNING

Department of City Planning
University of Manitoba
Winnipeg, Manitoba

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ABSTRACT

The dispersed nature of population and employment centres has meant that transit properties in most North American cities have had to expand and adjust their transit services at an increased cost, while loosing ridership to the automobile, due to the decrease in their efficiency in servicing these outlying suburban areas. Thus the placement, design and functioning of bus station/terminals at major regional town centres or shopping facilities has significantly impacted on the operation of many transit properties, often improving quality of service delivered.

The purpose of this practicum is to investigate the placement of exclusive public transit facilities (terminals and stations) at regional commercial shopping malls. This practicum proposes to examine existing terminal and station locations in the city of Winnipeg, and will review similar facilities in the cities of Burnaby, Edmonton, Mississuaga, Ottawa, and Quebec City. An evaluation of current station planning practices and implementation is done with the review of basic planning and design principles and with the utilization of a passenger/operator survey.

Finally the practicum puts forth an implementation strategy with optimum balance of social, economic, legal, and design considerations in mind, together with an appropriate framework in which planning and development of future stations may occur in the city of Winnipeg.

ACKNOWLEDGEMENTS

There are many individuals I wish to thank who have contributed significantly both in the completion of this practicum and throughout the course of my studies.

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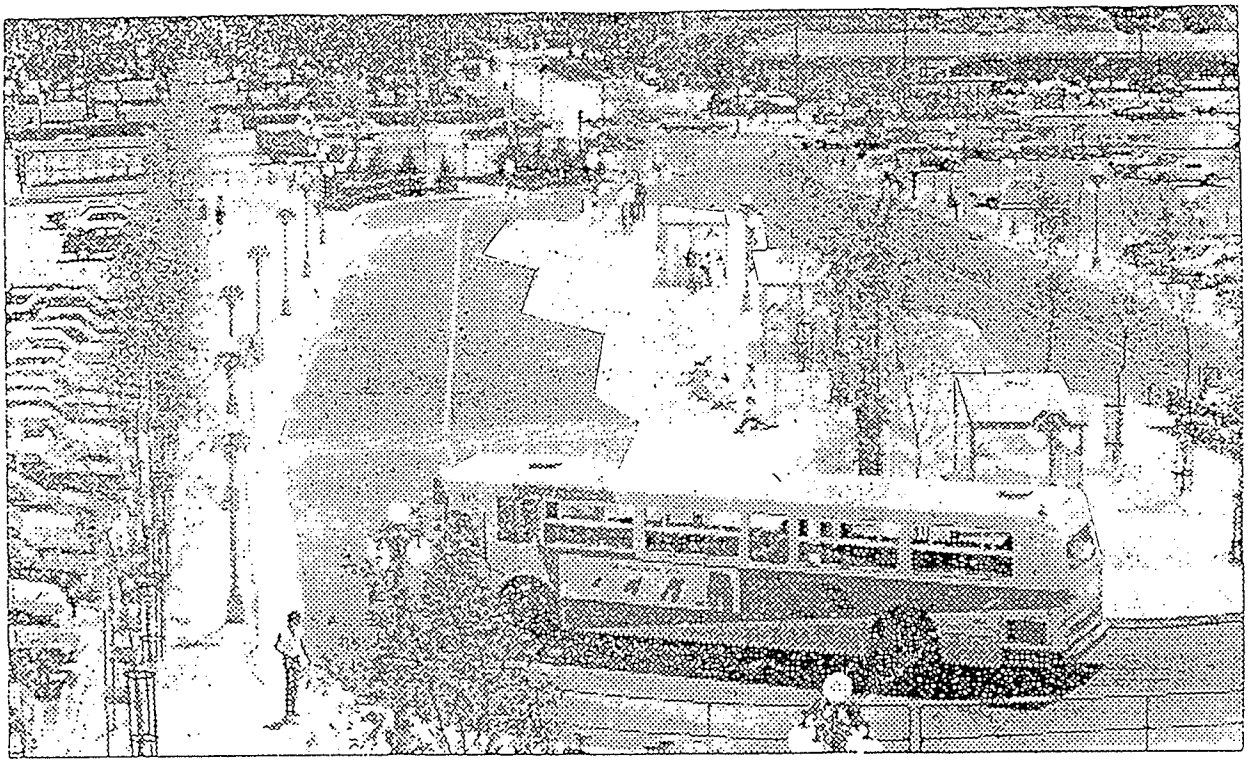
POLO PARK TRANSIT STATION



CHAPTER ONE
Introduction

"Good transportation and communication are not only among the most difficult things to achieve; they are also basic necessities."

Jane Jacobs, The death and life of Great American Cities (1961, 339).

Introduction

The practicum explores the underlying link between mass transit and land use in Canadian cities. Land use for the purpose of this practicum will focus on the use of land as a locus of urban activity. An efficient land use pattern is therefore predicated on the ability of people to move about the differing loci of urban acitivity. As cities become more dense because of energy and economic constraints of the future, a case for greater use of public transit becomes evident. As city governments begin to recognize the need for better provision of public transit services, efficiency, economy, and convienence will be of importance in planning for better public transportation. There is a need to streamline the current systems and make them more effective in connecting people with the different urban activities they must access around their city. Transit bus stations are one such opportunity to aid in the improvement of current transit operations in order to meet the needs for the future city.

The purpose of this practicum is to investigate the placement of exclusive public transit facilities (terminals and stations) at regional commercial shopping malls. This practicum examines existing station facilities in the cities of Vancouver, Edmonton, Mississuaga, Ottawa, and Québec City along with existing station locations in the city of Winnipeg. An evaluation of existing Winnipeg Transit policies related to station placement and development is be done, with recommendations that follow.

The Nature of the Problem

Modern planning practice has assumed that shoppers in regional shopping centres would travel by automobile in order to reach their destination. In fact, the regional shopping centre was born in the late 1950s and early 1960s along with the development and implementation of the limited access freeway. As a result of this, regional shopping centres generally have been located far away from the old inner city areas and along freeways to minimize land costs while obtaining the best possible road accessibility. The location of these centres near freeway or highway facilities and the large amounts of free parking available at them made it extremely difficult for public transit to service them. Winnipeg followed this typical North American development pattern of suburban growth, involving both residential and employment related developments as well as suburban commercial development along major arterial streets.

As employment concentration increased outside of the downtown, transit routing patterns also changed from a primarily radial configuration serving the downtown to a system consisting of an increasing number of cross town and feeder routes designed to serve the various suburban trip generators, including shopping centres.

The addition of these crosstown and feeder routes were implemented incrementally as the direction and the pace of growth necessitated. The picture that eventually unfolded as the suburban areas became fully developed was a mesh of transit bus routes that converged on the suburban malls, but without orderly pattern. In the case of most malls a lot of confusion surrounded the routing of buses around the mall areas. Some bus routes travelled into shopping mall parking lots stopping at the front door, while other routes did not and stopped on the street nearby. It was difficult for passengers to transfer adequately between buses at these central locations.

Other problems that exist at most regional malls is that buses are often tied-up in traffic bottlenecks. The reason for this problem is attributed to their operation in mixed traffic, such as automobiles and other vehicles. Because of this serious problem, buses are often running late, and during the Christmas season this can mean an additional 20 minute wait for users of the transit system.

Various methods can be utilized by urban transit planners and mall developers to increase the attractiveness of public transportation. The dispersed nature of centres of population growth and employment has meant that Winnipeg Transit, like every other North American city, has had to expand and adjust its transit services at an increased cost while loosing ridership to the automobile due to the decrease of transits capability to service outlying suburban areas. Thus the placement, design and functioning of bus station/terminals at major regional town centres or shopping facilities have a significant impact on the operation of a transit property, often improving the quality of the service delivery. The main advantages of constructing exclusive transit stations/terminals at regional malls are: 1.That this action would centralize all bus routes going to a shopping centre; 2. It would centralize passenger service and transfers; 3. It would simplify route structures, and; 4. It would segregate buses from car and truck traffic thus avoiding tie-ups in the mall parking lot.

In many cities across Canada, urban transit planners have become aware of these methods and have taken advantage of them so as to improve the quality of transit operations in their cities. They have practiced co-ordinating their land-use strategies with the planning of public transit. The best known example of this is the handling of the impact of Toronto's Yonge/University subway line and its stations on the surrounding land-uses. In Montreal, the construction of the Metro subway system has engendered a complex underground pedestrian system linking many downtown developments. Another example is that of Edmonton, where transit stations/terminals are an integral part of its timed-transfer system, linking all areas of the city effectively by the bus. The city of Ottawa also co-ordinates the development of its transit stations with various land uses around the transit service area.

The joint development of a transitway station with a major regional hospital, and the advanced building of a transit terminal in a new suburban area are examples of how Ottawa insures a high profile for transit in the future planning and development of the city. Transit stations have also been located at other high activity areas such as post-secondary institutions found in Winnipeg at the University of Manitoba, Vancouver at the University of British Columbia, Edmonton at the University of Alberta, and Ottawa at the Carleton University. This practicum recognizes the existence of these facilities but will only focus on transit stations at regional shopping malls. A brief mention of post-secondary transit station locations will made later on in the practicum.

Nature of the Inquiry

This Practicum is interdisciplinary in nature in that a variety of viewpoints are being examined. It emphasizes policy, management and operations, design, and land-use which are areas related to the planning profession. The need for interdisciplinary study is evident in the nature of this type of transit planning. The study includes the following: 1. The planning of the transit Station/Terminal itself, its relationship to the surrounding environment and community, and the impact of the facility on pedestrian and automobile traffic, and impact on bus operations. 2. The consideration of cost factors of the construction of such a facility and impact on transit operations (i.e. round trip times, service frequencies, schedule adherence). 3. The design of the transit Station/Terminal in terms of passenger convienence (i.e. walking distance, transferring, travel times), customer information , signage, and customer safety. 4. A brief examination of the legal aspects of building transit facilities follows and includes: land-ownership, development cost sharing, and right-of-way access.

The following method of analysis was utilized for each chapter topic:

1. The analysis of the relationship between transit and land use planning.
2. The analysis of general station location.
3. The analysis of station amenities.

Practicum Research

The method of research for this practicum involves four stages: the literature review, interviews/surveys, case studies and finally synthesis.

Literature Review. This first stage serves to familiarize the author with existing reports, studies, books and articles dealing with transit terminals/stations and the relationship between transit and land use planning. Topics in various disciplines such as Engineering, Architecture, Economics, Law, and Urban planning are explored.

Interviews/surveys. Interviews with regional mall management, transit officials, and city planners contribute first hand experience to the practicum, allowing for gaps in research material to be filled. Primary data was generated in the form of passenger boarding/alighting counts and bus driver surveys.

Case Studies. The evaluation of stations/terminals in other cities, particularly Burnaby, British Columbia, Edmonton, Alberta, Mississuaga, Ontario, Ottawa, Ontario, and Québec City, Québec offer an in depth study of specific examples of planning, design options, legal considerations, operations experience, and land use impact.

The evaluation reviews all the material gathered through the literature, interviews/surveys, and case studies in each chapter and evaluates the benefits and weaknesses of planning principles at the end of each chapter. The planning principles, once scrutinized, lead to conclusions and recommendations about what are desirable elements in the future planning for exclusive transit facilities at regional shopping centres in Winnipeg.

Organization of Practicum

Chapter 1 of this practicum discusses the problem of providing transit service to regional shopping malls and introduces the concept of exclusive transit station/terminals at these locations. It also outlines the structure of this practicum, methods of research, and nature of the practicum inquiry.

This background material lays the foundation for Chapter 2 which explores in the link between mass transit and land usage in cities, the general locations of transit stations in the city, the design and function of transit station/terminal facilities, and the use of stations/terminals with the timed-transfer concept. A review of shopping centre planning in the city of Winnipeg is also undertaken in relation to the examination of the link between mass transit and land use planning.

Chapter 3 details the station/terminal development efforts of other transit authorities in the chosen case study cities. Information and data gathered from this inquiry allows for comparison with the current Winnipeg situation in further chapters, and then highlights the successful factors in station/terminal development and implementation from these other centres.

Chapter 4 The evaluation of existing station/terminal facilities in Winnipeg is carried out in this chapter, with current demographics, traffic characteristics, transit system dynamics and results from the passenger boarding/alighting counts and bus operator surveys taken at Polo Park and Garden City Transit Stations scrutinized.

Chapter 5 then proceeds to outline in detail guidelines for the implementation of transit stations/terminals according to specific aspects (ie. social, economic, legal, and design). Successful features will include: improving overall service delivery, providing the customer with a reliable product, creating a strong sense of place for transit in the urban community, and bridging the gap between transit planning and land use planning within the urban

context. The development of a Transit Station Program Policy, for the on-going planning and implementation and maintainence of these facilities, is presented in this final chapter. It then concludes making specific recommendations for the future siting of exclusive transit station/terminals in the city of Winnipeg.

Chapter 6 reviews and highlights the main findings of this practicum, restating the perceived need and proposed future guidelines for station/terminal development in the City of Winnipeg.

Summary

Transit stations provide a focal point for transit service at major activity centres around a city and provide a safe, clean and comfortable area for waiting and transferring passengers. They can also have amenities for auto parking for carpoolers and transit patrons. Transit stations can be interfaced with other transportation systems such as national rail lines, intercity and airport bus services, and rapid transit lines. By building transit stations and co-ordinating their development with high activity land use patterns, transit planners are then able to utilize taxpayer's dollars in a way that provides a significant benefit to the travelling public of a city.

This practicum presents a framework for action that can be used by transit authorities and shopping centre owners in re-evaluating transit service to existing regional malls. It can be used by transportation engineers, transit planners and private developers in preparing plans for new facilities at high activity land use areas such as shopping malls.

CHAPTER TWO
Exclusive Transit Stations: Location, Site Planning and Design

"An extremely important, but often ignored fact is that the purpose of passenger transportation is to move people; movement of vehicles is a means towards that goal, but not a goal in itself... public transport should be favored over private because it provides a basic transport service to the entire population, it is more economical, and it has much lower negative side effects... The ultimate significance of bus preferential treatments is that the service improvements resulting from it usually change the competitive position of transit with respect to the auto."

Vukan R. Vuchic, Urban Public Transportation (1981,244).

Introduction

This Chapter explores in the link between mass transit and land usage in cities, the general locations of transit stations in the city, the design and function of transit station/terminal facilities, and the use of stations/terminals with the timed-transfer concept. A review of shopping centre planning in the city of Winnipeg is also undertaken in relation to the examination of the link between mass transit and land use planning.

Transit bus *stations* are off-street or on-street areas or buildings with stops for several bus routes. Transit bus *terminals* are the end stations of one or more bus routes; however, the term is often used for any large station with passenger facilities, such as waiting areas, ticket stands, and so on. Other terms which have been applied to these types of facilities are *transit exchange* (Vancouver), *transit centre* (Edmonton), *transit terminal* (Ottawa), and *transit station*. The term *transit transfer centre* is used extensively in the American literature. For simplicity sake, the term *transit station* will be used throughout this practicum.

Bus transfer stations are usually built at transfer points among several bus routes or between main line haul bus routes (or rapid rail transit lines) and bus feeder

routes. Stations must be located on sites with good accessibility to major highways and arterials, which in the North American transit context has seen these facilities developed at major regional shopping centres. It is because shopping centres are being built to satisfy motor transportation needs, and because they are a strong attractor for urban activities, that transit stations are being located there.

Mass Transit and Land Use Planning

The reason for inclusion of this section on Mass Transit and Land Use Planning is to establish a recognized link between these two interrelated urban activities. The theoretical, historical, and empirical viewpoints all point to a joint transit and land use interrelationship, but the institutional frameworks under which both of these city activities function are often at a distance from each other. The reason for the separation of the two activities can be traced to a gap in the enabling legislation of both. It is from the perspective of developing a new vision of the future city, and mobility in that future city, that the link between transit and land use planning must be explored.

Only after a bridging of transit and land use planning, both through a recognition through legislative policy and in the physical environment itself, can the successful implementation of transit terminals contribute to a new vision of mobility and access in the future city.

Historical Context

The patterns of land use in our cities have changed over time reflecting a number of social, economic, and technological changes. Historically, the availability of public transportation has been closely tied to the density, use, and arrangement of land within our cities. One of the major factors involved in the helping to change the way in which land is used is the mode of transportation which is available at a particular point in time. Each new innovation in transportation technology has allowed greater trip

lengths to be achieved and therefore the boundaries of Canadian cities to been expanded.

The invention of the electric streetcar in the late 1880's brought a greater advantage in transportation over the previously horse-drawn vehicles of the past. The streetcars greater speed and reliability allowed longer trips and increased the separation between home and work in cities. The increased separation of home and work can also be attributed to the environmental effects of the industrial revolution on cities, and the response of health and planning authorities to it at the time. However, it was the streetcar that permitted the early development of the affordable suburban home to take place.[1]

It wasn't until shortly after World War II that the full impact of the automobile was felt on the Canadian city, greatly altering its shape and form. At this time, there was an unprecedented demand for suburban housing and dramatic increases in car ownership. Congestion forced the city planners and engineers of the day to construct major freeway and expressway facilities to accommodate the increase of cars on the road. This massive building of highway facilities and high levels of car ownership helped establish the modern automobile as the cornerstone of current planning practices.[2] Transit properties during this period went into decline and disrepair as the automobile became the choice of mode for most individuals.

The historical relationship between transit and land use planning could therefore have undergone two phases in which transit had originally facilitated suburban growth and urban expansion, only to lose its role to the car which again altered the shape and form of the city. Developers originally had been involved in the promotion and building of street railway lines only later to abandon them for the automobile-oriented subdivisions of modern times. In other words, mass transit was used as a tool for spurring urban growth, which was later by and large abandoned.

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[1] Vuchic, Vukan. Urban Public Transportation: Systems and Technology. Toronto: Prentice Hall p.32.

[2] Hodge, Gerald. Planning Canadian Communities. Toronto: Metheun, 1986. p. 92-93.

Theoretical Basis

The theoretical basis of transportation and land use has its roots in location theory. According to location theory, a change in the availability of transportation services causes a change in access to all parts of a region. Through time, and the use of computers, it had become possible for transportation planners and engineers to predict the relationship between various transportation and land-use models and alternatives. The use of transportation planning models allowed the planners and engineers to predict forecasts of future transportation requirements given the specific land-use activities in a city. However, many early transportation models made simplistic assumptions that transportation facilities were only accommodating land-use without having any significant impacts on it, and ended up influencing land use without recognizing it and, consequently often making wrong predictions about the future traffic patterns of the city. With modifications and the development of more comprehensive modelling techniques, planners and engineers were then able to better predict future traffic patterns based on an understanding that transportation and land-use are highly interrelated and cannot be considered independently of one another.

A model developed by Michael D. Meyer and Eric J. Miller recognizes that the relationship between land use and transportation is a circular one. In their model, the development of land creates new travel demands and new transportation facilities. New facilities make other lands accesible to existing activity centres and alter land values. Increased accesibility and improved land values influences locational decisions, and begins repeating the whole process once again.[3]

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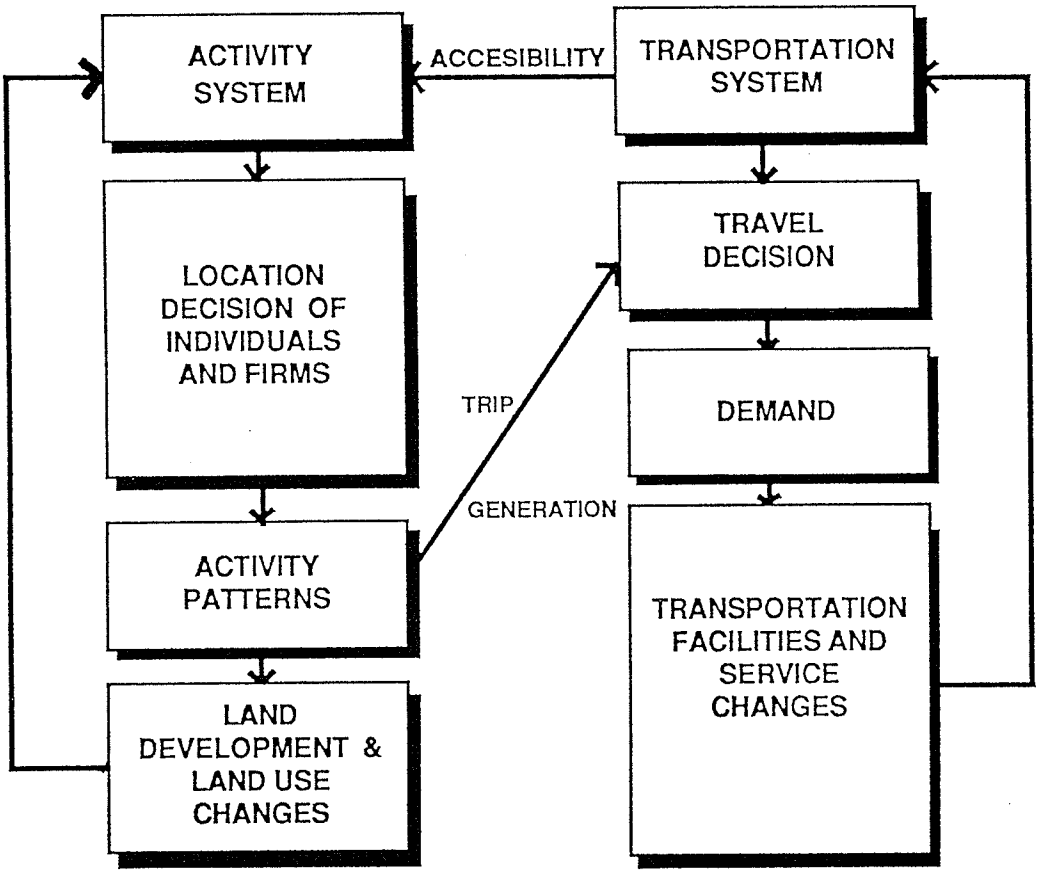
[3] Meyer, Michael D. and Eric J. Miller. Urban Transportation Planning: A Decision-oriented Approach. New York: McGraw-Hill, 1984. p. 63.

FIGURE 1

THEORETICAL RELATIONSHIP BETWEEN TRANSPORTATION AND LAND USE



SOURCE: Meyer, Michael D. and Eric J. Miller. Urban Transportation Planning: A Decision-oriented Approach. New York: McGraw-Hill, 1984. p. 63.

Empirical Evidence

Land-use is known to be a determinant both directly and indirectly of the demand for travel because it influences trip generation, trip length, trip distribution, and modal choice. A number of studies have suggested in the past that the link between land-use and transportation is fairly evident.

Some of the observations worth noting about the transportation and land-use linkages are:

- the direct relationship between residential density and the number of trips made per dwelling.
- the density and pattern of land-uses creates travel demand in turn which results in the consumption of energy for transportation purposes.
- the size of an urban area can directly influence the impact of public transit services. According to the Canadian Urban Transit Association (CUTA), larger cities enjoy a higher degree of transit utilization than smaller cities.[4]
- According to Pushkarev and Zupan, the use of public transit is primarily dependent on the size and density of a city's central business district and the amount of non-residential destination trips.[5]
- Also, Pushkarev and Zupan point out that the number of trips by transit increases with an increase in residential density. The residential densities in the 2 to 7 dwellings per acre range produce only marginal transit ridership, while the densities in the 7 to 30 range provide significant transit use.[6]

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[4] CUTA. Canadian Urban Transit Handbook. Toronto: CUTA/RTAC, 1985. p. 27-11.

[5] Pushkarev, Boris S. and Jeffery M. Zupan. Public Transportation and Land Use Policy. Don Mills, ON.: Fitzhenry & Whiteside Ltd., 1977. p. 184-187.

[6] Ibid.

The empirical evidence suggested significant implications for transit use and land-use planning in urban areas. This does not mean that planning urban areas according to principles conducive to transit will necessary result in a significant increase in transit ridership. Rather, that only the potential for increase transit utilization exists if these planning principles are applied. The decision to use public transit by an individual depend on a number of variables, including: income, car ownership, quality of transit available, congestion, parking availability, and public perception of the transit system.

However, the historical, theoretical, and empirical evidence also suggests that transit usage and land-use patterns are closely related. There are general patterns of land-use that will naturally be conducive and supportive of the use of public transit. CUTA identifies a number of these land-use arrangements which, based on all of the evidence, contribute to increase transit utilization. These land-use arrangements include:

- poly-centred municipalities,
- concentration of high-density residential, commercial, and employment areas,
- self-contained neighbourhoods,
- development of multi-functional activity centres.[7]

Shopping Centre Planning

In planning for a new retail shopping complex, or the expansion of an existing centre, a number of transportation related issues must be reviewed. These issues include traffic access locations, parking supply, and internal circulation at the mall. Often, the provision of transit facilities or modal splits are not even considered. Rather, the practice was to consider transit in examining downtown developments, areas of suburban employment concentration or the the impact of rapid transit facilities on the surrounding site.

[7] CUTA. Canadian Urban Transitt Handbook. P. 27-17.

The minimum setbacks employed by many cities for the residential, industrial, and commercial buildings have had detrimental impacts on walking distances because of their usually large allowances for parking space. Shopping centre merchants consider a large visible parking lot as an essential component of the mall design. However, from a transit property perspective large setbacks may discourage people from using public transit. Reduced setbacks can encourage transit use and can be accomplished at very little cost to the developers.[8] See figure 2.

Access to the shopping mall can be increased by having a bus stop at the buildings entrance or by reducing the distance between transit routes and shopping facilities. Developers tend to prefer partial setbacks with transit access to parking lots for aesthetic reasons and the fact that a zero setback could discourage automobile users from shopping at the mall. Transit properties are often reluctant to enter the mall lot unless exclusive access is secured, because buses often become tied-up in mixed traffic due to conflict and congestion. Although a modification to the design of the shopping centre and changes in local zoning bylaws are sometimes warranted to permit reduced setbacks, this often is justified by the benefits in terms of general accessibility, increased transit ridership, and increased numbers of shoppers.[9]

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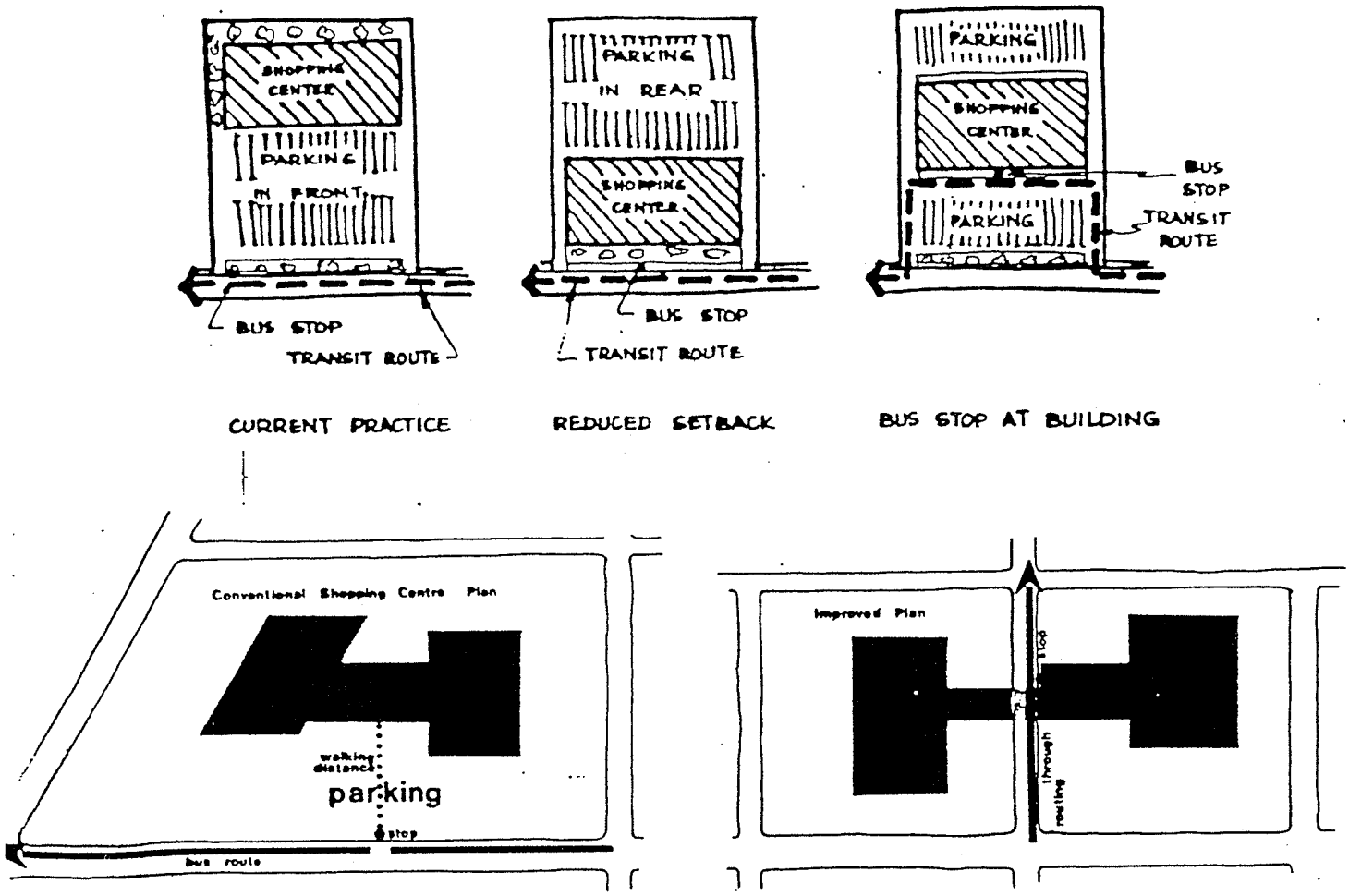
[8] CUTA. Canadian Urban Transit Handbook. p. 27 - 44.

[9] Ibid.

FIGURE 2

PLANNING AND DESIGN OF SHOPPING CENTRES



SOURCE: CUTA. Canadian Urban Transit Handbook. p. 27- 45.

General Locations

The great majority of bus passengers board and alight at curbside stops. This is not just a practice enforced by low investment in public transit, but is seen as desirable because the stops are located on the major traffic routes and the buses themselves do not have to be diverted from their routes. Only in the last ten years have the improvement of major bus stops or stopping areas been realized. The use of better shelters and the posting of timetable information or the use of computerized telephone scheduling systems have reduced the unpleasantness of waiting for transit. Many of these new shelters have been built by private advertising companies in exchange for the rights to hang poster advertisements in the shelters and gain revenue from such a practice. Bus stations and terminals have often been built to improve the physical surroundings of town centres while centralizing transit operations for easier access.[10]

Optimum locations for transit stations include major regional shopping centres, universities, medical centres and other similar facilities which generate a high degree of activity. Transit stations could also utilize free standing locations independent of other land uses. Well placed transit stations can work very well in industrial parks or business parks. Stations can form the nucleus of substantial new developments. Where express bus routes are concerned, transit stations which accommodate these express services should generally be constructed very close to major arterial or freeways to promote greater efficiency and speed in travel between the station and the downtown.[11]

There are basically two types of transit stations that can be utilized by a transit authority. These include *on-street* and *off-street* designs, although it is preferable to establish the off-street style of transit terminal. The rationale for this is that the segregation of transfer facilities offers safety and convienence for both transit patrons

[9] White, Peter. Planning for Public Transport. London: Hutchison & Co. (Publishers) Ltd., 1976. p.64.

[11] Schneider, J.B. Planning and Designing a Transit Center-based Transit System. Washington, DC.: U.S. Dept. of Transportation, 1980. Section II.

and private vehicles. On-street facilities should be viewed as a temporary or interim option or used if and when the off-street centre is not feasible. Many of the off-street bus stations combine both through-routing and local route termination in sawtooth layouts as the on-street facilities do with straight-curb loading.

Design and Function

The Canadian Urban Transit Association (CUTA) states that there is no unique or best station design that can be applied to every situation in every city. The reason for this, CUTA states, is that the design of the station is a function of many factors which are unique to each individual city or location, including:

- Pedestrian Movements
- Vehicle Movements
- Automobile Movements
- Site Availability
- Impact on surrounding area [12]

Vukan R. Vuchic, professor of transportation at the University of Pennsylvania, in his book Urban Public Transportation states that the best layout for a transit station from the perspective of passenger safety, comfort, and convienence is with bus stops around a major rectangular or oval island. This arrangement allows for passengers to transfer among all bus routes and thus makes the station a complete *pedestrian zone*.[13] See figure 3 for the different types of transit transfer stations.

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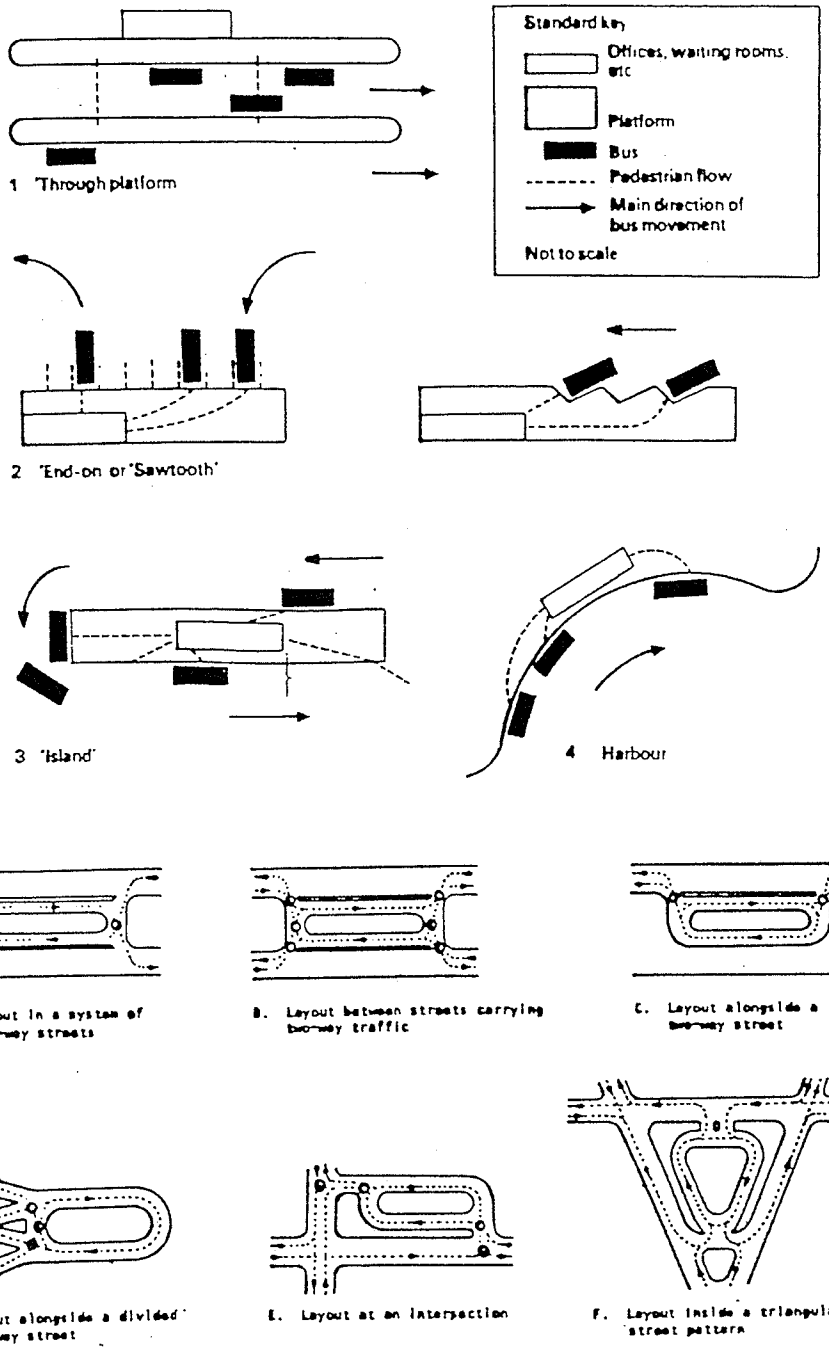
[12] CUTA. Canadian Urban Transit Handbook. p. 11-12.

[13] Vuchic, Vukan. Urban Public Transportation: Systems and Technology. Toronto: Prentice Hall, 1982. p. 281.

FIGURE 3

TRANSIT TRANSFER CENTRES



SOURCE: White, Peter. Planning for Public Transport. London: Hutchison & Co. (Publishers) Ltd., 1976. p. 65.

Petersen, Stephen G. and Robert H. Braswell. "Planning and Design Guidelines for Mode Transfer Facilities," Traffic Quarterly, July 1972, p. 411.

According to Vuchic the central island also has excellent operating features. The circular roadway allows buses to alight passengers at one berth, moving to a waiting area, then returning to the same, or to another berth for boarding. In addition, these stations allow for through routes to pull into the station, as well as terminating routes with the buses simply looping around the island and returning to its original direction.[14]

Access

Access is required for both passengers and vehicles in all transit stations. For safety reasons, pedestrian access is usually given priority. Distance is minimized while safety and expediency are maximized in the design. It is customary to priorize the functions of the station as follows: 1. For traffic safety and efficiency of movements; 2. Handling of transit vehicles; 3. Followed by passenger drop-off activities. The potential transit passenger who needs to park is usually given the lowest priority for a variety of reasons (including equity, efficiency and feasibility of accommodation).

Vehicle access to the station is ideally segregated by type. This prevents transit vehicles from being delayed as auto traffic builds at rush hour. This is important since it is both the time when the facility is subject to its maximum level of congestion and at the time when it needs to operate smoothly at maximum capacity. Two types of routes generally serve transfer stations: local routes and main-line haul or express routes. *Local Routes* serve the area immediately surrounding the transit station for the purpose of transporting passengers to and from the facility. These feeder routes, as they are commonly referred to, would extend radially out from the station and sometime operate on a timed transfer schedule to meet through buses. *Main-Line Haul or Express Routes* transport passengers to and from the suburbs into the downtown area with a high frequency of service and, in the case of express routes, with limited stops between the station and the C.B.D. Transit stations can also be served by shared ride taxi

[14] Vuchic, Vukan. Urban Public Transportation. p. 281.

services in lower density areas or at off-peak hours to provide demand responsive service to the suburbs.[15]

When an exclusive right-of-way (ROW) is not used, access needs to be controlled in the area surrounding the station in order to allow the free movement of transit vehicles. In a bus operation, for example, the transit authority may request the city to install left-turn lights in order to facilitate left-turning buses. This is particularly critical if the designer cannot place the approach on a secondary road. Most of the elements of a design strategy are oriented towards minimizing the conflicts between pedestrians, transferring passengers, autos and transit vehicles.[16]

Since land availability is one of the constraining factors in station design, the planner must consider the needs of both transit vehicles and autos. The size of the parking lots to be provided are a function of passenger demand and the capability of the surrounding streets to serve as feeder and distribution network for autos. One of the limiting factors in parking lot size is the distance that patrons are willing to walk.

Bus Bays

The number of bus bays or berths required at any station may be determined by a simple mathematical formula. One model estimates the number of bus berths needed, by each route, based on the maximum load point conditions, using the following equation:

$$N = \frac{P(bXS + C)}{3600\ S}$$

[15] Schneider, J.B. Planning and Designing a Transit Centre-based Transit System. Section II.

[16] Canadian Urban Transit Association.Canadian Urban Transit Handbook. p. 11-14.

where:

N = number of berths,

P = line haul capacity past the maximum load point (Persons/hour),

b = boarding service time (sec/person),

X = Percentage of maximum load point passengers boarding at heaviest stop,

S = bus capacity, and

C = clearance time between buses (closing doors of first bus to opening doors on second bus in seconds.[17]

A second model posited by Stephen G. Petersen and Robert H. Braswell simply take the peak hour bus volume divided by 12 to arrive at the total number of bus berth spaces required (based on a 5 minute frequency of service).

$$N = \frac{V}{12}$$

where:

N = number of berths

V = peak hour bus volume.[18]

Vuchic states that routes with headways of below 3 to 5 minutes usually require at least two berths, since bus delays often cause dwell times of the two buses to overlap at the station. Headways between 5 to 10 minutes allow use of only one berth if dwell times are short compared to the headways and delays. Some berths may serve several bus routes at once. These routes usually are characterized by long headways and have their arrival and dwell times at the station staggered so as not to overlap.[19]

[17] Ibid. p. 11-15.

[18] Peterson, Stephen G. and Robert H. Braswell. p. 411-413.

The design objective for local bus transit service is to move vehicles through the station efficiently and without delay. If the station is a shared facility with an intercity carrier, then these vehicles may be required to be delayed in order to allow passengers adequate time for loading. Intercity vehicles may also require time to load small shipments of freight. Thus, one bus bay may be required for exclusive use of the intercity carrier.

The simplest type of bus loading bay or berth is designed so that all the vehicles line up at some desirable spacing; this spacing is determined by the type of operation. If all vehicles are to move without severe interference, they must be able to position the rear door close to the curb and then to move into the travel lane. This is accomplished either by lining the buses up in a straight line along the curb and behind one another, or by incorporating a saw tooth bus bay design which allows relative smooth movement of vehicle while also lining up the front and back doors of the bus to a curb for passenger safety during boarding and alighting. See figure 3, page 19.

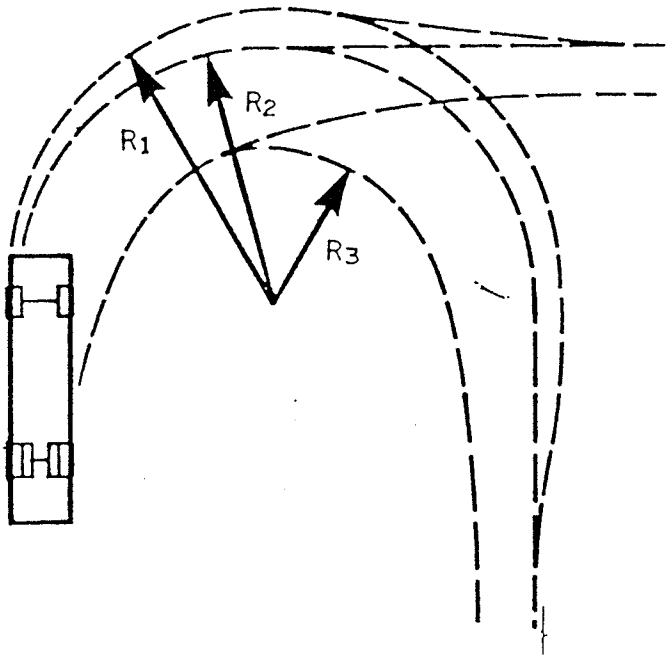
Turning Movements

Bus roadways must be wide enough to permit safe operation of the vehicle and permit turning movement with ease thus decreasing total trip time for each passenger. All of the turning movements should be based on a turning radius of full sized 40-foot vehicles, as this also permits articulated buses (60-foot long models) to also fit in this station because their turning radius is usually the same or shorter than a standard bus, see figure 4. The only modification required is that the actual bus berth for articulated buses has to longer in length to accommodate the larger vehicle. Where there are large volumes of transit vehicles, it is desirable that facilities be located off-street, at least 200 feet from street intersections or major arterials.[20]

---

[20] Rabinowitz, Harvey Z., and Edward A. Beimborn, Peter S. Lindquist and Donna M. Opper. Market Based Transit Facility Design. Washington, DC.: U.S. Urban Mass Transportation Administration, February, 1989. p. 174.

FIGURE 4
BUS TURNING CIRCLES



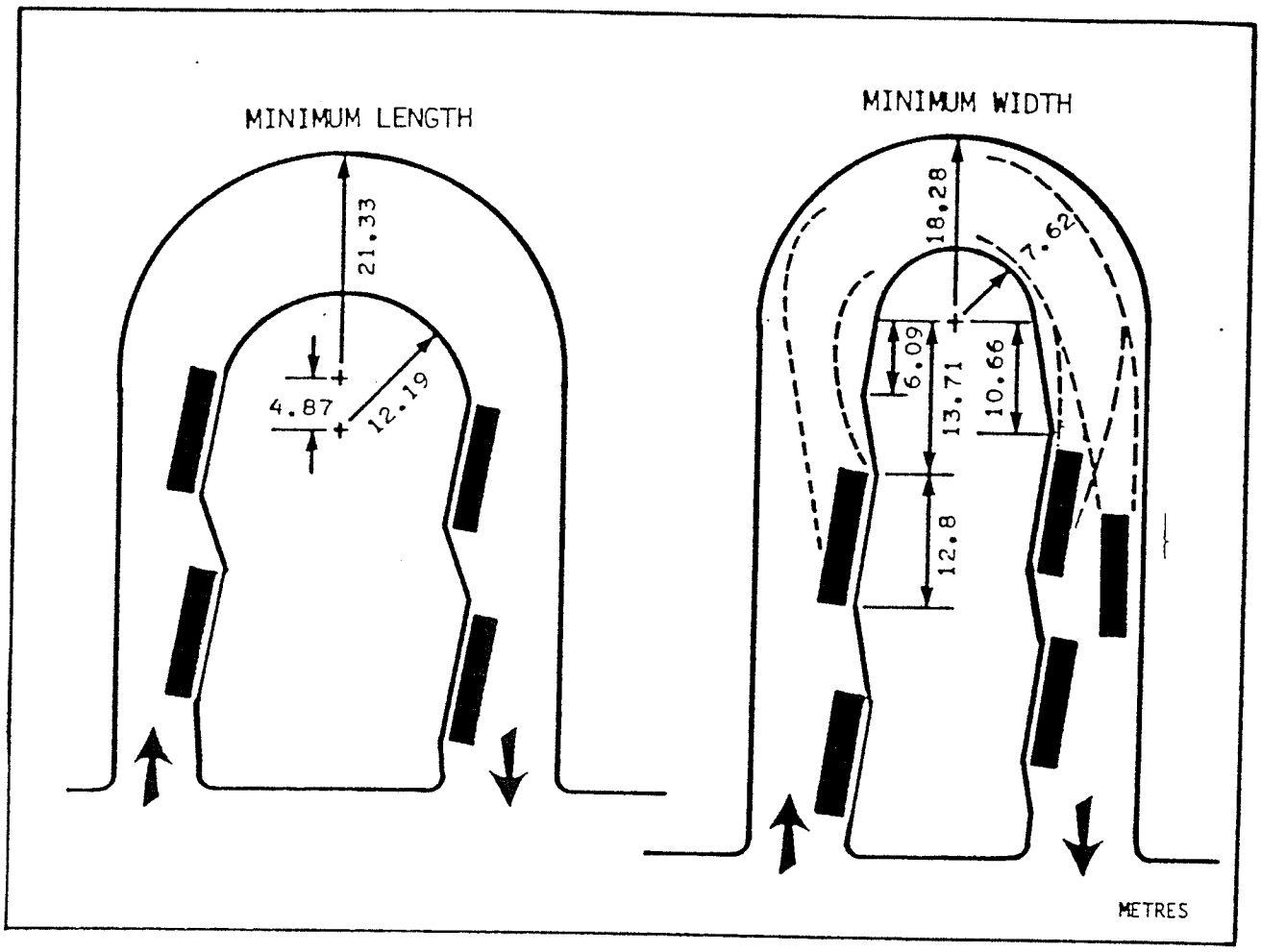
Standard Bus Dimensions			Articulated Bus Dimensions	
Length	40.0'	12.19m	60.0'	18.0m
Width	8.5'	2.59m	8.5'	2.59m
R_1	47.1'	14.36m	n/a	n/a
R_2	42.0'	12.80m	38.1'	11.60m
R_3	23.2'	7.07m	20.0'	6.10m

SOURCE: Canadian Urban Transit Association. Canadian Urban Transit Handbook. p. 11-18.

Vukan Vuchic. Urban Public Transportation. p.210,217.

FIGURE 5

BUS STATION LAYOUT



SOURCE: CUTA, Canadian Urban Transit Handbook. p. 11-20.

With regards to the development of a 45 foot bus, simply stated this bus does not win wide approval from Canadian transit authorities. The Canadian Urban Transit Association recently surveyed member authorities and has found out that a 45 foot bus will not become the industry standard.

The reasons why the 45 foot bus will not replace the 40 foot bus - currently the operating standard - is that there are no operational advantages to be gained. The 45 foot bus does offer marginal increases in seating capacity, but not enough to have a savings impact on labour costs and productivity. The new bus also would change the turning dimensions in everyday operations which would mean capital investments to change such facilities as storage garages and maintainence, transit stations, and generally on-street corners. At this point, Canadian transit operators have no interest in the 45 foot bus. The increased capacity and labour and productivity savings of the 60 foot articulated bus and its smaller turning radius are more of interest to transit authorities in urban centres. However their colleagues in the intercity bus industry are very interested in the 45 foot bus for long distance highway operations.[21]

Information and Signage

Information dissemination has become a subject of increasing interest to many operating authorities in recent years. As operators are faced with considerable variations in ridership, caused in part by economic conditions, those programs which attract new ridership and increase the visibility of transit service to the community are favored. Information programs and communications strategies can, of course, vary significantly, but the basic objective is always the same: to facilitate the use of the system for a potentially wide range of users, including those with mobility limitations.

Since transit modes can operate either on a on-street or off-street stop basis, depending on the type of technology and service being provided, information needs will vary. A transit station will have to be adequately marked so that passengers can

[21] William B. Menzies. Supt. of Planning. Winnipeg Transit System. February 8, 1990.

transfer with a minimum of difficulty and can easily determine the correct direction of travel. See figure 6.

Information loses its impact if the form is to complex or unusual for the average passenger to interpret. Many systems utilize a overall system map (for main-line haul or express routes and locations along with local route connections), frequency tables, schedule posting and a telephone information system to communicate to both the riding and non-riding public. Public telephones should also be available at the station.[22]

Security

It is important that all users of the transit system feel secure on the site of the station, because there will be times when very little activity is occurring at the facility. Sufficient lighting on the station site at all hours, as well as architectural features and design that minimize dark areas will help in public and police surveillance of the site. Also, the adjacent shopping mall has its own security system which may watch over the activity at the station.[23]

Safety and security are of prime concerns for the user of public transit. Most transit crimes occur in the stations, not on the vehicles. According to Richards and Hoel, a study of transit crime on the Chicago Transit Authority found that 75 percent of the recorded crimes occurred in the stations of the system. Waiting on station platforms is the most dangerous activity for transit users. Crimes recorded at these stations include:

1. Crimes against the person, including assault, battery, rape, mugging, etc.;
2. Crimes against the person's property, including purse snatching, robbery, etc.;
3. Crimes against the systems property, including vandalism, etc.;
4. Crimes against the public, including drunkenness, drug law violations, sex offenses, etc.[24]

[22] CUTA. Candian Urban Transit Handbook. p. 11-24.

[23] Fruin, J. "Environmental Factors in Passenger Terminal Design." Transportation Engineering Journal. Vol. 98, No. TE1, February, 1972. p. 98-99.

Security measures that are important to the user are: a high probability that incidents will be detected, the chance of receiving help when it is required, and the need for receiving help quickly. Some of the options for station security include police or transit employees in the station area, although this option is quite costly and only feasible at high volume stations. Another measure includes an electronic monitoring device, but obviously this would be costly if implemented at all stations. Low-cost but effective measures include sufficient lighting all over the station area at all hours, Architectural and building features that minimize dark areas and prevent vandalism. Highly visible stations can be easily patrolled by the on-street police and viewed by security staff from the regional shopping mall at minimal cost to the transit authority.[25] See figure 6.

Context

Ideally residential population in the service area of a transit station should range between 25,000 and 100,000 persons. Each of the service areas of the station should support a wide variety of land use activities, such as: employment, health care facilities, schools, commercial centres, and recreation. Generally the local feeder routes connect most of these activities with each other and the station facility. The limits of service areas do not exceed a 30 minute cycle time for the local feeder buses. For transit stations located at regional shopping malls, service areas should generally coincide with the market area of the mall: 4-5 miles or a 15 minute travelling time to the mall.[26]

While the location of transit stations lends itself to quantitative analysis, many constraints that prevent implementation of ideal solutions are encountered in practice. The siting of such facilities, therefore, must take into account a large number of factors above and beyond those which are directly associated with the efficient operation of buses. These include community impact, availability of land, and context. The design

[24] Richards, Larry G., and Lester Hoel. "Planning Procedures for Transit Station Security." Traffic Quarterly. 1982, p. 355, 362.

[25] Ibid. p. 367.

[26] Schneider. Planning and Designing. Section II.

of the transit terminal facility should be easily identifiable both as a "foreground" building and as part of the overall city transit system. The station facility will be significant in the community - it is located in a high activity location and will independently generate traffic. The usage of the standard transit system logo, colour and the materials utilized in construction of the terminal should leave the public with a memorable image.[27]

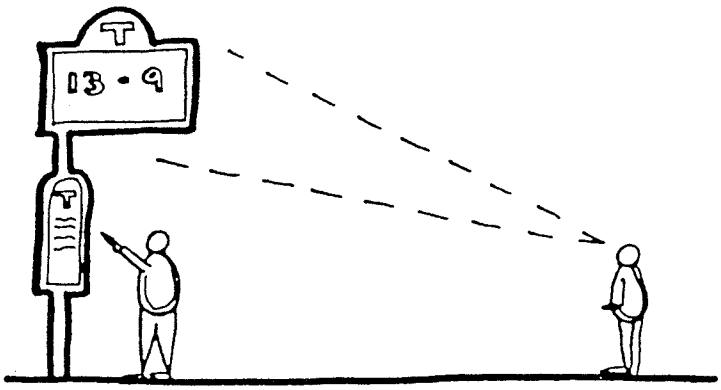
Public buildings, such as public libraries, city hall, and court buildings, are designed for prominence and importance, and often leave citizens with a memorable image. A transit station is an important public building, it is used more frequently than most public buildings, but is not held in as high as regard as these other buildings. See figure 6.

[27] Rabinowitz, Beimborn, Lindquist, and Opper. Market Based Transit Facility Design. p. 167.

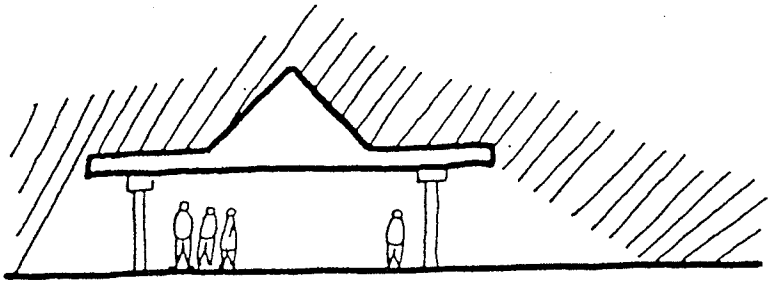
FIGURE 6

TRANSFER CENTRE SITE PLANNING

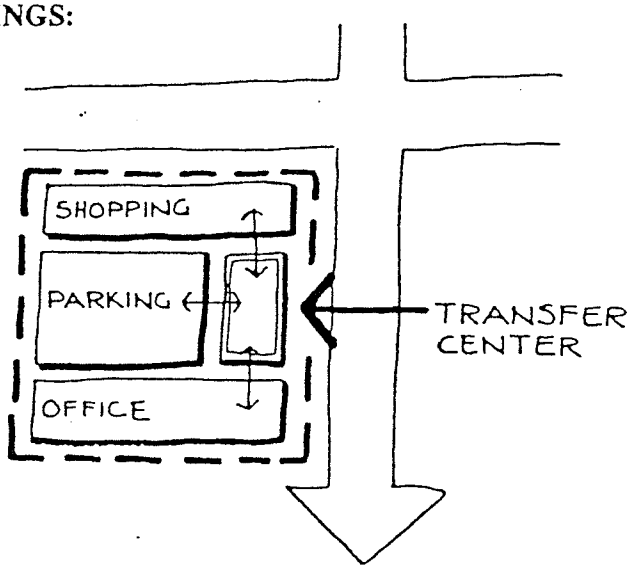
- PROPER SIGNAGE



- CLIMATIC FACTORS
- SECURITY



- SITE DESIGN IN CONTEXT WITH IMMEDIATE SURROUNDINGS:



SOURCE: Rabinowitz, Harvey Z., Edward A. Beimborn, Peter S. Lindquist and Donna M. Opper. Market Based Transit Facility Design. Washington, DC.: U.S. Urban Mass Transportation Administration, February, 1989. p. 170, 176.

Time Transfer Focal Point Concept

The *time transfer focal point (TTFP)* concept may be defined as a series of routes and schedules that have been co-ordinated so that transfers between all lines destined for a particular transfer point are synchronized. This allows a bus rider to travel from their home on a local route, then transfer quickly and easily at the transfer point to another local or regional line to their desired final destination.[28] Local feeder bus routes can be aligned and scheduled to enable buses on all routes to meet at the transit station at the same time. Main-line haul or express services can also be co-ordinated to coincide with the local feeder buses permitting good transfer connections.

In order for a timed transfer focal point concept to become economical and effective, the Transit Planning Section of the City of Edmonton suggests the following requirements:

> - All buses in the area must meet at the specific transit centre at the same minutes past the hour.
>
> - For the transit planner, the timed transfer concept is based on the frequencies exhibited during the midday or the base service. Other time periods including peaks, night, holiday service, etc. are developed from this information.
>
> - Routes should be long enough to yield round trip cycle times (preferably thirty (30) minute cycles) with associated service frequencies that mesh with each other. If this is not possible, interlining of routes should be incorporated.
>
> - Slack or recovery time must be provided to ensure reliability. This can take place at transit focal points to ensure passengers make all connections.
>
> - Costs are reduced as less midday buses are required to serve the Central Business District (C.B.D.), however, riders can easily access the C.B.D. by transferring at a transit focal point.[29]

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[28] "Guidelines for the Integration of Public Transit and Land Use Planning." Transportation Department, Transit Planning Section, City of Edmonton, June 1988. p. 7-9.

[29] Ibid.

Time Transfer Focal Points are a sophisticated variation on the pulse/ centre focused network that has been used in smaller cities since the earliest transit operations. The pulse/centre focused network or timed transfer, (see figure 7), is based on the principle that all bus routes in a city meet and leave at precisely the same time at a downtown transit station. A case example in Manitoba is the city of Brandon where the entire system is focused on the downtown transit terminal and all schedules of all routes are co-ordinated to meet and depart at 5 and 35 minutes after every hour. Very rarely, in large Canadian cities, has the time transfer concept been adopted on a overall system basis. The exception being the City of Edmonton, where the entire transit operation is based on the timed transfer system complemented by a transit centre concept. Generally, most large Canadian cities utilize the TTFP concept at their significant transfer points or terminals at selected locations throughout their system where connections are essential, such as the case in suburban Vancouver. In these situations, transit stations act as a focal point for transfers between infrequent and frequent bus routes by providing the passenger with a comfortable and central location in which to change vehicles. This type of arrangement, of course, does not always mean that buses will be operating on the TTFP concept and scheduling model.[30]

The question of time transfer is an important one when dealing with transit station design for two main reasons:1. Time transfer provides a convienent service to passengers who must transfer between buses; and 2. The costs of implementing such a service to the transit property. Ideally, the *time transfer* concept is viewed as means by which transit systems can co-ordinate their buses to provide the rider with easily made connections between buses in order to complete a journey around a city. However, in practice, the costs of running such a service are higher.

It is the question of cost that have prevented many transit authorities from converting their current practice of high vehicle productivity systems to a system wide time transfer service.[31] Many of the larger authorities in Canada prefer to use time

[30] William B. Menzies. Superintendent of Transit Planning. City of Winnipeg Transit System.

transfer only at their key transfer points throughout their system networks. Essentially what this means is that a passenger who travels from an frequent to an infrequent route will usually be the beneficiary of a timed transfer between buses at an on-street location (usually in the suburbs). However, transfers between frequent routes are not time transferred because the wait time the passenger must experience is usually in the range of 3 to 12 minutes, not an unreasonable time period. Another factor to remember about the time transfer concept is that not all buses in this type of organization are timed to meet at the transfer location at the same time. If a frequent express route runs in the peak period on a 7-8 minute frequency and arrives at the transfer location connecting to a feeder bus that runs only every 15 minutes (or 30 minutes), then only every second or third express bus will actually meet the feeder bus at the same time! To further this argument, a comparison between a time transfer system and a high vehicle productivity system, and a comparison of some key operational and productivity[32] statistics between the city of Edmonton and the city of Winnipeg highlight the increased costs to a large system if time transfer is used. Data used in this comparison can be found in Table 1.

Winnipeg transit operates a high vehicle productivity type of system and Edmonton has used the time transfer concept for approximately fifteen years. Winnipeg operates fewer vehicle kilometres than does the city of Edmonton, but has a urban area than is approximately twice the size. This could mean that many parts of Winnipeg do not have transit service. However, in reality, Winnipeg Transit manages to provide bus service to roughly 95 percent of the city's developed urban area. What this figure means is that Edmonton, as stated by its time transfer policy, must maintain a basic service (30 minute frequencies) on almost all of its routes with the exception of peak hour express services. This includes operating buses into low density areas where no demand exists.

---

[31] A High Vehicle Productivity system is based on the practice of closely matching the demand for service with the supply of service.

[32] Productivity, for the purposes of this practicum, will be defined as the quantity of (transportation) output per unit of consumed resource. For example, vehicle kilometres/driver/hour, or passangers per kilometre/unit cost of operation.

Winnipeg, based on its high vehicle productivity system, operates high frequencies on all routes, including mainline, crosstowns, and feeder bus routes, during the peak hours and moderate frequencies on mainline and crosstown routes with feeders operating at low frequencies or no service during off peak periods when demand is very low.

If time transfer, as the literature states, is such an attractive feature then why did Winnipeg Transit outperform Edmonton in 1988? Given the fact that Edmonton's city economy growth rate slowed drastically in the 1980s after the bust of the oil market, but Edmonton experienced virtually the same rate of growth as Winnipeg did in this time period. For 1988 the city of Edmonton's growth rate was 5.9 percent while Winnipeg's was 5.6 percent. The answer to that becomes clear if one considers that Edmonton, because of its time transfer policy, operates more buses than the demand warrants. Further review of the data will support this argument. See Table 1. Winnipeg and Edmonton have virtually the same hours of operation. But, Edmonton has the higher total number of vehicle kilometres operated and yet only half the urban area to cover. The populations of the two cities (corporate limits for transit service) are virtually the same but ridership per capita and passengers revenues per capita per vehicle are higher in Winnipeg.[33] Direct costs of regular service services are lower in Winnipeg than in Edmonton. Straightout, it is costlier to maintain time transfers on an overall system bases.

Does this mean that the concept of time transfer is not useful? Certainly not considering that synchronized interface is important in situations where a connection between a frequent and infrequent route are essential to some transit patrons. Transfers between two frequent routes, however, do not entail any long amount of waiting time. Winnipeg Transit utilizes time transfer at a few key on-street locations in its system.

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[33] Also to be mentioned is that the composition of the populations of both cities is relatively similar in that they are considered to be largely blue collar working class.

Petersen and Braswell cite that there is substantial evidence that travellers assign a greater disutility to time spent transferring than time in the vehicle.[34] In Winnipeg the current policy of the high vehicle productivity system is to maintain the one seat ride while reducing the number of transfers between origin and destination.

TABLE 1

1988 OPERATING AND PRODUCTIVITY STATISTICS

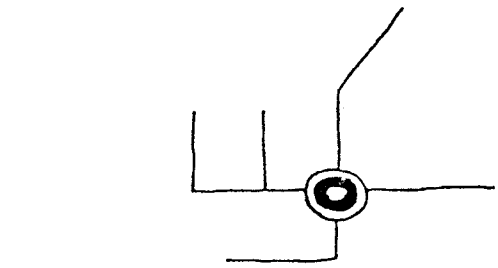
	WINNIPEG	EDMONTON
1. Service Area Population (City)	596, 894	578, 000
2. Urban Area	225 sq.mi.(578km^2)	130 sq. mi. (336km^2)
3. Population Growth Rate 1981 to 1986 (City)	5.6%	5.9%
4. Revenue Passengers	55.3 million	41.2 million
5. Active Vehicles	543	731
6. Total Vehicle kilometres	26.4 million	32.4 million
7. Revenue Vehicle Hours	1.3 million	1.4 million
8. Total Direct Costs of Regular Service	$ 67.7 million	$ 77.1 million
9. Ridership per capita (# of rides per person per year)	92.633	71.394

SOURCE: Canadian Urban Transit Association. Operating Characteristics for 9 major Canadian Cities. 1988.
Statistics Canada. 1986 Census Highlights. 1987. p. 4.

[34] Petersen and Braswell. p. 406.

FIGURE 7

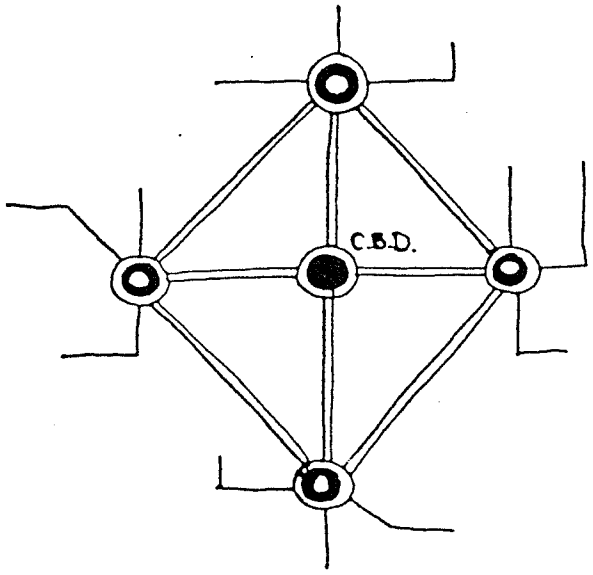
TRANSFER CENTRE SYSTEMS



SMALL SYSTEM

ONE TRANSFER CENTER

(BRANDON)



LARGE SYSTEM

MULTIPLE TRANSFER CENTERS

(EDMONTON)

SOURCE: Rabinowitz, Beimborn, Lindquist and Opper. Market Based Transit Facility Design. p. 164

Summary

The realization that transit planning and land-use planning are interrelated and that an interaction between both can lead to a more balance transportation system for the future city is important in reducing the reliance of people on the automobile for mobility. By carefully locating future transit stations near centres of high urban activity land uses, the planners can ensure that a more efficient allocation of civic resources will be realized.

There is an historical relationship between transit and land use planning which has fostered the growth and development of the early Canadian city. Theoretically, transportation planners have identified this relationship and have developed models that were designed to predict future land use and travel patterns when planning for the growth of cities. Empirically, evidence has pointed that land use is a determinant both directly and indirectly of travel patterns and of the choice of mode. Different land use configurations have been shown to produce different types of travel patterns, and in recent times has influenced the greater use of the automobile with a lesser reliance on public transit.

The trend toward suburbanization of urban development and the location of residential, educational, recreational, and commercial activities to outlying areas has put pressure on public transit to respond to the changing land use patterns. At first, the will to adapt public transit to the suburban context was low, however with a renewed interest in energy conservation and the environment public transit has recently become attractive once again.

The planning and design of transit stations is one way to improve and integrate public transit with existing or planned land uses. The design consideration of certain amenities can make the transit station facilities attractive and safe to the user of public transportation. By making these facilities attractive, and by locating them closer to high

activity centres, planners can create the conditions whereby the ridership on public transit could increase. This of course provides a return on the investment of public money into the urban transit system, and develops a more balanced approach to movement within the urban environment. Transit station development is one way in which planning for a balance future transportation system can occur in Canadian cities.

CHAPTER THREE
Case Studies: Transit Station use in Canada

In most Canadian cities, there's a prevailing belief that transportation problems can best be approached through effective land-use planning. New mixed-use "Town Centres" are sprouting upwards on the fringes of several large Canadian cities partly in hopes of creating viable transit and pedestrian environments...Canadian cities, moreover, back up their transit investments by initiating various supportive programs, including station area zoning incentives and controls on downtown parking.

Robert Cervero, Transportation Quarterly (July 1986, 293-316)

Introduction

This chapter discusses in some detail the implementation of exclusive transit stations in the cities of Ottawa, Mississuaga, Edmonton, Québec City and Burnaby. It uses specific examples to illustrate the way in which each of these municipalities has developed the transit station concept.

Ottawa, Ontario

The Regional municipality of Ottawa-Carleton is a metropolitan region made up of eleven municipalities with a population of 650,000, about 90% of whom live in the urban area. The annual growth rate for the region was 2.1% between 1981 and 1986. The largest municipality in the region is Ottawa with a city population of 300,000.[35] In terms of employment, the region supports about 370,000 jobs of which 22% are federal public service jobs. The growth rate in jobs between 1981 and 1986 was also steady at about 3.2% per year.[36]

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[35] Statistics Canada. 1986 Census Highlights. Ottawa: Queen's Printer, April 1987. P.4.

[36] Gault, Helen E. "Planning Transit to Shape a Community." A paper presented to APTA Eastern Education and Training Conference, June 6, 1989. p. 2.

The Ottawa-Carleton Regional Transit Commission, or OC Transpo as it is commonly called, has the sole authority to operate public transit services within the urban transit area of the region. With a fleet of approximately 800 buses, OC Transpo carries more than 80 million passengers annually, providing 50 million kilometres of service.[37] The Commission de tramsport de la Communauté regonale de l'Outaouais provides service in the city of Hull, Québec and connects with OC Transpo.

The transit terminal at the St. Laurent Shopping Centre is the largest in the OC Transpo system and is chosen for this case study.The shopping centre has a gross leasable area of 70,000 square metres, a high level of mall/transit integration has been achieved through working closely with the shopping centre owner. The land for the station was made available for $1.00 by the owner for two main reasons: first he was convinced that the high level of transit service that could be provided to and by the mall would attract customers, and second he was able to reduce the requirement for car parking spaces by 25 for each transit bay in the station. The station was built on three levels, local bus routes use the upper level, the mezzanine level provides access to and from the shopping centre, and downstairs is the thru-bus or transitway platform. Public information, on the form of video monitors of scheduled bus departures, are placed strategically inside the shopping centre.[38]

However, all attempts to integrate transit with commercial facilities has not been as successful as would be desired by the OC Transpo planners. The Lincoln Fields station, which is a major hub of activity located on the west transitway, is within 400 metres of a community shopping centre. Attempts where made by OC Transpo officials to interest the owner in jointly providing a pedestrian connection between the transit station and the mall. No agreement could be reached with the owner and the current pedestrian connections are quite inconvienent for patrons who utilize transit to access the mall.

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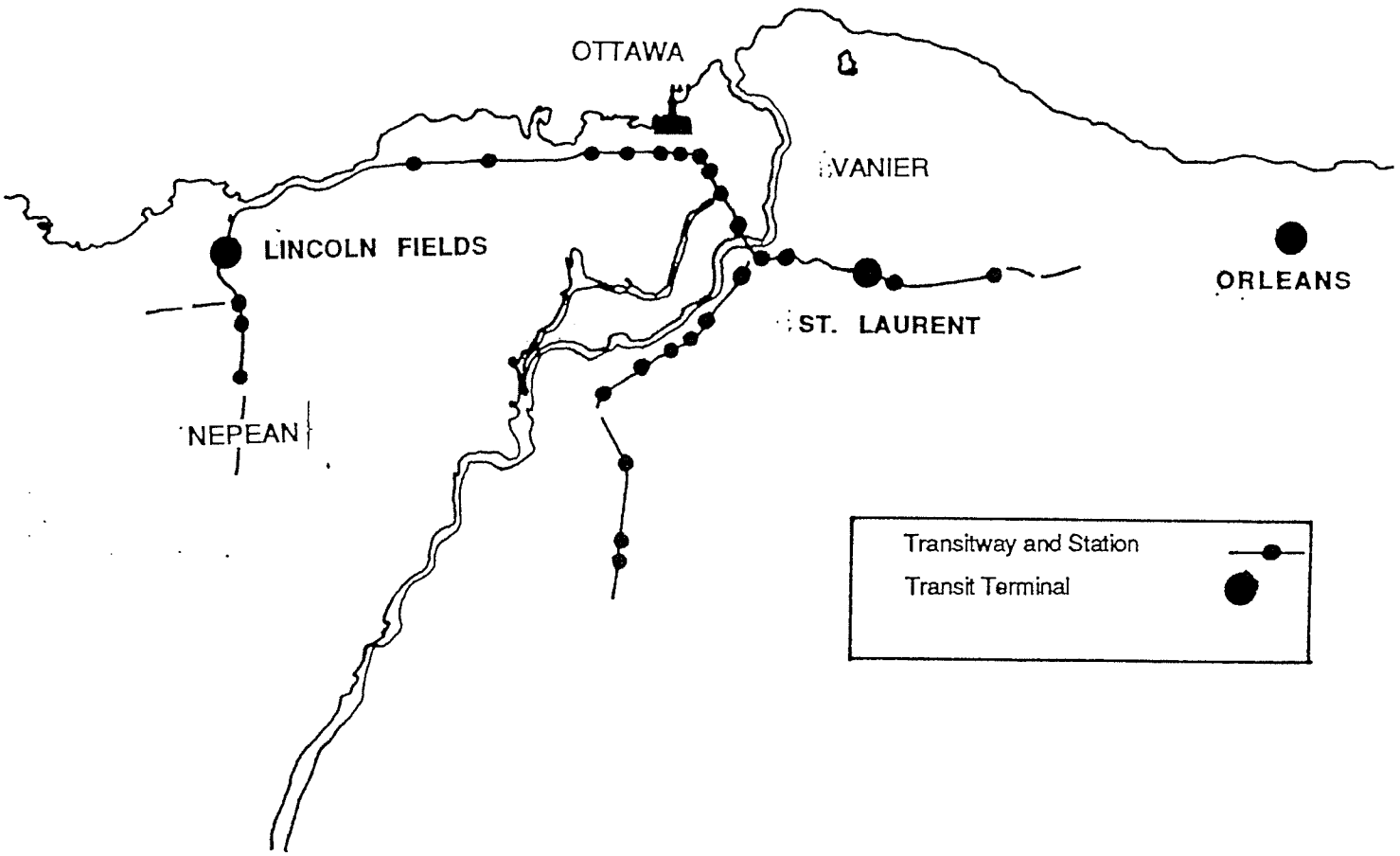
[37] Canadian Urban Transit Association. Operating Characteristics for 9 Major Canadian Cities. 1988.

[38] Gault. "Planning Transit." p. 5-6.

FIGURE 8

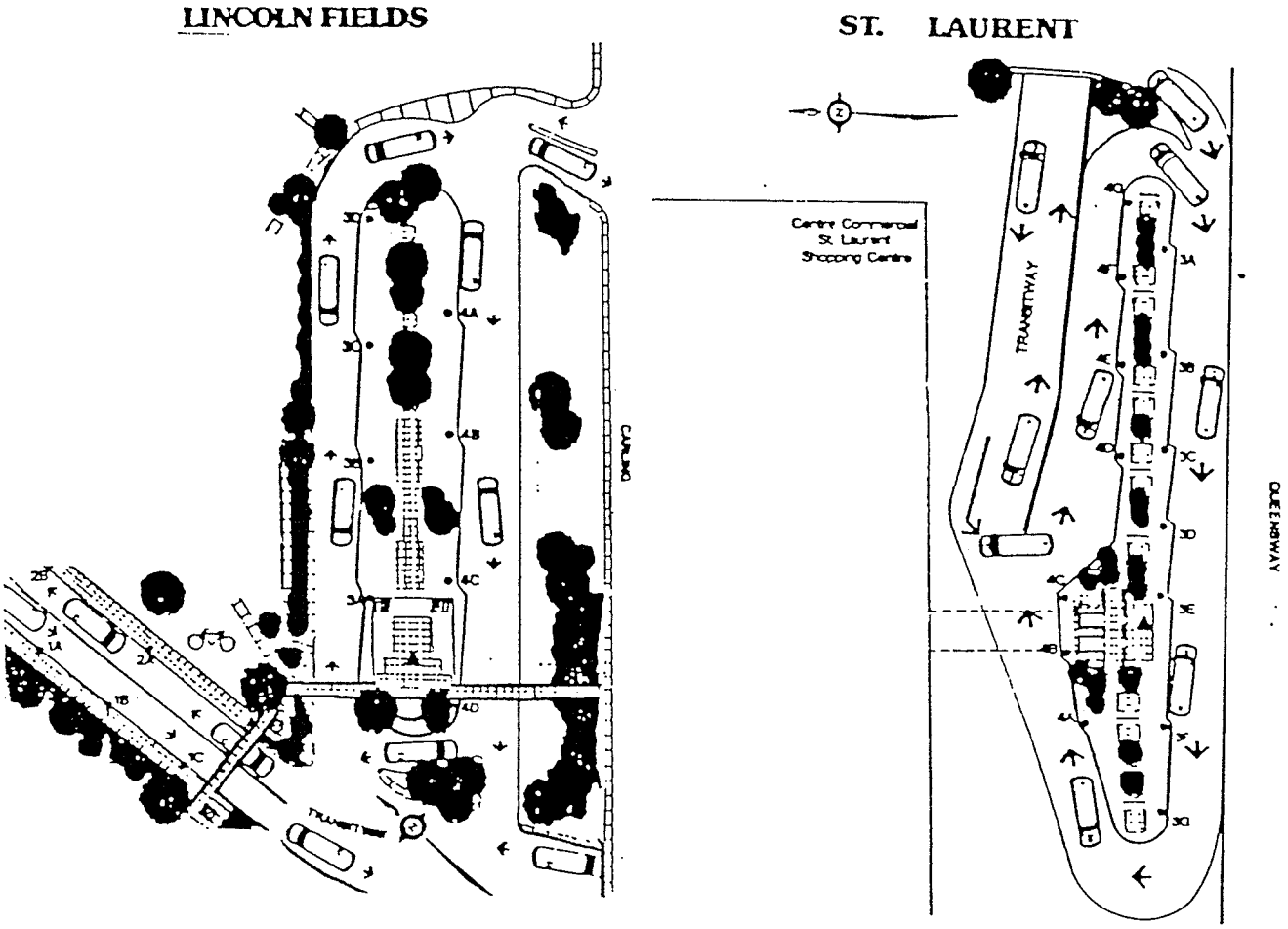
TRANSIT TERMINALS IN THE OC TRANSPO SYSTEM



SOURCE:OC Transpo. System Map/Carte De Réseau. September 1986.

FIGURE 9

OTTAWA-CARLETON TRANSIT TERMINALS



SOURCE:OC Transpo. System Map/Carte De Réseau. September 1986.

Helen Gault, Senior Transit Planner with OC Transpo, states that in Ottawa, in order to make public transit part of a new community it is important that it be a part of the original plan rather then being an after thought. The clear delineation of transit related facilities, including transit terminals and right-of-ways, for the next twenty or thirty years allows people to plan in view of taking advantage of the coming transit improvements. This would allow a developer time to prepare to for the timing and location of his/her next project in relation to public transit.

An example of this type of planning in Ottawa comes from the regional community of Orleans, a municipality of approximately 50,000 people which straddles two area municipalities in the east of the region. The transitway is unlikely to reach this area for about twenty years, but the development of a exclusive transit terminal at the regional shopping mall, Place d' Orleans, is in the works. The transit terminal in Orleans is being built currently ensuring a high profile for public transit as this new community develops.

Mississuaga, Ontario

The City of Mississuaga is located just west of Metropolitan Toronto and had a 1986 population of 374,005. The annual growth rate for the city was 18.7 percent between 1981 and 1986. Mississuaga is ranked ninth in size out of twenty -five of the largest municipalities, by population, in Canada.[39]

The City of Mississuaga Transit Department serves a 285 square kilometre area with a fleet of over 180 buses. The transit system is highly integrated with the surrounding municipalities of Oakville, Brampton, and Metropolitan Toronto. The major hubs in the Mississuaga transit system are at the Islington Subway Station in the City of Etobicoke and at the Square One complex in Mississuaga.

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[39] Statistics Canada. 1986 Census Highlights. Ottawa: Queen's Printer, April, 1987. p. 4.

The six shopping centre stations operated by Mississuaga Transit were located where they are presently more than 10 years ago. Five of the transit stations are the off-street type, with one being of exclusive use and one being an on-street location. Most have been upgraded within the last four years, by the construction of pavement, more bus bays, and improved shelter facilities.

The Square One transit station, located in the city centre, is the only such facility in the Mississuaga system with exclusive use and access, and separation from other vehicles. It has two rectangular islands with sawtooth bays, as can be seen in figure 11. It is close to a major shopping centre with a pedestrian walkway between station and mall, and is located on mall property. The facility is currently becoming congested by new bus routes and more buses, and will require more stops and bays. However, expansion is difficult since it would require the removal of parking spaces; this is being protested by mall tenants. Two alternatives that have emerged in this situation are: to utilize on-street bus stops on Civic Centre Drive and facilitate more on-street transfers, or to built a new station facility close to a highway on the other side of the shopping centre.

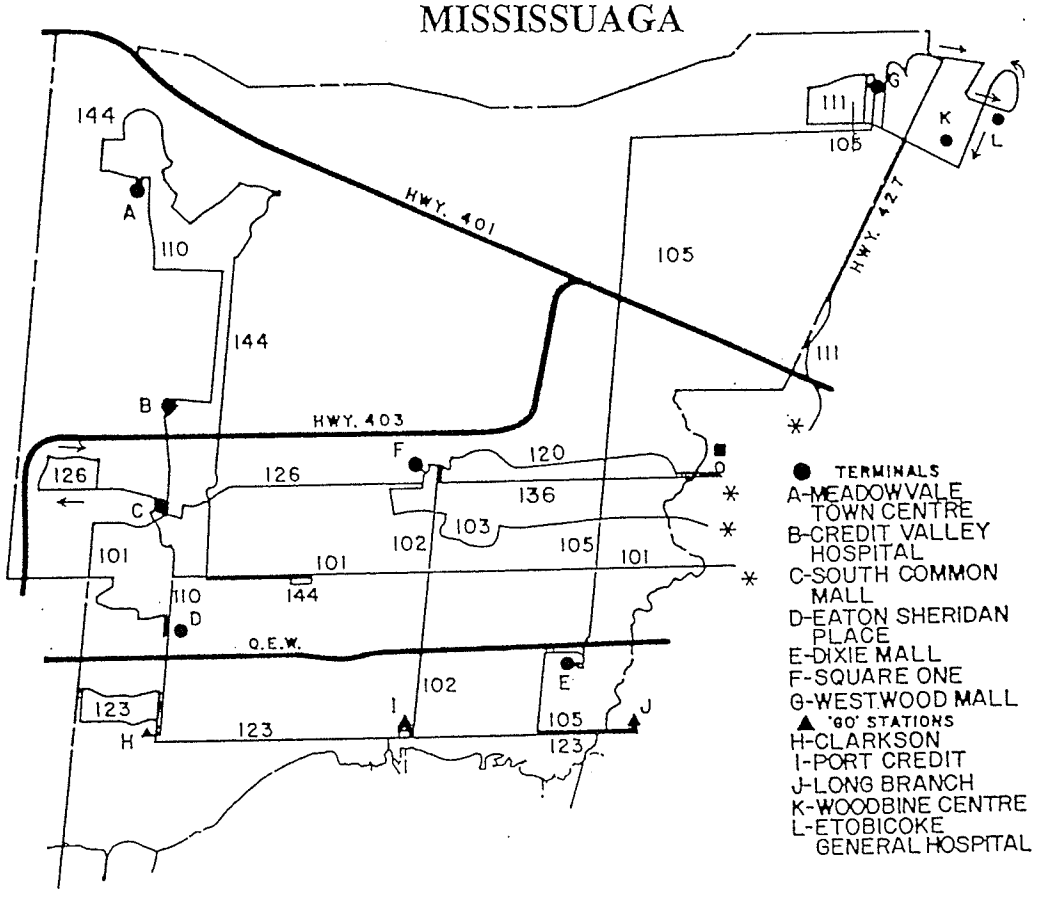
South Common transit station was designed in conjunction with the mall owners. Buses use a two-way mixed-traffic access road to the north and the south as seen in figure 12. The station has also become congested and difficult to add more bus bays (five bays have been added in the last three years). Mississuaga Transit has had difficulty in operating at this station location because other traffic is allowed to operate through the station on the through street, with some trucks and taxis actually stopping and using the bus bays for pick-ups and deliveries. Another problem associated with this facility is that it has become a teen gathering place of which the mall owners have become very concerned about.

Westwood Mall Station is located at a regional shopping centre and was planned according to a design similar to that of the Square One facility. Off-street transit service is centralized into this large station with both Brampton Transit and the Toronto Transit Commission (TTC) also sharing this facility.

Another land-use location where exclusive transit stations are utilized are at the GO Transit stations, where bus passengers can transfer to GO Trains to commute into Toronto. An example is the Clarkson GO station. Mississuaga Transit also operates to the Toronto Transit Commission's Islington Subway station.[40]

FIGURE 10

TRANSIT STATION LOCATION IN THE CITY OF MISSISSUAGA

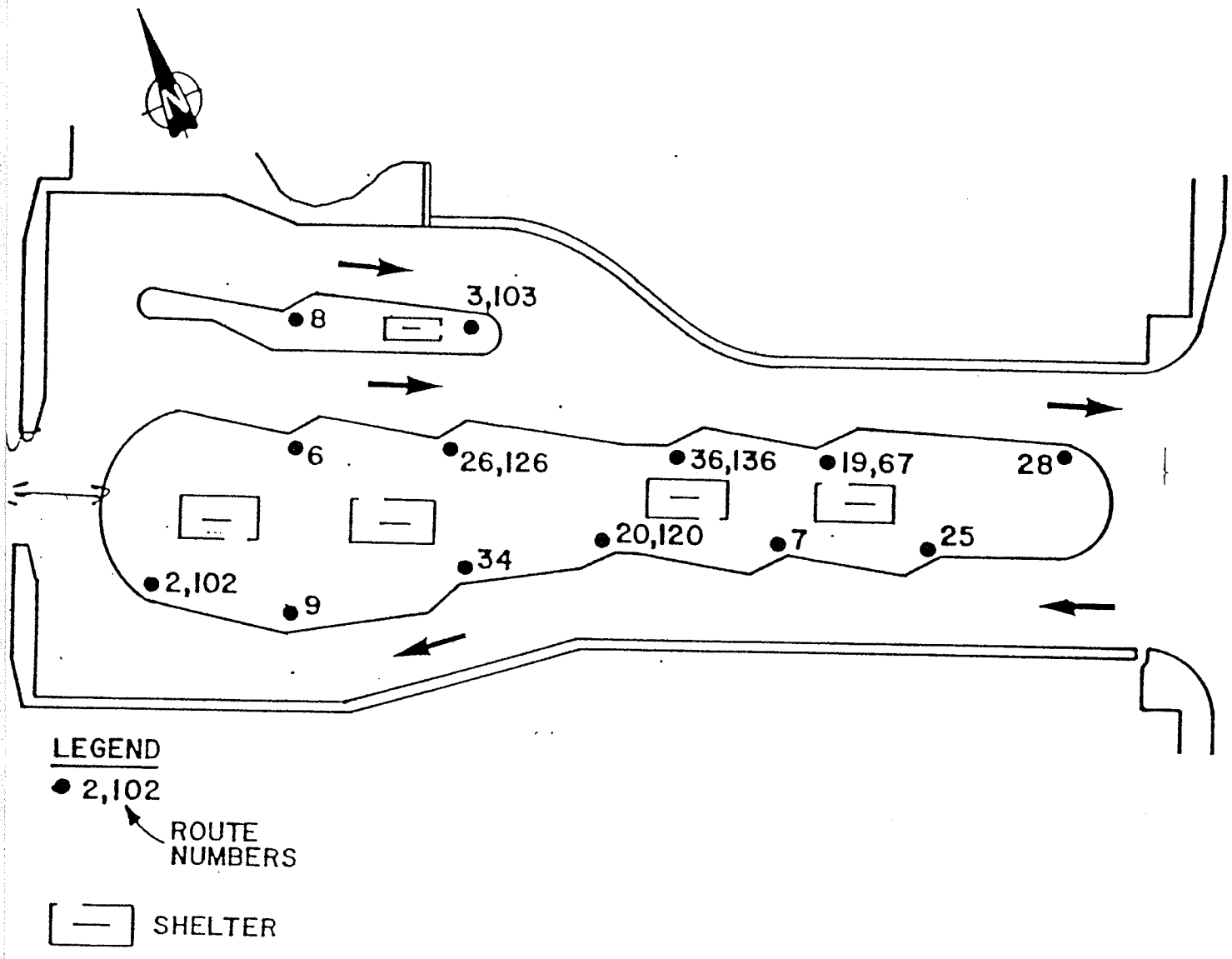


SOURCE: Norman Dodd. Service Planning Manager. City of Mississuaga. Transit Department.

[40] Mr. Norman Dodd. Service Planning Manager. City of Mississuaga. Transit Department.

FIGURE 11

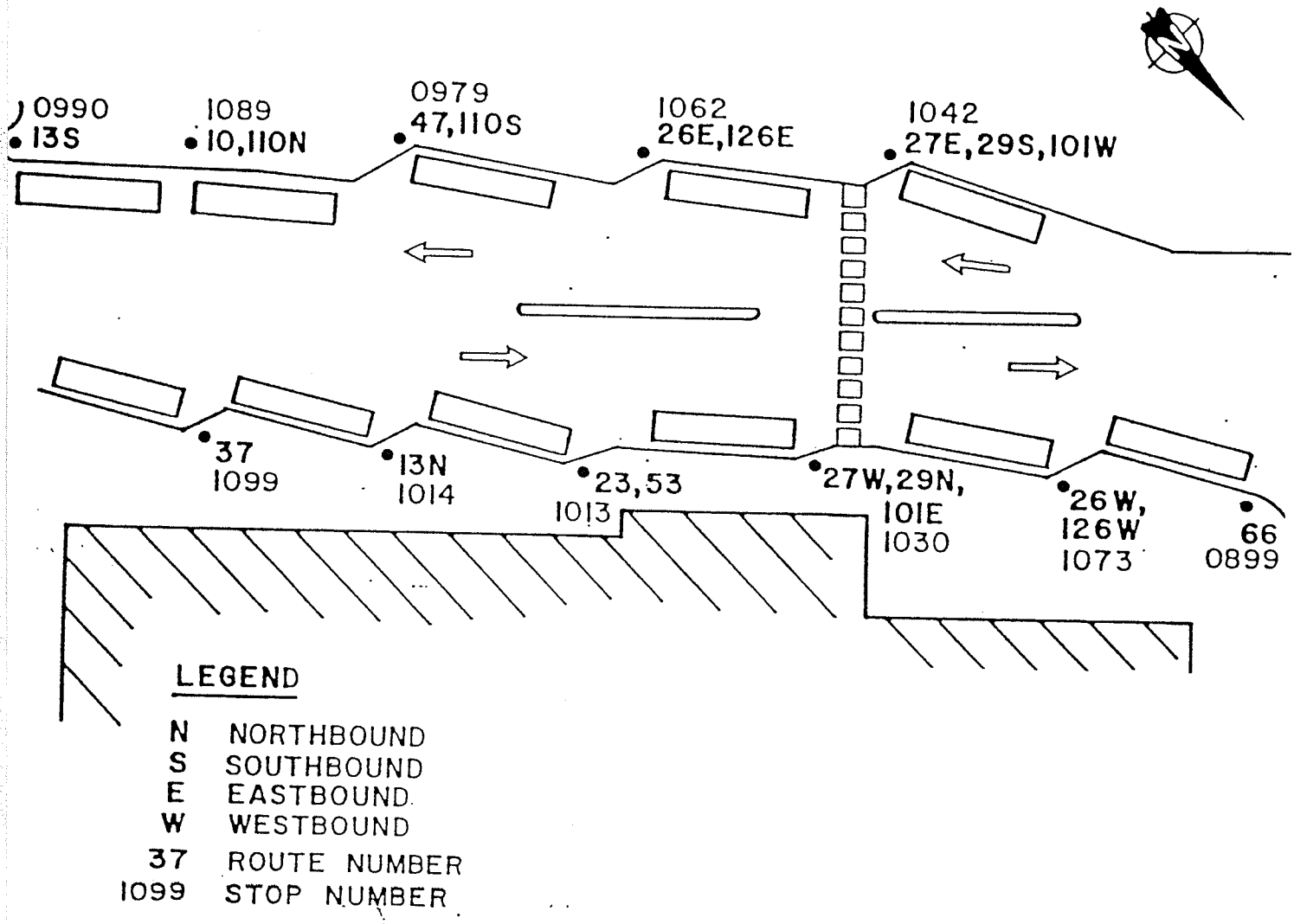
SQUARE ONE TRANSIT STATION



SOURCE: Norman Dodd. Service Planning Manager. City of Mississuaga. Transit Department.

FIGURE 12

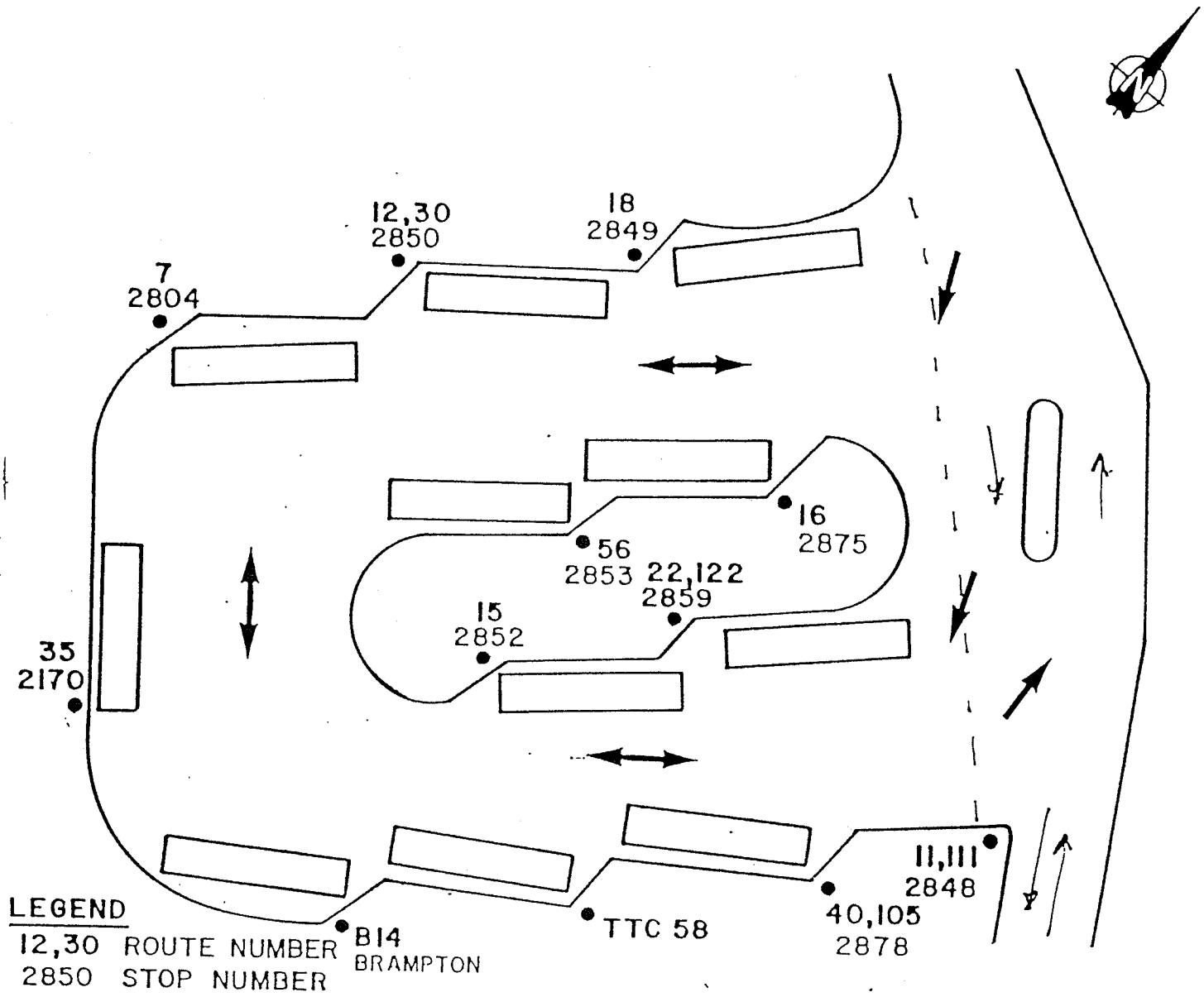
SOUTH COMMON MALL TRANSIT STATION



SOURCE: Norman Dodd. Service Planning Manager. City of Mississuaga. Transit Department.

FIGURE 13

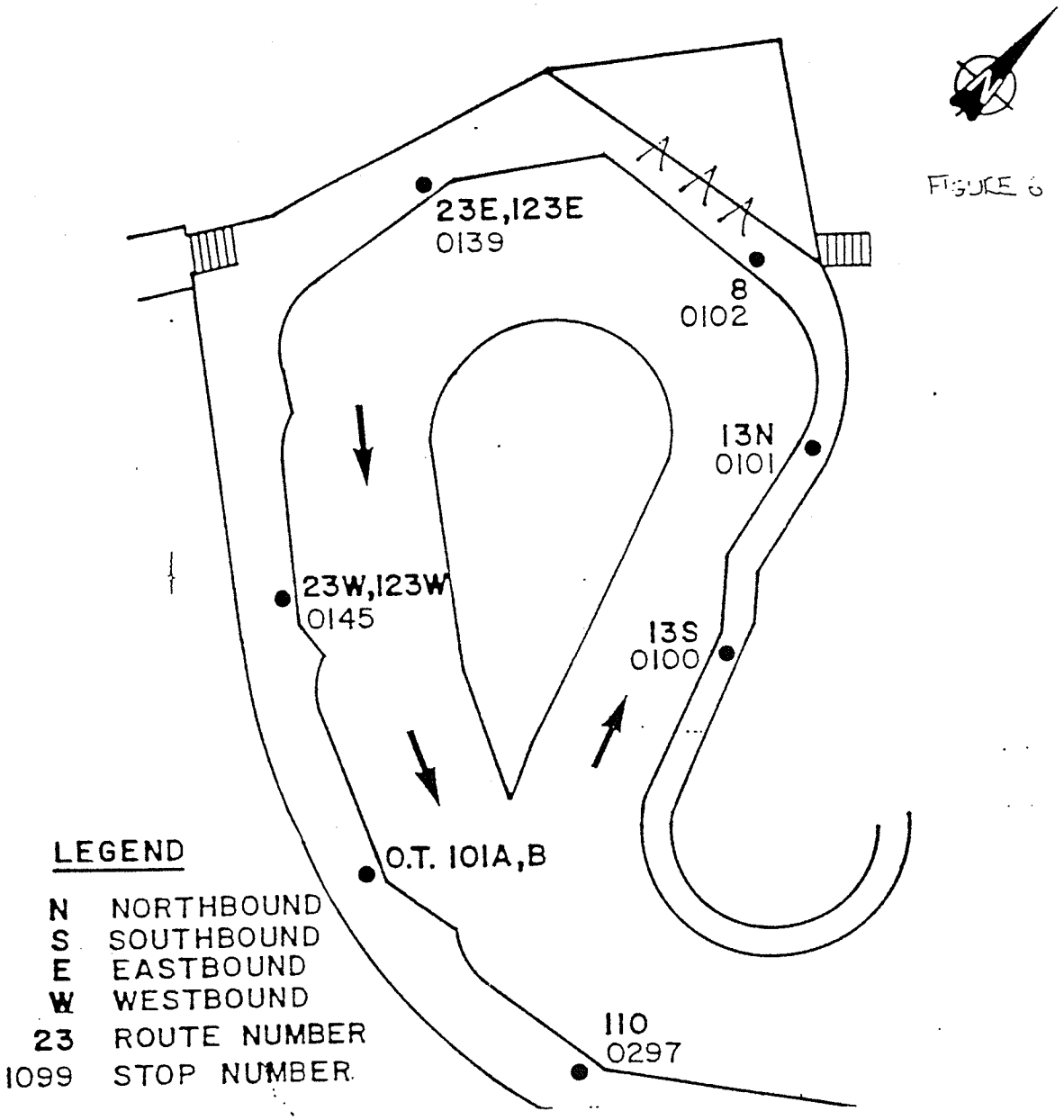
WESTWOOD MALL TRANSIT STATION



SOURCE: Norman Dodd. Service Planning Manager. City of Mississuaga. Transit Department.

FIGURE 14

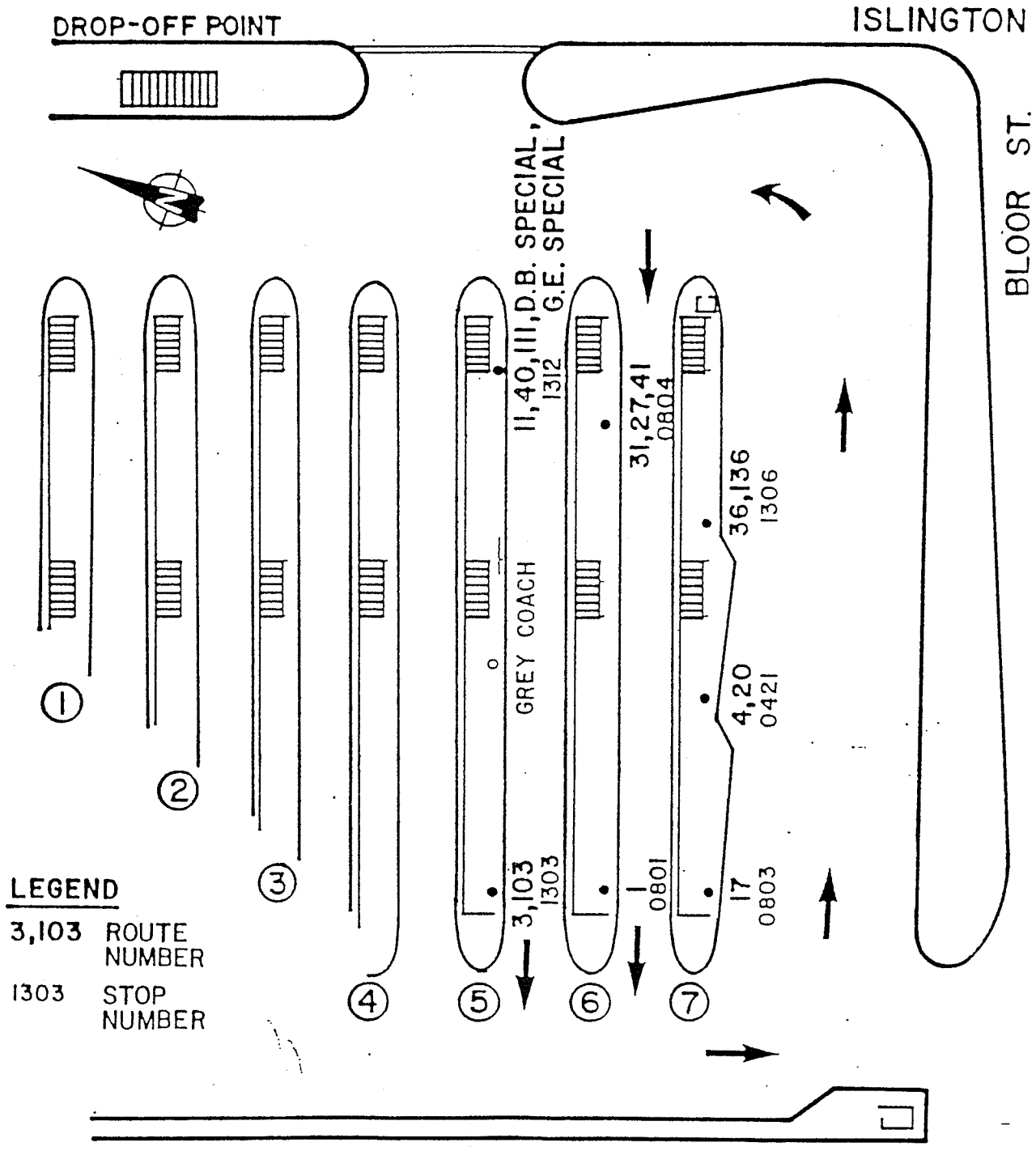
CLARKSON 'GO TRANSIT' STATION



SOURCE: Norman Dodd. Service Planning Manager. City of Mississuaga. Transit Department.

FIGURE 15

ISLINGTON SUBWAY STATION (ETOBICOKE)



SOURCE: Norman Dodd. Service Planning Manager. City of Mississuaga. Transit Department.

Québec City

The metropolitan region of Québec City is made up of 15 municipalities with a 1986 population of 603, 267 of which 164, 580 reside in the municipality of Québec City. The annual growth rate for the region was 3.3 percent between 1981 and 1986, 6.3 percent between 1976 and 1981 and 8.1 percent between 1971 and 1976.[41]

The *Commission de transport de la Communauté urbaine de Québec* (C.T.C.U.Q.) operates public transit service within the metropolitan region. With a fleet of 463 buses, C.T.C.U.Q. carries more than 41 million passengers annually, providing 23 million bus kilometres of service.[42] The *Corporation intermunicipale de transport de la Rive-Sud de Québec* provides transit service in Levis, Québec and connects to the C.T.C.U.Q.

In September 1988 the C.T.C.U.Q. completed the development and implementation of two transit stations in the suburban areas of Charlesbourg and Beauport. Le terminus Charlesbourg and Le terminus Beauport act as focal points for transit service in these municipalities and their surrounding areas.

Recently the C.T.C.U.Q., in a move to improve the quality of service offered to its clientele, implemented the *Rapidbus* or Express bus service between the suburban stations and the downtown. Essentially this system allows passengers to travel to and from downtown and their suburban homes by utilizing a local feeder bus and transferring at the terminal to a Rapidbus to downtown Québec City.[43] See figure 16 for a schematic of this new routing system.

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41 Statistics Canada. 1986 Census Highlights. p. 4.

42 CTCUQ. Rapport Annuél 1988. Québec City: CTCUQ, 1988. p. 7.

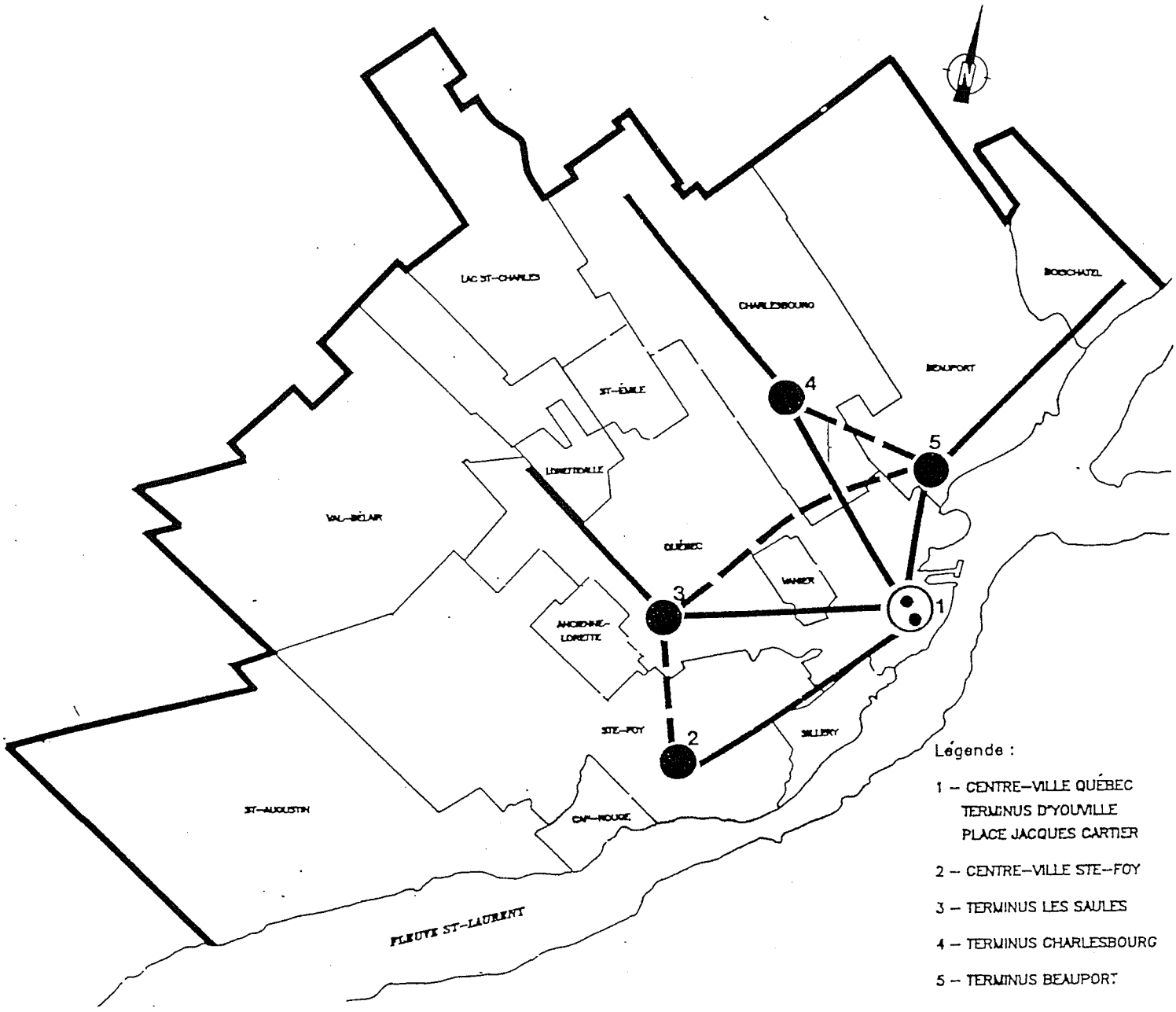
43 Ibid.

All of the stations in suburban Québec City are of the off-street type of facilities with an oval island design. Buses stop both around the centre island of the terminal and the outer edge, with the stop design being the straight curbside style.

The Les Terminus Beauport is a linear design with bus stops being of sawtooth style with a capacity for 12 vehicles. The Les Terminus Les Saules is an elaborate facility being of oval design with bus stops located around both the centre island and the outer edge of the facility. This station has a capacity of 14 vehicles with a storage area for two buses and two cars.

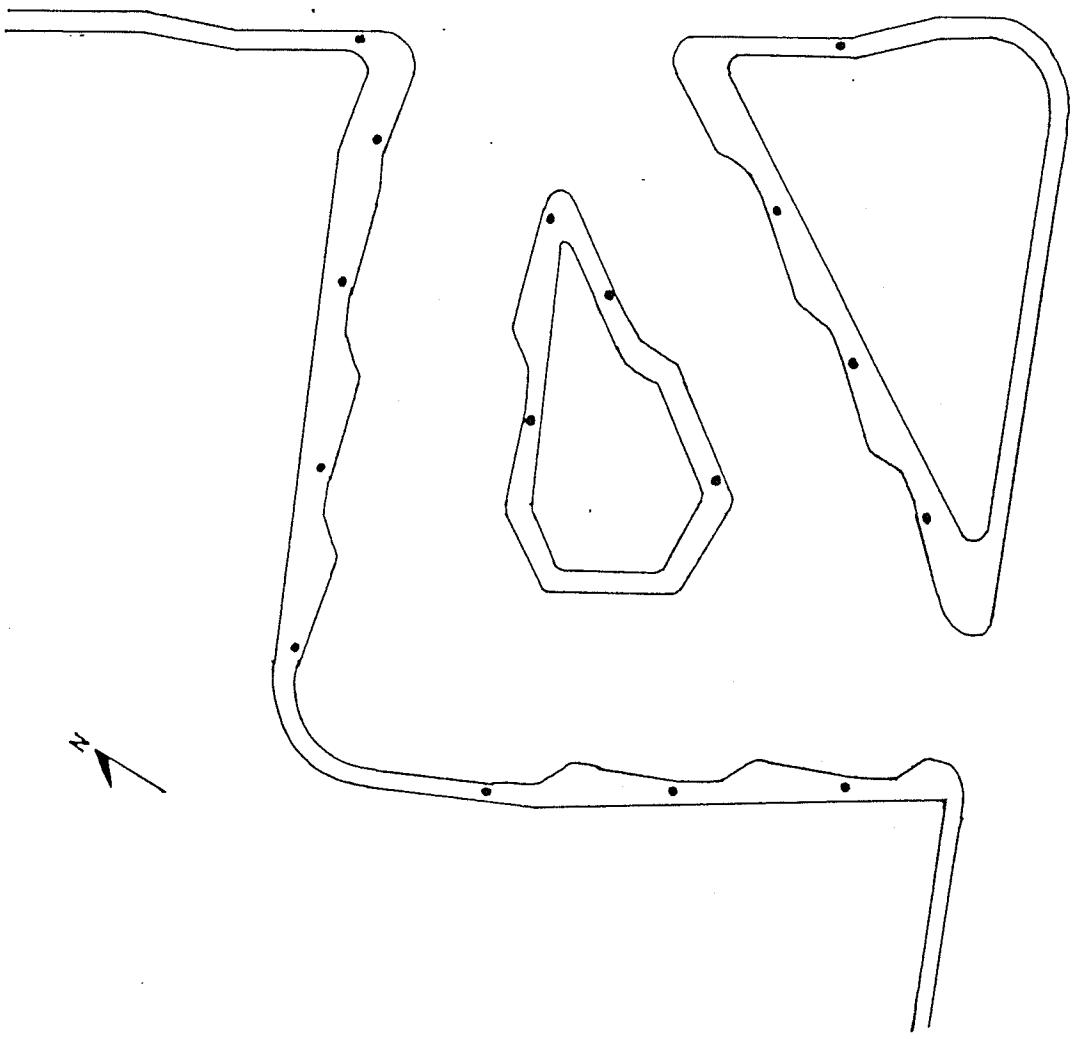
The Les Terminus d'Youville is located in downtown Québec City (Centre-Ville Québec) near the Place Jacques Cartier complex. The station is semi-exclusive in that some of its stops are located on-street in mixed-traffic while others are exclusive bus-only lanes. This facility is highly visibly in that it occupies a small block and has a cluster of well designed shelter facilities on-site. Shelters and canopies at each of the bus stops create a platform style with large informational signage identifying route assignments for these bus bays.

FIGURE 16
STRUCTURE DU RESEAU DE LA CTCUQ



SOURCE: CTCUQ.

FIGURE 17
TERMINUS LES SAULES



SOURCE: Pierre Bouvier, ing., Chef de la division, Etudes et Développment du réseau, CTCUQ.

Edmonton, Alberta

The Census Metropolitan Area of Edmonton had a 1986 population of 785, 465, with the city of Edmonton itself having a population of 573, 982. The annual growth rate of the region was 6.0 percent between 1981 and 1986, 18.1 percent between 1976 and 1981, and 11.7 percent between 1971 and 1976. The growth rate for the city of Edmonton was 5.9 percent between 1981 and 1986.[44]

Edmonton Transit operates public transit service within the city's corporate boundaries. The City of St. Albert and the County of Strathcona suburban bus systems operate in neighbouring municipalities and to downtown Edmonton and connect with Edmonton Transit service. Edmonton Transit, Strathcona County Transit, and St. Albert Transit systems are partially integrated in that a passenger may transfer from one authority to another in order to complete their trip. Edmonton transit operates a fleet of approximately 600 diesel buses, 100 trolley buses, and 37 light rail trains (LRT) vehicles. The system currently carries more than 40 million passengers annually, which is down significantly from the early 1980s highs of nearly 70 million annual riders.[45]

An integral part of transit station development, or *transit centre* as they are referred to in Edmonton, is the *timed transfer focal point* concept. In the mid-1970s, Edmonton's bus system was completely redesigned, with all routes reorganized to feed, in synchronized patterns, into 19 transit centres spread across the city as shown in figure 19. Edmonton was the first municipality in Canada to implement this concept on such a large urban area. Currently five to twenty bus routes simultaneously converge on one of the city's transit centres precisely 5 and 35 minutes after the hour during the off-peak periods, and 15- or 20- minute intervals during the peak periods.[46]

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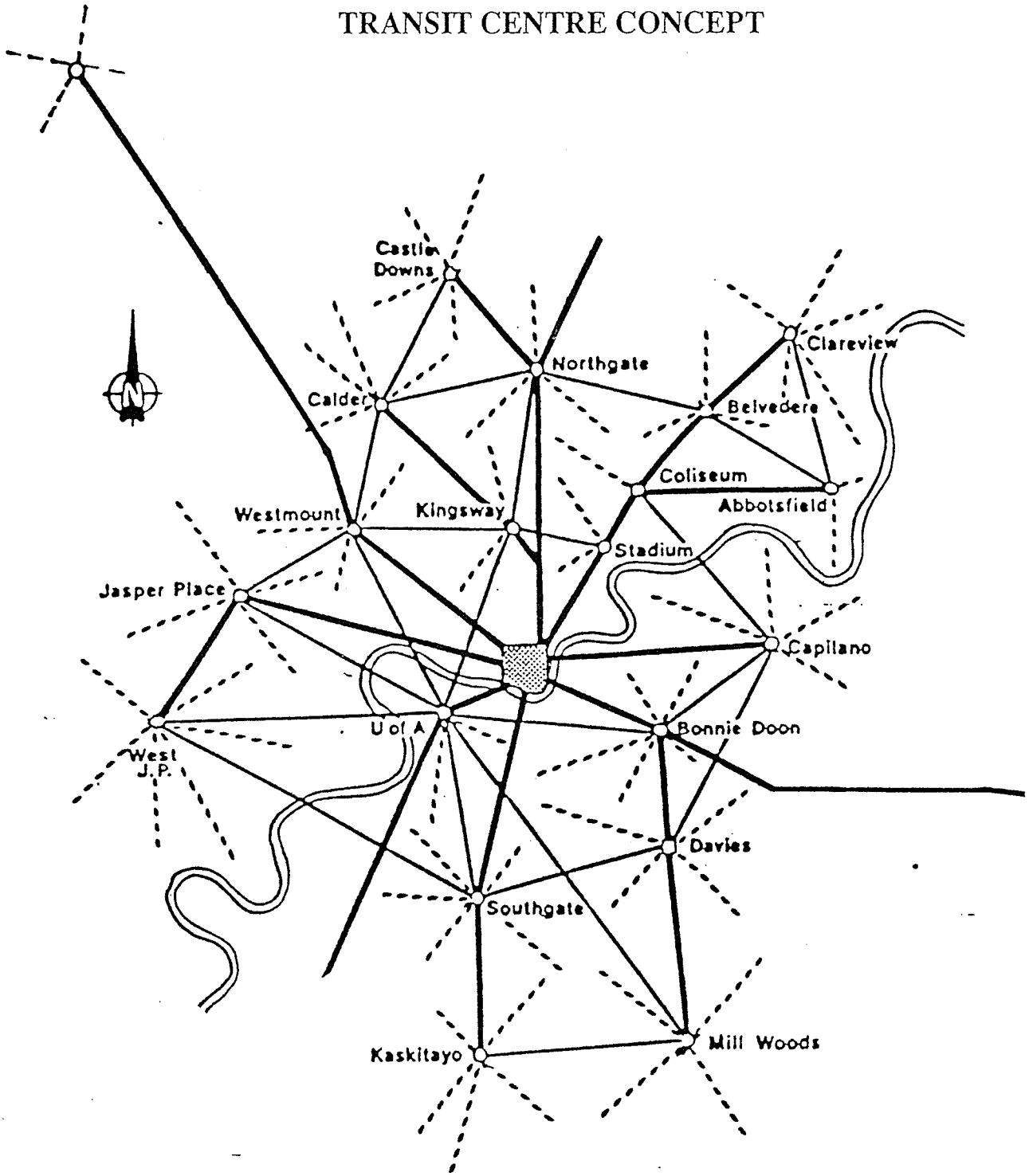
[44] Statistics Canada. 1986 Census Highlights. p. 4.

[45] CUTA. Operating Statistics. 1988

[46] Cervero, Robert. "Urban Transit in Canada: Integration and Innovation at its best." Transportation Quarterly. Vol. 40, No. 3, July 1986. P. 293-316.

FIGURE 18

TRANSIT CENTRE CONCEPT



SOURCE: Mike Mah. Senior Transportation Engineer. City of Edmonton Transportation.

Passengers continuing their trip scramble from one bus to another in order to make connections, and precisely 3 minutes after the buses arrive they depart the transit centre. This arrangement, often referred to as pulsing-scheduling - akin to a pulsating heart beat - has allowed Edmonton to service not only downtown radial trips but also crosstown commuter trips quite effectively.[47] J.J. Bakker, professor of engineering at the University of Alberta and consultant to Edmonton Transit, claims that Edmontonians can reach nearly 90 percent of a 130 square mile service area within 50 minutes or less during the midday by public transit.[48]

Out of the 19 transit centres in Edmonton, 10 are located on the premises of shopping malls and retail complexes where ample land was available for development. Property often has been leased to the city for as little as $1 dollar a year, while two centres benefitted from land being donated outright by the owner.[49] Recently, the owners of the Kingsway Garden Mall expanded their retail area. The developer recognized that transit brought a significant amount of business to the mall and included paying for the construction of a new station facility.[50]

Merchants have greatly benefitted from the increased volume of customers dropped off at their door step. These findings were corroborated by Newman, Bebendorf, and McNally, in a study on the timed transfer focal point concept for the Urban Mass Transportation Administration in Washington, D.C., in which they concluded that shopping malls have reported significant gains in sales following the opening of on-site transit facilities while competing retail complexes without a transit facility were experiencing losses. [51]

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[47] Ibid.

[48] Bakker, J.J. "Advantages and Experiences with Timed Transfer." A paper presented at the 60th annual meeting of the Transportation Research Board, Washington, DC., 1981.

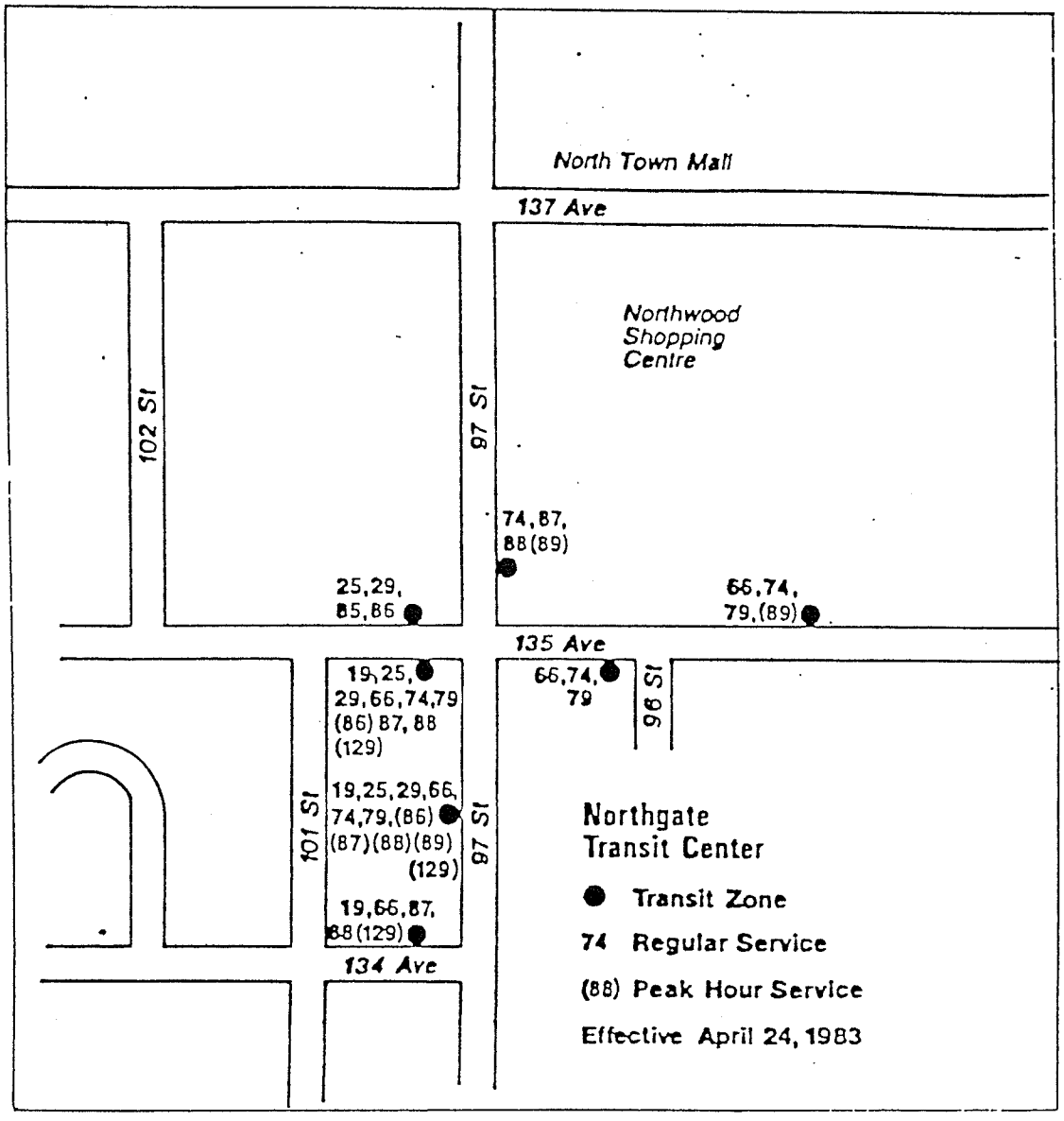
[49] Cervero, Robert. Transportation Quarterly. p. 293-316.

[50] Transit Topics. The newsletter of the Canadian Urban Transit Association, November, 1988.

[51] Newman, D.A., M. Bebendorf and J. McNally. Timed Transfer: An Evaluation of its Structure, Performance and Costs. Washington, DC.: U.S. Dept. of Transportation, 1983. Section II.

FIGURE 19

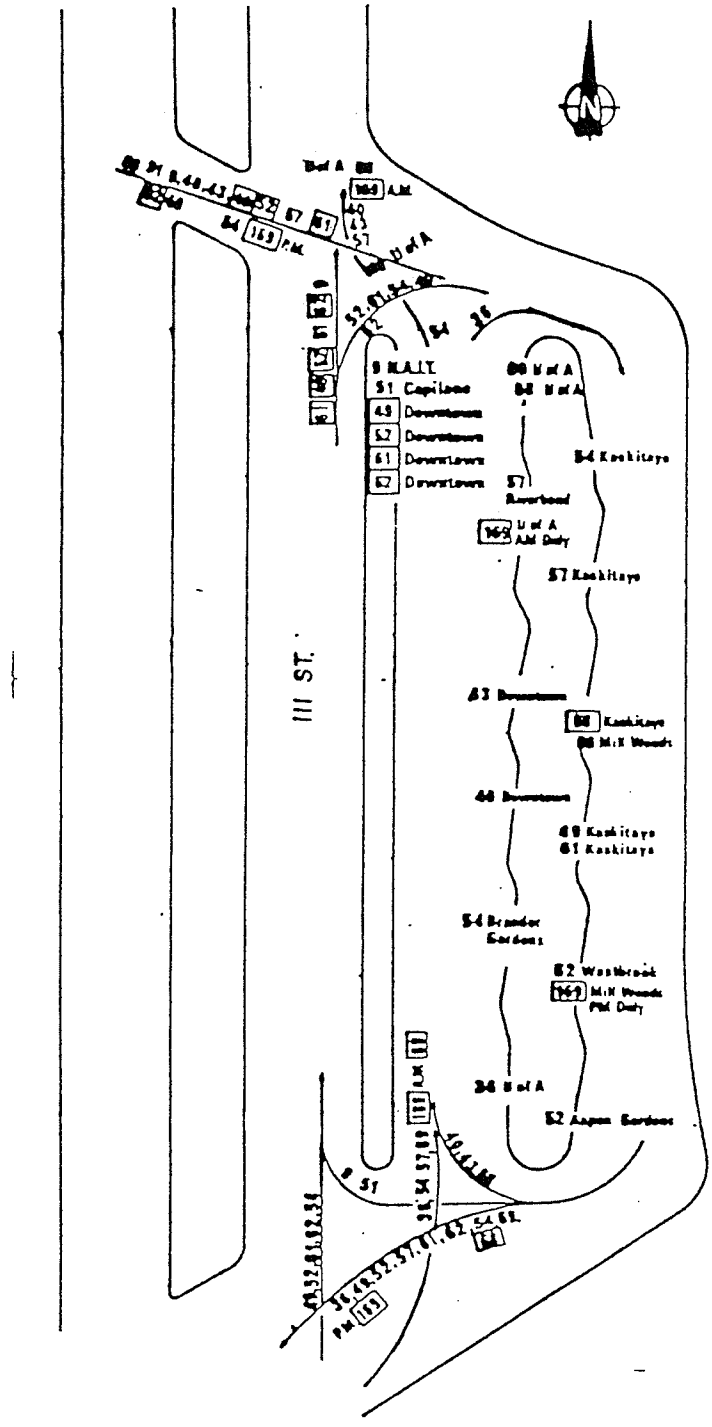
ON-STREET TRANSIT CENTRE DESIGN - NORTHGATE



SOURCE: Mike Mah. Senior Transportation Engineer. City of Edmonton Transportation.

FIGURE 20

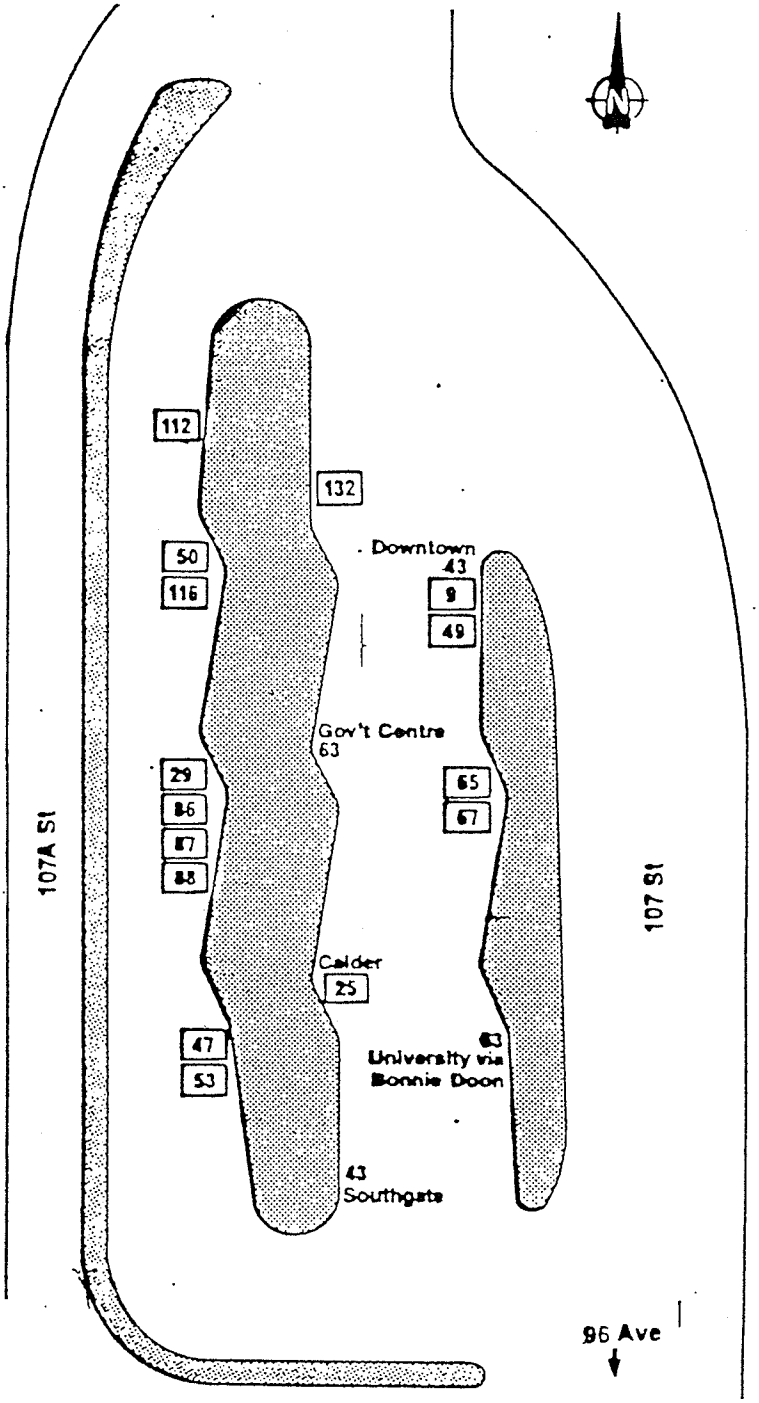
OFF-STREET TRANSIT CENTRE DESIGN - SOUTHGATE



SOURCE: Mike Mah. Senior Transportation Engineer. City of Edmonton Transportation.

FIGURE 21

OFF-STREET TRANSIT CENTRE DESIGN - GOVERNMENT CENTRE



SOURCE: Mike Mah. Senior Transportation Engineer. City of Edmonton Transportation.

Many of Edmonton's transit centres are enclosed, heated buildings complemented by scheduling and routing information. The cost of building these structures is roughly $350,000 each. All of the transit centres, with the exception of on-street facilities, feature sawtooth bus bays which eliminates on-site competition and reduces space requirements (relative to straight curbside parking).[52]

For most commuters utilizing Edmonton's timed transfer system, average travel times dropped 20 percent compared to previous travel times especially during the midday. Also, Edmonton Transit was able to eliminate redundant routes and consolidate trunk routes. With less radial connections into the downtown, transit was able to reduce one-third of its buses running on congested city centre streets.[53]

As mentioned earlier, the City of St. Albert (population 38,318) operates its own suburban transit service. Essentially the St. Albert Transit runs local services within its corporate boundary which are timed to meet buses going to and from Edmonton.As well, a bus bay has been reserved in the transit centre for Greyhound Lines of Canada for its intercity buses running from Edmonton to Spirit River and Edmonton to Ft. McMurray.

St. Albert buses utilize two Edmonton Transit Centres enroute to downtown Edmonton, along with the centre at the University of Alberta campus. Through an arrangement between both cities, there is full transferability between Edmonton, St. Albert, and Strathcona County transit routes.

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[52] Cervero, Robert. Transportation Quarterly. p. 293-316.

[53] Ibid.

Burnaby (Vancouver), British Columbia

The Census Metropolitan Area of Vancouver had a 1986 population of 1,380,729, with the city of Burnaby itself having a population of 145, 161. The annual growth rate for the region of Vancouver was 8.9 percent between 1981 and 1986. For the city of Burnaby the annual growth was 6.3 percent as measured between 1981 and 1986.[54]

The Vancouver Regional Transit System (VRTS) operates public transit service within the city of Burnaby. The VRTS is a partnership of the local municipalities that make up the Vancouver regional area and is jointly operated and financed by BC Transit which is a provincial government department. The VRTS operates a fleet of approximately 850 diesel and electric trolley buses, 114 light rail cars, and 2 harbour ferries. The system carried more than 100 million passengers annually in 1987.[55]

Within the city of Burnaby specifically there are three transit stations, or *transit exchanges* as they are referred to by BC Transit, on or near area shopping malls. The three transit exchanges in Burnaby are located at the Lougheed Mall in the east end of the city, Metrotown which is the regional town centre located along the skytrain line, and the Brentwood Mall just to the north of the Metrotown complex as shown in figure 22.

The design of transit exchanges in Burnaby depends on land availability and ownership, the number of bus berths (loading bays) required, and access and egress limitations to and from the site. The Transportation Engineer from BC Transit works very closely with the private developer, Municipal and Provincial Highways departments to ensure that all the factors in site planning and design are accounted for. Some of the factors are:

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54 Statistics Canada. 1986 Census Highlights. p. 4.

55 Glen Leicester. Service Planning Manager. BC Transit. Vancouver.

- compatibility between the design of the bus exchange and the development;
- optimization of land used;
- traffic conflict on the Mall property and circulation problems with the adjacent roadway;
- visibility of the transit exchange for security reasons.[56]

Transit exchanges in Burnaby happen to be located at the three major transit focal points for transferring. These coincide with Municipal Town Centre policies and thus reinforce land use plans in existence. The construction of the off-street transit exchanges benefits both the transit system and its user along with the shopping centre. To illustrate this point, ridership at Metrotown has shown a dramatic increase since the opening of the permanent bus exchange at the Eaton Centre. The following tables and figures help highlight the data.[57]

The analysis, done by BC Transit in July 1989, compares loads on an hourly basis just prior to the opening of Eaton Centre (January to Mid-March 1989) and after the mall opening (Mid-March to June 1989). Passenger loads during the daytime were analyzed for each business day of the week, namely, weekday and Saturdays. The time period between 10:00 AM and 6:00 PM was chosen as it is a close parallel to store opening hours. The arrival and leaving loads of all routes were summed up to provide a picture of the total passenger activity. Table 2 provides passenger volumes for weekdays which is graphically presented in Figure 23. The statistics show a total of 910 additional rides per day, or a 20 percent growth. Table 3 shows Saturday passenger volumes while Figure 24 provides a graphic presentation. On Saturdays, ridership has grown by about 940 passengers or a 29 percent increase.[58]

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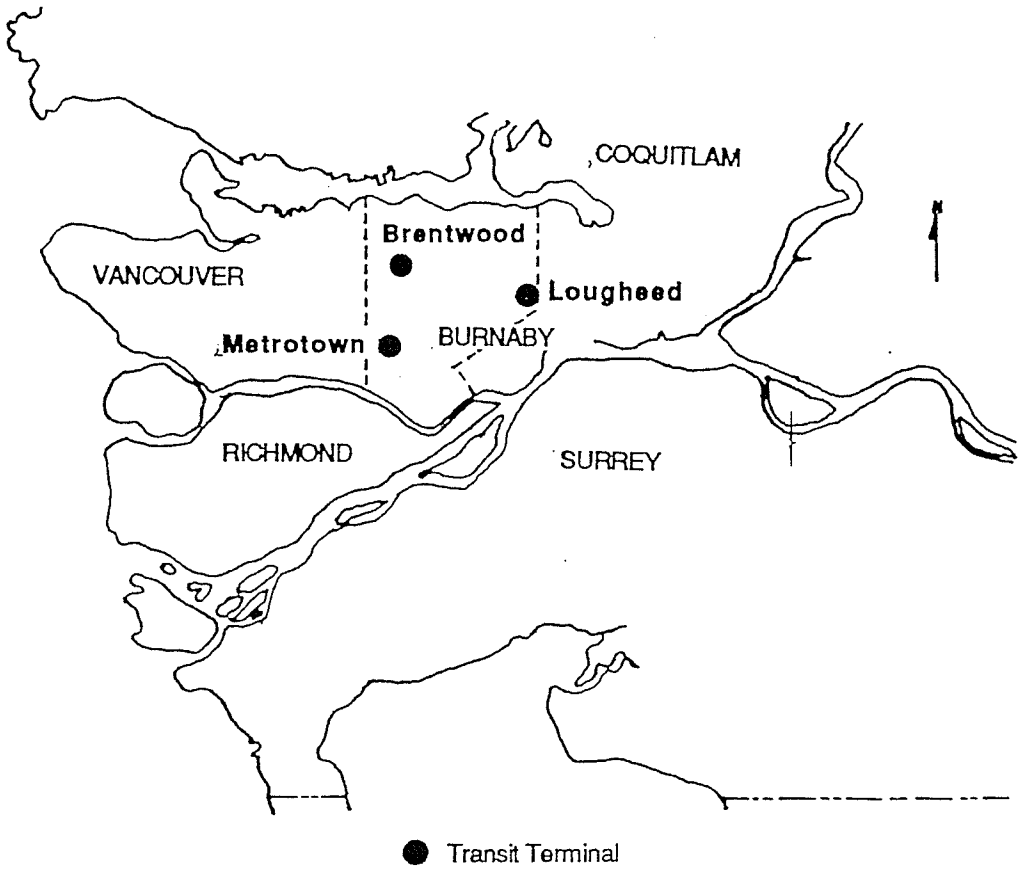
[56] Ibid.

[57] Ibid.

[58] BC Transit. Metrotown Ridership Growth: Impact of Eaton Centre Opening. Vancouver: BC Transit, July, 1989. p. 1-4.

FIGURE 22

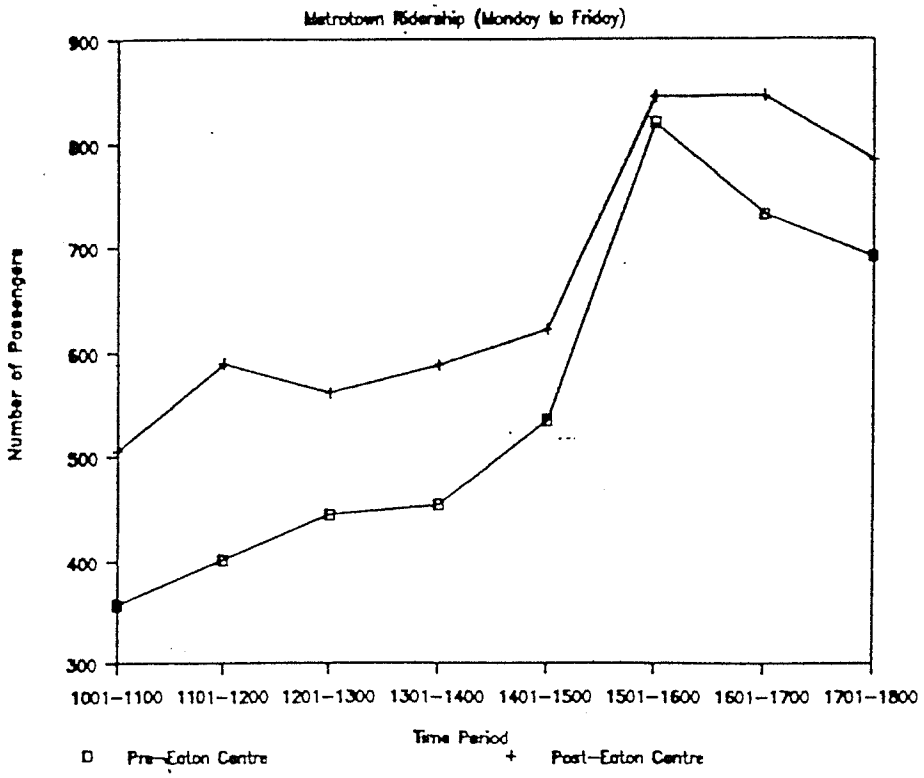
TRANSIT EXCHANGES IN BURNABY



SOURCE: Glen Leicester. Service Planning Manager. BC Transit. Vancouver, British Columbia.

TABLE 2 and FIGURE 23

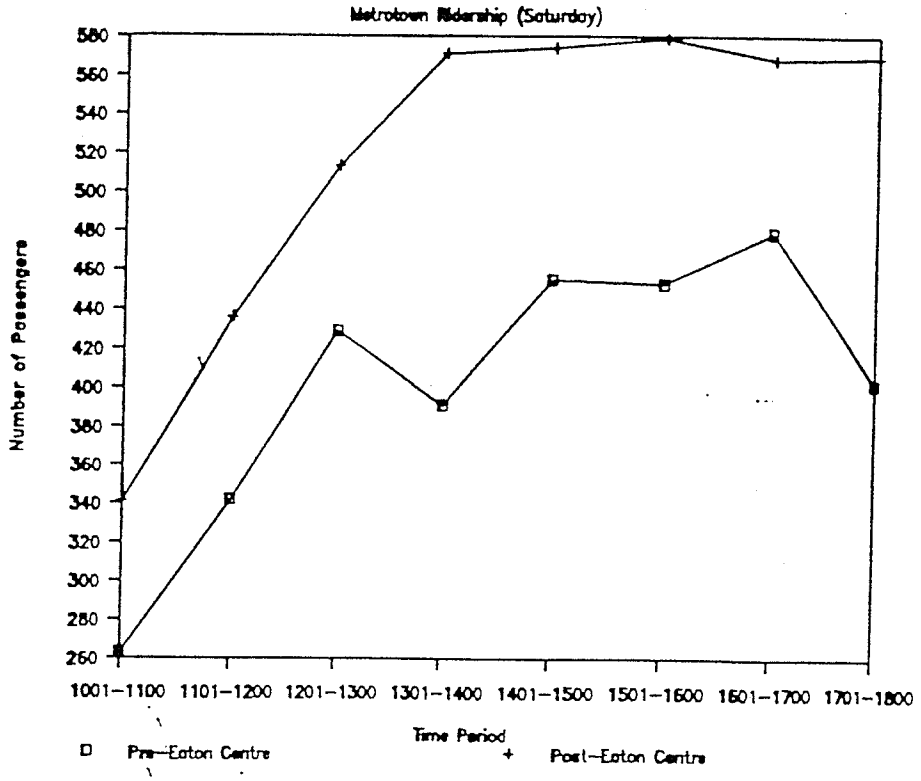
Time Period	# of Buses	Total Load Pre	Total Load Post	Load Change Total	Load Change %
1001-1100	44	358	506	148	41.3%
1101-1200	44	402	590	188	46.8%
1201-1300	44	446	562	116	26.0%
1301-1400	44	455	588	133	29.2%
1401-1500	46	535	622	87	16.3%
1501-1600	56	820	845	25	3.0%
1601-1700	63	732	846	114	15.6%
1701-1800	65	691	785	94	13.6%
TOTAL	406	4439	5344	905	20.4%



SOURCE: BC Transit. Metrotown Ridership Growth: Impact of Eaton Centre Opening. Vancouver: BC Transit, July 1989.

TABLE 3 and FIGURE 24

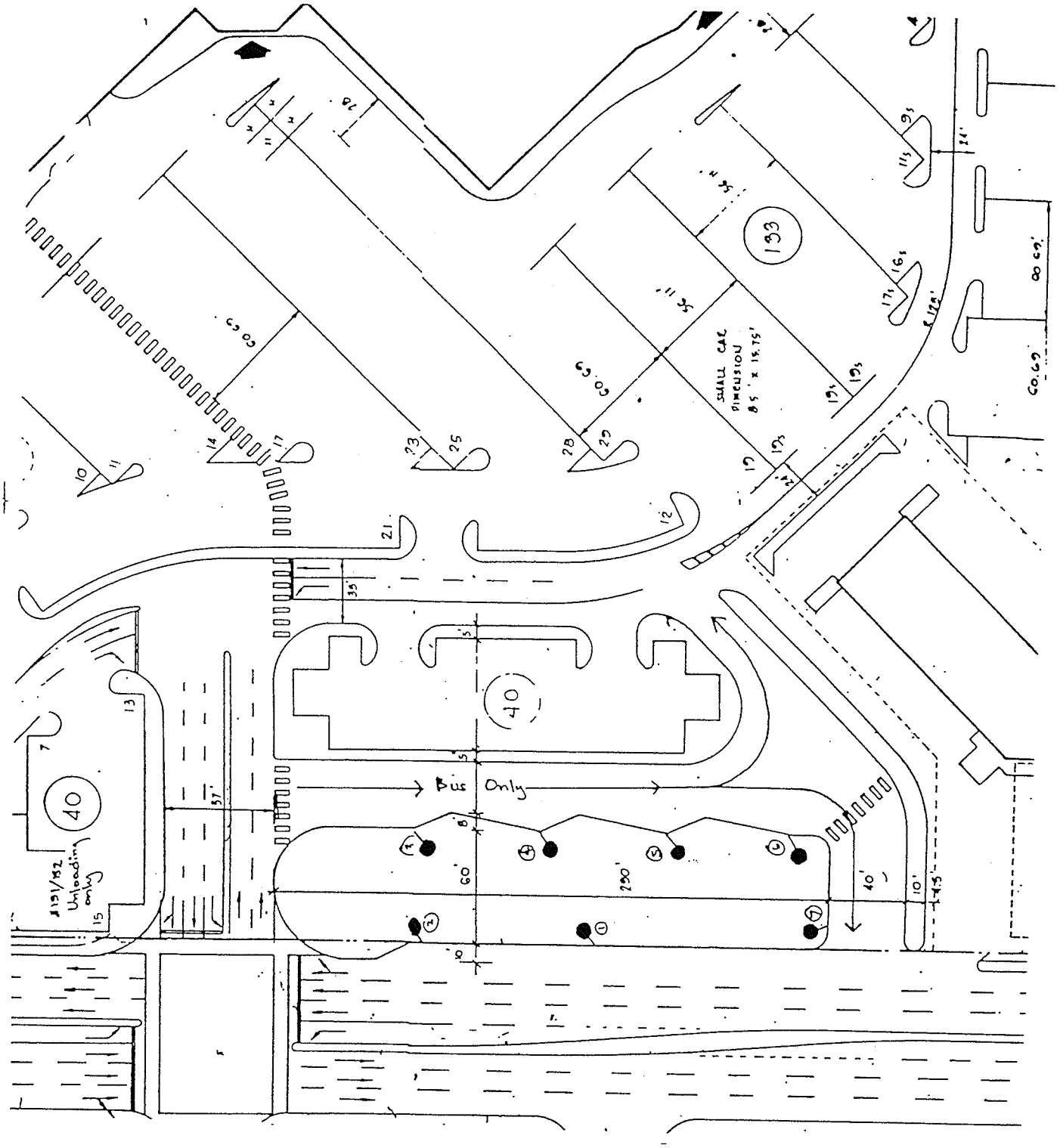
Time Period	# of Buses	Total Load Pre	Total Load Post	Load Change Total	Load Change %
1001–1100	44	263	341	78	29.7%
1101–1200	44	342	436	94	27.5%
1201–1300	44	429	513	84	19.6%
1301–1400	44	391	571	180	46.0%
1401–1500	46	455	574	119	26.2%
1501–1600	45	453	579	126	27.8%
1601–1700	45	479	568	89	18.6%
1701–1800	45	402	569	167	41.5%
TOTAL	357	3214	4151	937	29.2%



SOURCE: BC Transit. Metrotown Ridership Growth: Impact of Eaton Centre Opening. Vancouver: BC Transit, July 1989.

FIGURE 25

BRENTWOOD MALL EXCHANGE - BURNABY



SOURCE: Glen Leicester. Service Planning Manager. BC Transit. Vancouver, British Columbia.

The transit exchanges have provided numerous benefits to VRTS passengers. For example, at the Brentwood Mall, passengers previously has to cross the street to transfer between buses. With the new exchange which features a central oval island, their safety and convenience is greatly enhanced. The exchange has bus shelters and benches on the platform for the passengers comfort, while waiting for connecting buses. The transit exchanges have also taken advantage of good signage. Each bus berth or bay is numbered and has an identifying sign denoting the route(s) using that particular bay. At some of the exchange locations, the VRTS provides schedule information with a "Infotube" or digital display showing the departure times of all trips from that location.[59]

The legal considerations which have been taken into account during the planning and implementation stages of transit exchanges are:

- obtaining formal easement from the developer/owner of the mall;
- BC Transit is liable for its operation and passenger safety within the easement;
- agreement to use the access roadway is obtained; and
- BC Transit be saved harmless for the design features of the development which are outside of its control.[60]

In terms of maintenance, BC Transit is responsible for the sweeping, cleaning, maintenance of bus shelters, snow removal, and operator's washrooms located on the site of the transit exchange.[61]

The success of Eaton Centre in attracting increased transit ridership is largely due to the integration of transit facilities and the development itself. From the beginning the entire development of the Eaton Centre complex at Metrotown was planned with transit access in mind. The close proximity of the bus exchange has made travelling by transit to the mall both attractive and convenient.[62]

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[59] Glen Leicester. BC Transit.

[60] Ibid.

[61] Ibid.

[62] BC Transit. Metrotown. p. 5.

Summary

It is evident that, judging from the data collected from the case examples across Canada, transit station development at regional shopping malls has been quite successful. This success is expressed in both the safety and convienence feature offered to the passengers utilizing transit and to the transit properties which achieve greater schedule adherence for their buses and operational advantages gained over the private automobile. The regional shopping malls obviously benefit a great deal by having their visibility increased as transit riders are quickly driven to the large complexes and dropped off right at the door step.

The concept of placing transit stations at regional shopping malls was found in four of the five case study cities. Burnaby, Edmonton, Mississuaga, and Ottawa, had all located or integrated their transit stations with regional or major community shopping malls throughout their urban areas.Two case study cities, Burnaby and Ottawa, also co-ordinated the location strategy of their transit stations with existing Town Centre policies and land use plans. In Burnaby, the transit exchanges had been located at the three major shopping malls which were in accordance with the Burnaby Municipal Town Centre Policy, and in Ottawa the transit authority was included in the early stages of planning for new regional town centres. OC Transpo was allowed to either secure transit right-of-way lands accessing the new neighbourhoods or built a transit terminal in a new area in advance of actual demand for such a facility.

The principle of allowing transit to have exclusive access to a transit station on site at a regional shopping mall was found in four of the five case study examples. The fifth example, Québec City, also had exclusive access for their off-street transit stations but did not locate their facilities at regional shopping malls. Only the city of Mississuaga operated some transit stations where exclusive access was not secured.

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[62] BC Transit. Metrotown. p. 5.

The use of the *timed transfer focal point* concept on a system wide basis was found in one of the case study examples. The city of Edmonton implemented the TTFP concept in the mid-1970s and re-organized their entire transit system around the 19 transit centres located around the urban area. Québec City also based its entire transit routing system around five major transfer stations located around its urban area. Other cities featured in the case study utilized the TTFP concept on a selective site basis where transfers between certain types of bus routes were necessary to connect passengers of outlying areas with the entire transit system. An example was found in the city of Vancouver.

Examples of the use of the oval island style of transit station was found in every case study city examined in this chapter. The cities of Edmonton, Mississuaga, and Québec City also employed other design styles such as the straight-curb alignment of buses alongside a shopping mall or in a on-street station situation. All of the examples provided amenities with their stations, such as shelters (heated and non-heated), route and system information, and signage.

The success of the Burnaby (Vancouver), Edmonton, Mississuaga, Ottawa and Québec City experience in continuing to expand and utilize the exclusive transit station concept seems to indicate dearly that much can be gained by cities like Winnipeg in expanding and developing similar facilities.

CHAPTER FOUR
Case Study: The City of Winnipeg

"Costs of mass transit can be prodigious...By reducing the dominance of the car and the parking lot and the parking garage, the systems reinforce the integrity of the centre...Crank in this benefit and such environmental benefits as clean air and lessened congestion - not to mention aesthetics - and mass transit begins to look like a bargain."

William H. Whyte, City: Rediscovering the Centre, 1989.

Introduction

This chapter examines the City of Winnipeg as a case study and is divided into two sections: 1. A literature and terchiary data review; and 2. Primary data analysis. The evaluation of existing transportation system in Winnipeg is carried out, with current demographics, traffic characteristics, transit system dynamics, shopping centre expansion examined, and followed by a case study of the existing two transit stations. The was an opportunity to undertake passenger boarding/alighting counts and bus operator surveys at the Polo Park and Garden City Transit Stations, along with the opportunity to compare current survey data with data gathered by the transit department in 1985 before the transit stations were built.

Plan Winnipeg, the city's official plan to guide development and growth over the next twenty years, makes no specific recommendations or reference toward the implementation of transit stations at regional shopping malls, it does however prescribe the right mix of land-use and transportation conditions that are conducive to the establishment of these facilities. The plan recommends the curtailment of rapid suburban growth and favours a policy of containment with emphasis on infill development into older or existing neighbourhoods. This strategy also favours transit development over further infrastructure development for automobiles.

In describing the Plan Winnipeg transit-oriented approach a series of exclusive busways and bus-only lanes along major arterial corridors to facilitate radial movements toward the downtown are recommended.

When new developments are located within an existing activity centre, the cost of providing public amenities and services to that development are lower than if it were located in an undeveloped area. As Plan Winnipeg suggests, the transit system should encourage most commercial and industrial developments to locate in existing urban built-up areas, where public services and facilities are already in place and the needed improvements for upgrading can be provided cost-effectively.

By clustering many city activities throughout the urban area results in a concentration of trip ends. When a recreation complex, health care facility, public library or seniors centre are all located adjacent by a regional shopping mall, the transit routes that serve the shopping mall also allow people to travel to these other activity centres without transferring buses.

Although transit access is often considered to be a low-priority factor in the location decision of most developers, it is becoming an increasingly important variable as traffic congestion continues to grow, the program costs to mitigate traffic problems are levied on new developments, and the cost of energy increases.

Another reason for the development of transit stations in the city of Winnipeg is the harsh climatic conditions that exist during most of the year. Consideration for the welfare and protection of each potential passenger of the transit system should be incorporated into the design and implementation of a transit station development program. Major transfer points throughout the transit system should be developed into terminal sites not only to promote concentrated development, but to reduce the effects of Winnipeg's harsh climate on transit's patrons and induce a greater use of public transit.

Demographics and Traffic Characteristics

Between 1981 and 1986 the population of the of the city of Winnipeg had increased by 5.6% according to Statistics Canada census data. Previous population increases have been 0.6% (1976 - 1981) and 4.8% (1971 - 1976). In 1981 the department of Environmental Planning carried out a study projecting future population trends for Winnipeg. The study reported that the population would increase by a projected 4.2% (1986 - 1991), 2.6% (1991 - 1996) and 1.6% (1996 - 2001).[63]

The total number of dwelling units in the city of Winnipeg has increased by 6.6% between 1981 and 1986, an increase much smaller, however, from previous five year periods (+17.6% for 1976 - 1981; +21.6% for 1971 - 1976). The total number of inner city area housing units has changed little over the last fifteen years while housing in the suburbs has increased by 162% over the same time period. This clearly shows a trend toward a movement of people to the suburban areas of Winnipeg and away from the older inner city areas.[64]

The number of registered passenger vehicles in the city of Winnipeg has been increasing at a steady rate of 8% over the last ten years. Passenger vehicles registered to those living in outer areas of Winnipeg (the suburbs) has increased as well, but vehicle registration in the inner areas has dropped off. This could be an indication of increased reliance on public transit by inner city residents and a decreased dependence on transit by suburban residential dwellers. Also, commercial vehicle registration increased 7.2% between 1981 and 1986.[65]

In terms of travel demand, the total number of work trips (a.m. peak hour) in Winnipeg has increased by 5.6% from 1971 to 1976 and by 4.1% from 1976 to 1981.

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[63] City of Winnipeg. Travel and Demographic Trends, 1962 - 1986. Winnipeg: Streets and Transportation Department, January, 1988. p. 1.

[64] Ibid. p. 6.

[65] Ibid. p. 1.

Data from the latest five year period 1981 to 1986 shows an increase of 11.3% in total work trips.[66] This significant increase in work trips means that an increasing number of vehicles are being carried on the existing roadway system during the peak morning peak hours of travel in Winnipeg as shown by Table 4.

Total work trips can be further broken down by mode into four categories: vehicle driver, bus passenger, vehicle passenger, and other (walker or cyclist). The modal split for the past fifteen years has shown little or no change, with vehicle driver consistently holding over 50% of all trips made by mode choice. Transit has consistently remained steady at 22% of overall trip mode choice in Winnipeg.

Table 4 Traffic Capacity on Major thoroughfares in Winnipeg

Street	7AM - 7PM Average Weekday	AM PEAK Hour Loads	PM PEAK Hour Loads
PORTAGE	52,291	5,257	5,314
PEMBINA	33,519	3,722	4,002
HENDERSON	28,400	3,465	4,087
MAIN	26,200	2,345	3,259

Source: Streets and Transportation Department. 1986 City of Winnipeg Traffic Flow Map.

Transit System Characteristics

The city of Winnipeg Transit System serves a population of 596,894 (city), generating 55,300,000 revenue passengers per year with approximately 26.4 million vehicle-kilometres operated annually. Between 1981 and 1986, total passengers carried increased by 4.2%. During the same time period, annual kilometres operated stayed virtually the same and annual hours of operation decreased by 2%. This indicates that Winnipeg Transit decreased its yearly total yearly operating hours while managing to increase its total annual ridership figures.[67]

[66] Ibid.

[67] CUTA. Operating Statistics. 1988.

Winnipeg Transit maintains a fleet of 543 vehicles, the majority of which are standard 40 foot and 35 foot diesel buses with a small number of gas buses for para-transit operation. Of the 543 vehicles in the fleet, 480 are required for morning and afternoon peak service demand for a typical winter weekday. The total number of bus routes provided by transit increased from 52 in 1981 to 61 in 1986. The majority of these 61 routes (including 13 express services) focus on the downtown area which accounts for 48% modal share of all morning peak hour work trips.[68] The current morning peak transit modal share of work trips city wide is 21.8%. Winnipeg Transit carries approximately 200,000 revenue passengers per typical weekday.

In Winnipeg, the passenger per kilometre ratio has shown itself to be decreasing while total kilometres per capita are increasing and passengers per capita are remaining relatively constant. (City of Winnipeg 1986) A 1982 consultants report for Winnipeg Transit suggests:

> Although there are a number of reasons why this has occurred, one of the more obvious ones is that population growth in these urban areas occurs generally in the suburbs which are further from the primary destinations which are usually in the downtown; the suburban areas have a lower population density and are more difficult to serve, and many of those who commute from suburban areas have a more diverse range of trip destinations which are also more difficult to serve by transit. Another factor that has some effect on transit service efficiency is the destination of work trips. In many urban areas, major employment centres are being established in the fringe areas outside of downtown.[69]

The dispersed nature of population growth and employment centres has meant that Winnipeg Transit has had to expand and adjust its existing services, at an increased cost while loosing ridership to the automobile, due to the decrease in transit efficiency in serving outlying areas.

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[68] Ibid.

[69] IBI Group and W.L. Wardrop & Associates. "The Feasibility of Conversion to Non-Petroleum Power Sources." Final Report, Winnipeg Transit System, March 15, 1982. p. 23.

Even though there is generally a high level of transit service in the city of Winnipeg, accessibility to the system is not uniform among all city residents. One group, the physically disabled have great difficulty in using and accessing regular on-street transit services. Generally municipalities across Canada have responded to this need by providing a variety of transportation services, including door-to-door service for the physically disabled, and improvements to regular transit services and the development of parallel para-transit services.

However adapting public transit systems to meet the needs of the physically disabled implies either making future facilities accessible to all or retrofitting existing facilities and services. In the city of Winnipeg, the Handi-transit service operated by Winnipeg Transit utilizes smaller gas engine buses which are outfitted with lifts and wheelchair tie-downs to meet the needs of the physically disabled. Recently, the system was expanded to incorporated the use of specially designated taxi-cabs to provide additional capacity for the para-transit operation. These taxi-cabs now handle calls from disabled persons who are able to ride in automobile vehicles, which generally implies that these persons are not limited to a wheelchair. The operation of the service is subsidized by both the city of Winnipeg and the Province of Manitoba.

Shopping Centre Expansion

In the expansion plans for both the Garden City Shopping Centre and the Polo Park Shopping Centre, transit was considered by the developers during the planning process. It was realized that transit played an important role in providing an alternative means of travel, and in some cases an only means of travel to the centre.

The Garden City Shopping Centre is located in the community committee area of Lord Selkirk/West Kildonan in the northwest corner of Winnipeg. The centre opened in 1970 and has 444,636 square feet gross floor area (G.F.A.[2]) and 361,323 square feet gross leasable area (G.L.F.A.[2]). A Parking ratio of 5.9 spaces per 1,000 is

provided.[70]

Garden City Shopping Centre is a lineal mall with two major anchors at each end of the enclosed facility. Access to the facility is from three sides by way of two regional arterial and one local street. Winnipeg Transit operates four bus routes through the transit terminal.[71]

Polo Park Shopping Centre is located in the community committee area of City Centre/Ft. Rouge on the western boundary with St. James Assiniboia. Polo Park is the largest regional shopping mall in the city and has 1, 054, 700 G.F.A.^{2} and 892,403 G.L.F.A.^{2}. A parking ratio of 6.0 spaces per 1,000 square feet is provided. [72]

Polo Park Shopping Centre is a lineal mall with a large centre court, upper and lower shopping levels, and two major anchors at each end of the enclosed mall. Access is provided from three regional arterial streets and one local street. Transit operates eight routes which enter the shopping centre property, two routes looping around the westside while the remaining six routes utilize the transit terminal off Portage Avenue.

The planning process employed for the expansion of both Polo Park and Garden City shopping centres involved the access of transit in addition to building design and market analysis. Thus, existing transit routing patterns were reviewed and alternatives developed to meet the needs of the expanded facilities. Transit station development was reviewed in terms of the impact on parking, conflict and congestion, and pedestrian accessibility.

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[70] Information Winnipeg. City of Winnipeg, June, 1983. p. 1-2.

[71] Tebinka, Richard. "Transit Service at Shopping Centres." p. 2 - 3.

[72] Information Winnipeg. City of Winnipeg. p. 1-2.

During the planning for the expansion of both centres, the influence of transit on internal circulation and the number of parking spaces to be provided were of main concern to the planners. An examination of the overall circulation and parking system also meant that any provision of a transit facility would have to minimize the adverse affect to any tenants. The Sears management were concerned over the loss of parking spaces on their property. After the parking layout was revised and the new facility design finalized, Sears actually gained spaces (1,580 total parking spaces) after development.[73]

Case Study of Existing Station Facilities in Winnipeg

Shopping Centre Access Policy

The current policy of the City of Winnipeg Transit System in regards to shopping centre access is as stated: "To provide on-site transit access to all regional shopping centre."[74] The objectives behind this policy are to minimize the walking distances for the shopping centre customers who use public transit, minimize diversions for through passengers on transit, and to maintain schedule adherence of the transit service.

Some of the design guidelines currently in place and used by Winnipeg Transit when implementing a new transit terminal are as follows:

- Centralize all routes into a single station;
- Separate bus traffic from auto traffic;
- Provide bus access from both route directions;
- Locate station near shopping centre entrance;
- Locate station near washrooms (especially for drivers);
- Provide heated waiting areas for passengers;
- Station must be visible from shopping centre;
- Route and Schedule information must be provided;
- Be careful with landscaping;

[73] Tebinka, Richard S. "Transit Service at Shopping Centres." A paper presented at the 1988 RTAC Annual Conference, Halifax, Nova Scotia, September, 1988. p. 5.

[74] Shopping Centre Access Policy and Design Guidlines. City of Winnipeg Transit System, 1987.

- Use common sense about safety; and
- If designing a new shopping centre, orient shopping centre to the major street that transit uses.[75]

Garden City and Polo Park Stations

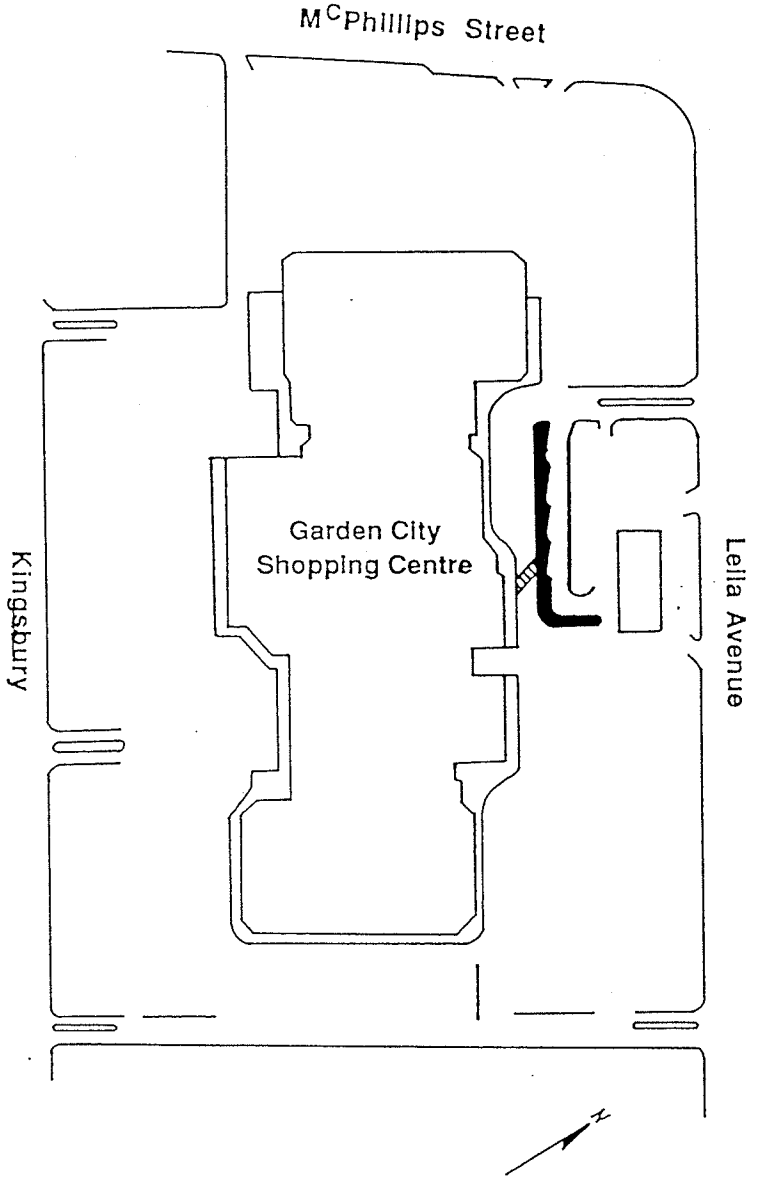
The exclusive transit station constructed at the Garden City Shopping Centre is a five bay straight alignment type, with the bays being constructed on concrete pads. Unheated bus shelters were constructed along the straight platform which parallels the shopping centre building. A long iron railing was installed along the platform between the transit station and the shopping centre to control where pedestrians would be able to enter and exit the facility. Buses access the station by entering mall property off Leila Avenue and travelling along a major lane then entering the exclusive transit station facility. Buses exit the facility through a secondary lane back to the mall access gate on Leila Avenue. Buses are allowed priority while travelling along the lanes and have all signals (stop signs) oriented in their favour. See figure 26 and 27.

The cost of the station was cost shared between the Garden City Shopping Centre owners, The City of Winnipeg and The Province of Manitoba. The Province and The City contributed $16,000 each to pay for the centre, for a total of $32,000. Garden City Shopping Centre contributed the balance of the costs to develop the $120,000 facility, or $88,000.[76]

[75] Ibid.

[76] Tebinka. p. 15.

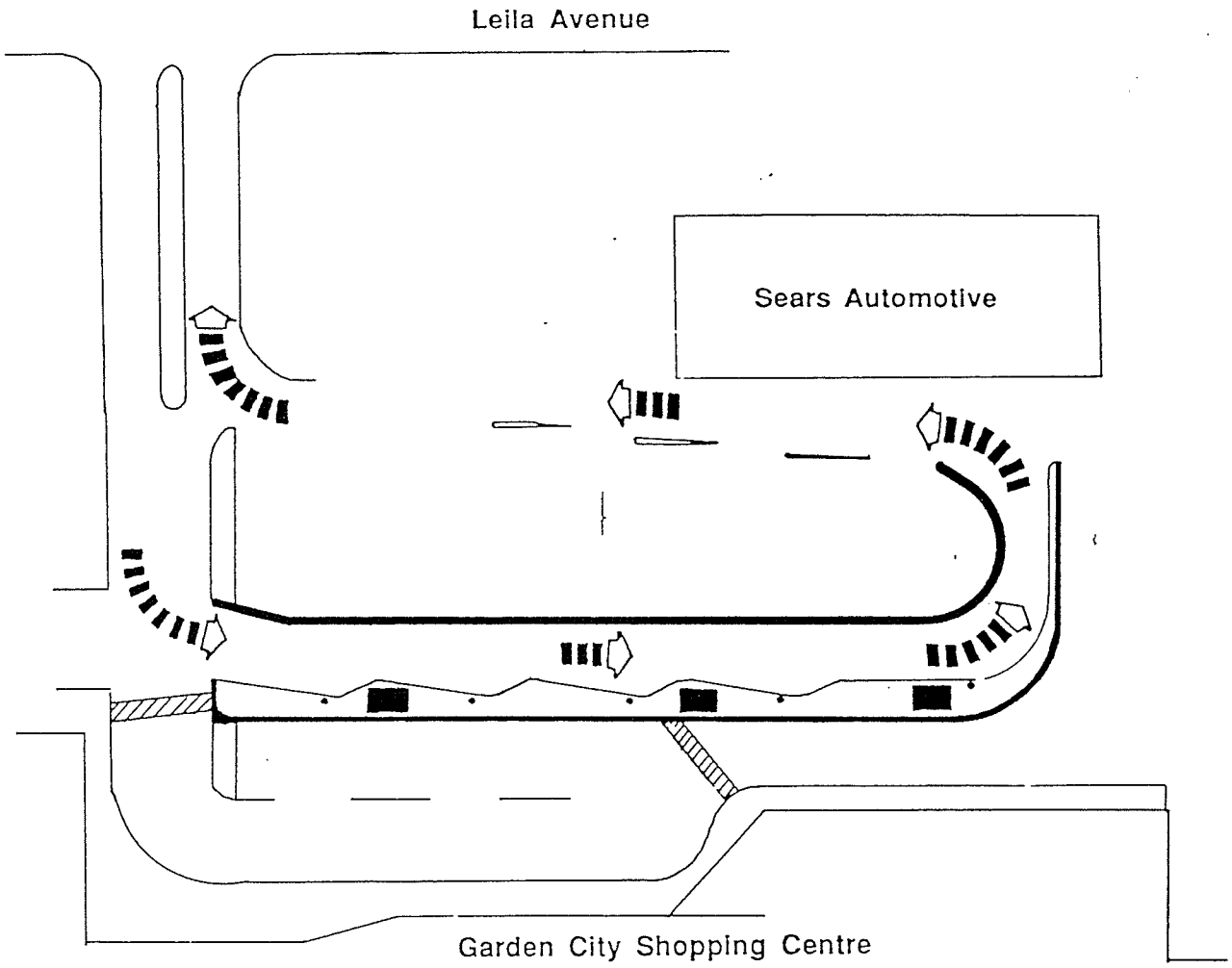
FIGURE 26
GARDEN CITY TRANSIT STATION - LOCATION



SOURCE: Tebinka, Richard S. "Transit Service at Shopping Centres." A paper presented at the 1988 RTAC Annual Conference, Halifax, Nova Scotia, September 1988.

FIGURE 27

GARDEN CITY TRANSIT STATION - DETAIL



SOURCE: Tebinka, Richard S. "Transit Service at Shopping Centres." A paper presented at the 1988 RTAC Annual Conference, Halifax, Nova Scotia, September 1988.

The transit station located at the Polo Park Shopping Centre is an eight bay facility centre around a centre island type of design. A iron railing is located at the top of the station to channel passengers into the designated walking areas provided and to prevent pedestrians from wandering out into vehicular traffic.Bus access to the station is off Portage Avenue and is exclusive in that no other traffic other than transit vehicles are allowed on site.

The cost of the station was $300,000 and included the provision of three bus shelters (one heated, two unheated). This cost was shared between the shopping centre owner ($240,000) and The Province of Manitoba ($30,000) and The City of Winnipeg ($30,000). The cost of the facility included $140,000 for landscaping around the site, which consisted of extensive tree planting, paving stone, cobble stone pedestrian walkways and extensive ornamental lighting. The landscaping of the site helped the facility blend in with the design of the redeveloped shopping centre and now provides an attractive focus for bus activity.[77]

Funding provided by the Province of Manitoba came through the Innovative Transit Projects Program administered by the Provincial Department of Urban Affairs. This program has been used previously to provide for new heated transit shelters located around the downtown area of Winnipeg.

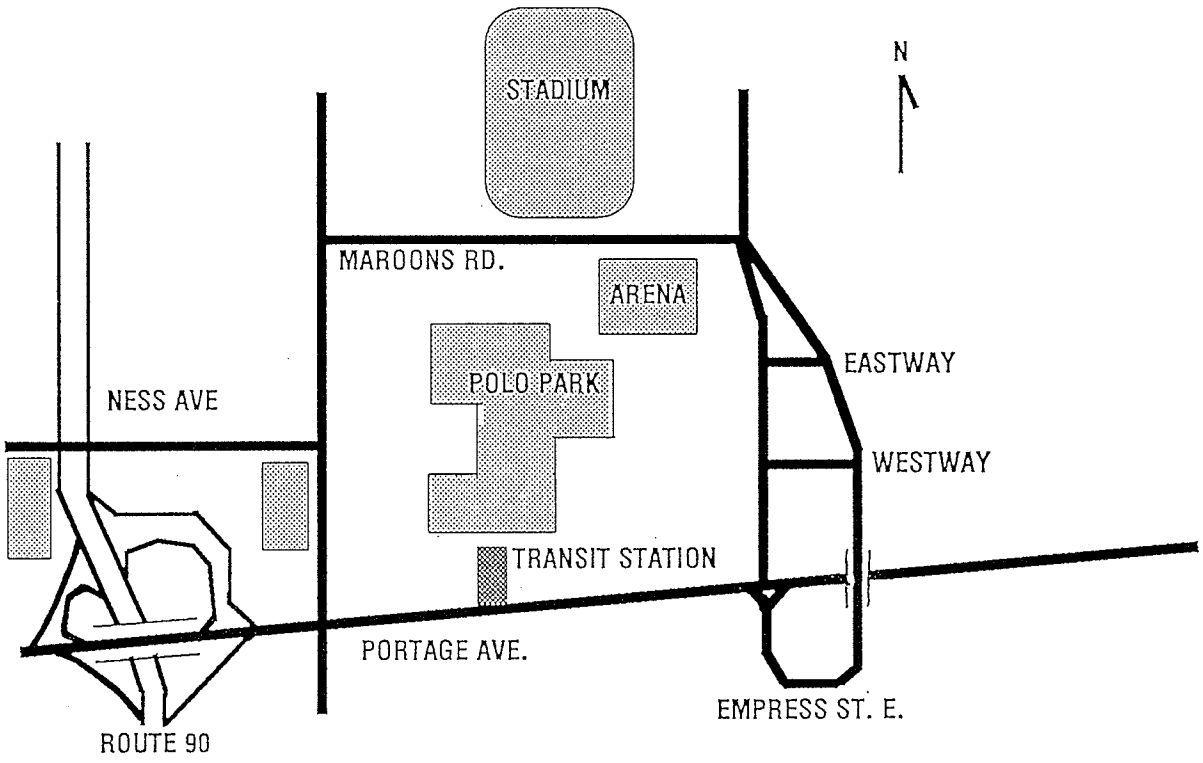
Bus volumes for the five bay Garden City station, which currently serves four bus routes, are 307 buses per day. Polo Park transit station service is featured on two sides of the mall, with the west side of the mall served by two routes and 147 buses per day. The main eight bay station on the southside just off Portage Avenue serves six routes and 256 buses per day.[78]

[77] Ibid.

[78] Ibid.

FIGURE 28

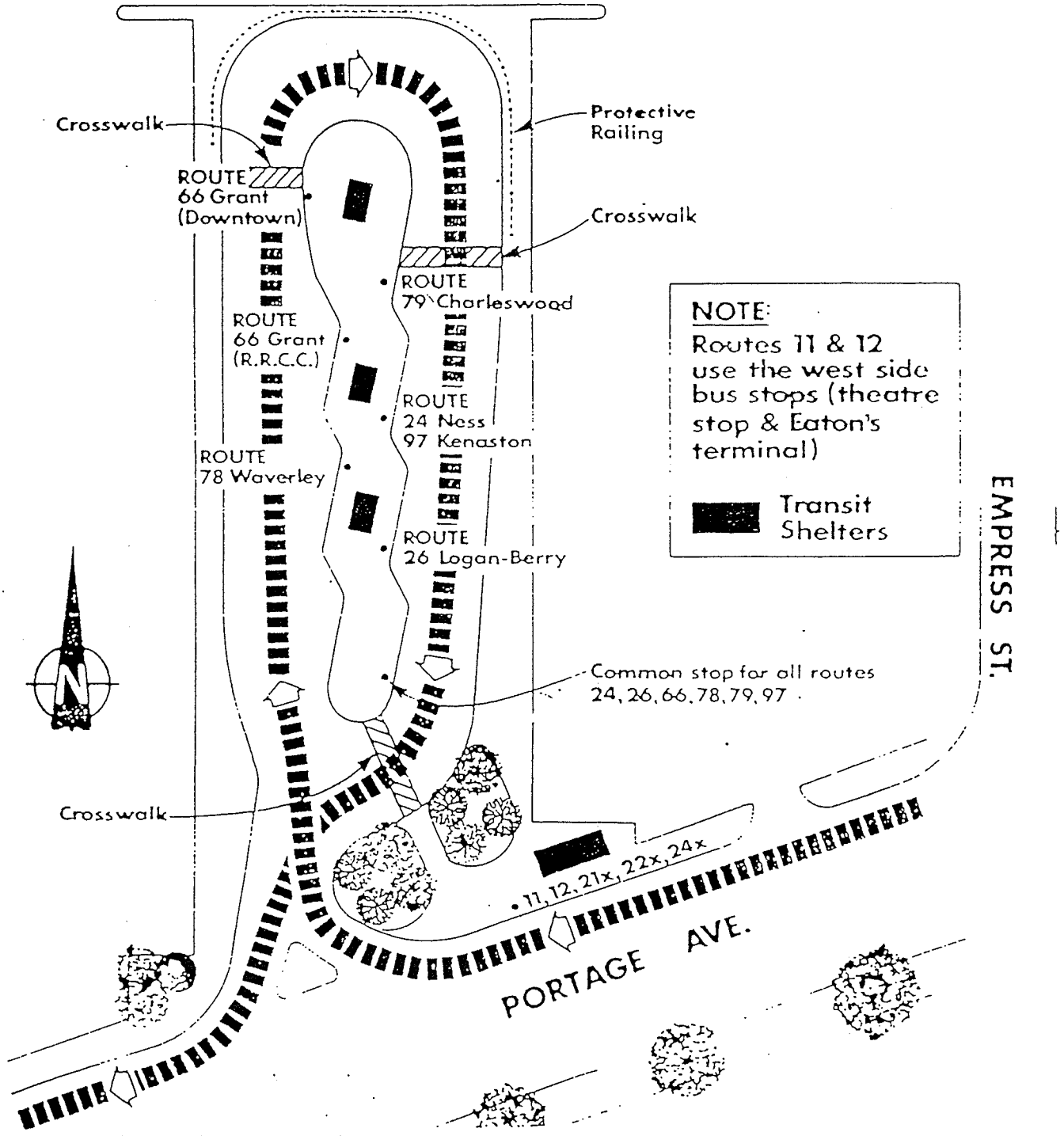
POLO PARK TRANSIT STATION - LOCATION



SOURCE: City of Winnipeg, Streets and Transportation Department, 1990.

FIGURE 29

POLO PARK TRANSIT STATION - DETAIL



SOURCE: William B. Menzies. SuperIntendent of Transit Planning. City of Winnipeg Transit System. October 1988.

Passenger/Driver Surveys

Purpose

The opportunity to undertake passenger boarding/alighting counts and bus operator surveys at the Polo Park and Garden City Transit Stations presented itself, along with the opportunity to compare current survey data with data gathered by the transit department in 1985 before the transit stations were built. The purpose of the counts and surveys was to ask two questions: 1. That the construction of transit stations at regional shopping malls increases transit ridership to these facilities; 2. That the stations have improved on-site operations at the malls while achieving transit planning goals and objectives?

In 1986, Polo Park shopping centre underwent a massive expansion of its commercial retail and open floor area space. At this time of redevelopment, the role of transit in servicing the retail complex was considered by planners, engineers and architects involved in the project. To this effect, a joint development agreement was reached between the mall owners, Cadillac Fairview, the City of Winnipeg and the Province of Manitoba, to develop the Polo Park transit station.

Also in 1986, the Garden City shopping centre redeveloped and expanded the southern portion of its complex into a food court concept area and additional retail space. During this expansion phase, transit service to the mall was reviewed and the development of the Garden City transit station was undertaken by joint agreement between the owners, the city, and the province.

The survey was designed to review the changes in boarding and alighting that have occurred at these two malls since the construction of the stations. The survey comprised two parts: First a passenger count was carried by the author. Data on boarding and alighting from 1985, before station implementation, was reviewed and

compared to the new survey data gathered. This survey demonstrates that transit usage at the malls has increased over the five year period and is related to the development of the station facilities.

Secondly, a survey of the drivers of transit buses who operate into the two station facilities was undertaken. It explored the operational effectiveness of the two stations as viewed by the operators who use them everyday. This data provided some insights into how useful the construction of these two facilities has been, and if any improvements should be considered for these two sites.

Description of Survey

Passenger boarding and alighting (passengers getting "on" and "off" the bus) during the daytime were observed on one day of the week, namely a business weekday. The survey was conducted in the month of January 1990 in order to reflect average passenger activity and loads normally experienced by transit during the year. The time period between 10:00 A.M. and 6:00 P.M. was chosen as it is a close parallel to store operating hours. The boarding and alighting of all routes operating into the terminals were gathered. All passenger boarding and alighting buses at the terminal were counted, however drivers boarding and alighting (whether driving the bus or on their way to work) were not counted. The counts were compared to the boarding and alighting totals of the 1985 "pre-station" data on a 2-hour time-period basis.

The operator's survey was undertaken by presenting, at random, a questionaire to a driver of a bus sitting in the station during the time-period 10:00 A.M. to 8:30 P.M. The driver was asked to fill out the survey survey and hand it back to the author on the bus.

Dates of the Surveys

The dates of the boarding and alighting passenger surveys were January 23, 1990 at the Garden City Shopping Centre, and January 24, 1990 at the Polo Park Shopping Centre.

The dates of the operator's survey were March 19, 1990 at the Garden City Shopping Centre, and March 19, 1990 at the Polo Park Shopping Centre.

Problems encountered

Only one major problem was encountered at the Garden City shopping centre site. The view of the station from a restaurant inside the shopping centre was occasionally blocked by delivery trucks which meant the author had to step outside of the mall in order to keep the view of the station. Fortunately this did not happen very often, and did not interfere with the count as parking trucks were anticipated before the arrival of any buses.

At the Polo Park site, the author was located in a second level restaurant over looking the station. The only problem that occurred at this site was the ability to keep track of passengers boarding and alighting during the rush hour, but this was anticipated and was remedied with the assistance of a second person.

For the driver's survey, the problem of getting the driver to take the time to respond to the questionaire was sometimes difficult. If a bus driver was running late, or did not have any layover time in the transit station then the survey was not completed. Only one driver who did have layover time at the station refused to answer the questionaire.

Observations

At the Garden City Transit Station generally most patrons used the crosswalk into the mall, but some (from the 71 and 73 routes) cut under the guard fence to cross into the shopping centre. People generally waited inside the heated mall entrance in the winter rather than in the bus shelters located on the bus platform in the station.

At the Polo Park Transit Station generally speaking, many passengers travelling to Polo Park from routes 78, 66, 79, and 97 would alight at the Portage and Tylehurst stop across Portage Avenue from the station. The buses on these routes usually arrive empty into the station after having to travel over Empress Street.

Polo Park is a well designed station, with good passenger safety and informational features. Its weakness is, of course, the fact that all routes terminating at the station from the west and southwest of Winnipeg cannot make a left hand turn from eastbound Portage Avenue into the station. Rather these buses have to travel around and over Empress Street and enter the station from westbound Portage Avenue.

People who do alight in the station sometimes jump the guard fence in the area rather than using the designated crosswalks. This of course can create a hazard for the turning buses in the station area, as bus drivers experience a blind spot while maneuvering a right hand turn and run the danger of hitting a patron who does not observe the crosswalk areas. Another danger occurs just outside the station area where passing car traffic near the mall entrance experiences difficulty stopping for wandering pedestrians.

TABLE 5

POLO PARK TRANSIT STATION

SUMMARY OF BOARDING AND ALIGHTING 1985/1990

TIME PERIOD	ROUTE	1985		1990		CHANGE	
		ON	OFF	ON	OFF	ON	OFF
10:00 - 18:00	78	148	5	201	26	35.8	420.0
	66RRCC/						
	66DNTOWN	75	132	241	86	221.3	-34.8
	79	264	5	445	34	68.6	580.0
	97	33	2	55	4	67.0	100.0
	26	55	3	95	4	72.7	133.3
TOTALS		575	147	1037	154		
TOTAL LOAD		722		1191		65.0%	

TABLE 6

GARDEN CITY TRANSIT STATION

SUMMARY OF BOARDING AND ALIGHTING 1985/1990

TIME PERIOD	ROUTE	1985		1990		CHANGE	
		ON	OFF	ON	OFF	ON	OFF
10:00 - 18:00	17	107	30	247	222	130.8	640.0
	18	248	193	257	238	3.6	23.3
	71s	105	74	87	81	-17.1	9.5
	71m	138	78	69	93	-50.0	19.2
	73	120	130	290	179	141.7	37.7
TOTALS		718	505	950	813	32.3	60.9
TOTAL LOAD		1223		1763		44.2%	

Polo Park and Garden City Transit-Transfer Station Operator's Survey

Each question allowed the driver to respond by circling the number that best represented his/her answer.

Example

2. How would you rate entering and exiting this station?
   Easy 1 2 3 4 5 Difficult

Section A: The Polo Park Transit Station

1. Does this station help you to maintain your schedule during rush hours?
   Very Helpful 33% 8% 8% 0 50% Not Helpful

2. How would you rate entering and exiting this station?
   Easy 17% 0 42% 17% 25% Difficult
   Comments:
   - Big bus is difficult to operate into the station.
   - Snow creates icy conditions, blocks entrance.
   - Entering is easy, exiting back onto Portage is difficult.

3. Are there any conflicts with automobile traffic at this site?
   No conflicts 33% 17% 17% 8% 25% Many Conflicts
   Comments:
   - At the exit, trying to get back into traffic is a problem.
   - Parked cars at the Northwest side bus stop (Eaton's) are problems.
   - Delayed entering the station because have to wait behind through buses on Portage Avenue.

4. Do you find that most passengers and pedestrians obey the designated crosswalks in the station area?
   Observe 25% 0 33% 8% 33% Do not observe

5. Do you feel the station is safe for both passenger and bus traffic operation?
   Very Safe 58% 17% 17% 0 8% Not Safe

Section B: The Garden City Transit Station

6. Does this station help you to maintain your schedule during rush hours?
   Very Helpful 36% 0 18% 9% 36% Not Helpful

7. How would you rate entering and exiting this station?
   Easy 9% 9% 36% 18% 27% Difficult
   Comments:
   - Lack of exclusive roadway for buses.
   - Exit lane: Cars stopped at the Sears Autocentre, Cars travel wrong direction on one way street.
   - Schedule does not allow enough time to operate into/through the station on #17 route.
   - Need for left hand turn lane onto Leila as cars often backed up at the light and buses cannot access this exit.
   - Station is too close to the Mall.

8. Are there any conflicts with automobile traffic at this site?
No conflicts 36% 0 18% 18% 27% Many Conflicts
Comments:
- Conflicts at the entrance and exit.
- Cars travel wrong direction on the one way exit lane.

9. Do you find that most passengers and pedestrians obey the designated crosswalks in the station area?
Observe 45% 0 9% 9% 36% Do not observe

10. Do you feel the station is safe for both passenger and bus traffic operation?
Very Safe 55% 9% 18% 18% 0 Not Safe

Additional Comments:
- Upgrade pavement as buses bottom out at the exit of Garden City Station.
- Buses and Shopping Centre Parking Lots do not mix!
- If buses enter a shopping centre site, then station should have exclusive bus lanes and access.
- Exits are icy in winter.

Optional:

Driver's preferred to remain anonymous and did not provide their names or number of years with Winnipeg Transit.

Evaluation

The purpose of the passenger counts and driver's surveys was to test the hypothesis' that the construction of transit stations at regional shopping malls has increased transit ridership to these facilities, and also that the stations have improved operations on-site at the malls while achieving transit planning goals and objectives.

The surveys have shown that the two transit stations have been an immense success in the first five years of operation. The passenger counts show that there has been a solid increase in the number of patrons using the transit stations, with the Polo Park Station experiencing a 65% increase in passenger boarding and alighting and the Garden City Station registering a 44% increase over a five year period before and after the stations were built.

The driver's survey registered a 58% response rate based on the 40 survey questionaires handed out to the drivers. Of the driver's responding, 52% came from the Polo Park Station while 48% where from the Garden City site. Key points to highlight about the Polo Park Transit Station are: 1. Entering and exiting the station appears to be a problem for some drivers; 2. Snow removal is also a major concern at this site; 3. Pedestrians who do not obey the designated crosswalk areas in the station present some safety problems for the drivers at this station. For the Garden City Transit Station, the following key points came out in the survey: 1. The need for exclusive bus lanes to enter and exit the site; 2. Schedule adjustments for passengers to board and alight buses; 3. Snow and ice removal during the winter to ensure safe operation of the buses; 4. Pavement upgrading on the exit lanes to prevent buses from bottoming out.

The driver's survey pointed out that some design modifications are needed at each site. The Polo Park Transit Station entrance and exit needs to be modified to allow safer operation of buses back onto Portage Avenue and into traffic, and Garden City could use more exclusive access lanes on the mall property.

Outside of the need to modify a few planning and design problems with the two transit stations, the driver's generally felt that the overall concept of exclusive transit facilities at regional shopping malls was a good idea. This was reflected in the comments that buses and shopping centre parking lots do not mix, but that if buses must enter the mall property then allowing them to have exclusive lanes is the only option to use in that situation. It was also reflected in the last question of the survey, in that the driver's at both stations felt that the stations were safe for passenger and bus traffic operations.

Summary

As stated in the beginning of this chapter, Plan Winnipeg makes no specific reference to the implementation of exclusive transit stations at regional shopping malls in Winnipeg. However, the development of such facilities has shown a potential for a more efficient and effective transit system and to increased ridership. These actions all lend support to Plan Winnipeg's transit-containment option, endorsed by both the Province and the City.

The development of transit stations at regional shopping malls is practical given the changing traffic and transit conditions in Winnipeg. With the demand for better transit service in the newer suburban areas and the need to maintain the high level of existing service to the downtown and within the inner city, stations allow for the transit system to adapt to these changing conditions and become a more viable alternative to the automobile.

The case study of Winnipeg in this chapter has provided insight into a number of factors that suggest that the development of exclusive transit stations at regional shopping centres is warranted. The increase in automobile ownership in the city of Winnipeg and the ensuing its use by suburban residents to facilitate trip movements between residential areas and suburban commercial shopping areas has meant that the parking lots of malls are more congested and difficult to effectively service by transit.

The main focus of transit service in Winnipeg continues to be on the downtown commuter trip, although transit has had to expand its service farther out to the new suburban areas and meet the new travel demands of persons wanting to travel between suburban residence and shopping mall. Given these conditions, Winnipeg Transit ridership has remained relatively high over the last ten years.

Suburban Shopping Centres have expanded considerably over the last ten years in the city of Winnipeg, such as the major expansions at Polo Park and Garden City with minor expansions at Grant Park, St.Vital, and Kildonan Place malls. These expansions and re-developments have affected peoples travelling patterns within the city of Winnipeg and put demands on transit to better service the mall sites. With Winnipeg Transit's policy of providing service to all regional shopping malls within its service area, the development of the transit station at two of the six regional malls has not only met the demand for improved transit service, but also improved the aspects of the overall city system.

The existing Polo Park and Garden City Transit Stations have aided transit in providing better service to the shopping malls and their surrounding neighbourhoods, and have reduced the walking distance for passengers between the bus stops and the front door of the malls. This is considered to be a bonus in Winnipeg because of the large setbacks that have been allowed by the planning department to the shopping centre developers.

The case study and surveys have shown that the two transit stations have been an immense success in the first five years of operation, although some design modifications are needed at each site. Generally each station have given the patron of transit, the transit system, and the mall owner better service, easier transfer movements, along with the benefits of increased access to shopping and recreational facilities.

CHAPTER 5
Implementation Strategies and Recommendations For Winnipeg

"The problem is to distinguish between two questions:
What would we like to achieve? and How shall we achieve it?"

Earl Levin, 1962

Introduction

Planning for transit transfer stations at regional shopping malls requires the close co-operation among many agencies which must adjust some of their activities to accommodate such a facility. For example, the streets and transportation department may be required to install or revise traffic control signals to accommodate bus turning movements into the new station. Legal advisors are necessary for the establishment of each of the involved parties rights and obligations. Thus, it can be seen that implementing transit stations is complex and requires the development of a strategic planning process.

This chapter outlines the successful features and factors of transit stations based on the examination carried out in previous chapters. It explores future site locations for exclusive transit stations around the city of Winnipeg, then the planning process is then reviewed. The chapter further explores the concept of a Transit Station Policy Program for the on-going planning, implementation and maintainence of these facilities. The recommendations that follow in this chapter were developed based on the evaluations of the case studies done both nationally and locally, and the results of the passenger counts and driver's surveys done at the Polo Park and Garden City Transit Stations. The evaluations and results again re-enforce the notion that major transit transfer points can be successfully integrated with major areas of urban activities and land use. That by carefully planning for the connection between transit and land use, cities can reduce the costs of urban growth while improving the form, quality, and efficiency of their environments for their citizens.

Lessons in Transit Station Planning and Design

The previous chapters examined the many different features and factors of transit station planning and design. The second chapter dealt with the underlying link between mass public transit and land use planning, station location, and on-site layout and anemities. The third chapter reviewed station development in the cities of Burnaby (Vancouver), Edmonton, Mississuaga, Ottawa, and Québec City. The fourth chapter examined Winnipeg as a Case Study by itself, exploring the need for stations and evaluating exisiting facilities. Four major lessons in transit station planning and design emerged. These lessons are: 1. Most common design recommended and employed; 2. Exclusive access to shopping mall property; 3. Location of Stations in relation to high activity urban land uses; and 4. Achievement of transit planning objectives.

The most common design recommended and used was the oval or rectangular 'island' style, where buses loop around a concrete pedestrian platform. This design was complemented by the use of the sawtooth bus bay, appropriate signage and information, and effective shelter facilities. Examples of were found in Burnaby (Vancouver), Edmonton, Winnipeg, Mississuaga, Ottawa, and Québec City.

Exclusive access by transit vehicle to service regional shopping centres was design principle employed by all of the case study cities. Mississuaga and Winnipeg provided examples of transit stations located on mall properties without exclusive bus lane access and highlighted the some of the problems encountered. It was from the experience of Mississuaga and Winnipeg that exclusive access was considered neccessary as part of any future plans for transit stations.

The location of transit stations in relation to high urban activity land uses, namely regional shopping centres, were found in all case study cities except for Québec City. In addition, the cities of Burnaby and Ottawa practiced co-ordinating their placement of transit stations with exisiting regional town centres as outlined in their regional land use planning

policies.

The achievement of transit policy objectives of increasing the use of public trtansportation has been accomplished with the implementation of transit stations. Contributing to the improvement of the quality of service delivered at regional malls has been the centralizing of bus passenger activity and a rationalization of route structures in exclusive facilities. These finding were corroborated by the boarding and alighting studies done at the Polo Park and Garden City transit stations in Winnipeg, and by the ridership data provided by BC Transit. Also, the link between mass transit and land use planning was realized when transit stations were located at regional shopping centres.

These lessons influenced the development of the recommendations contained in the proceeding sections of this chapter. The recommendations represent general principles which can be used by transit planners when considering transit station development.

Future site locations within the system

RECOMMENDATION ONE

That Winnipeg Transit actively begin pursuing development of seven transit stations around the city of Winnipeg in co-operation with the owner/developers of regional and community shopping malls nearby these proposed sites. These stations should be built at the rate of one per year starting in 1991 and ending in 1997.

In conjunction with station development, Winnipeg Transit should make necessary route modifications so that a circumferential route utilizing 9 of the 11 final station locations in the city could be implemented.

That all transit stations and their locations be clearly marked on future issues of the Winnipeg Transit Route Map and Service Guides.

The location of new transit stations in the city of Winnipeg transit network would seem evident given the successes of such facilities in Vancouver, Edmonton, Mississuaga, Ottawa, and Québec City. Their usefulness greatly aides transit in delivering better service

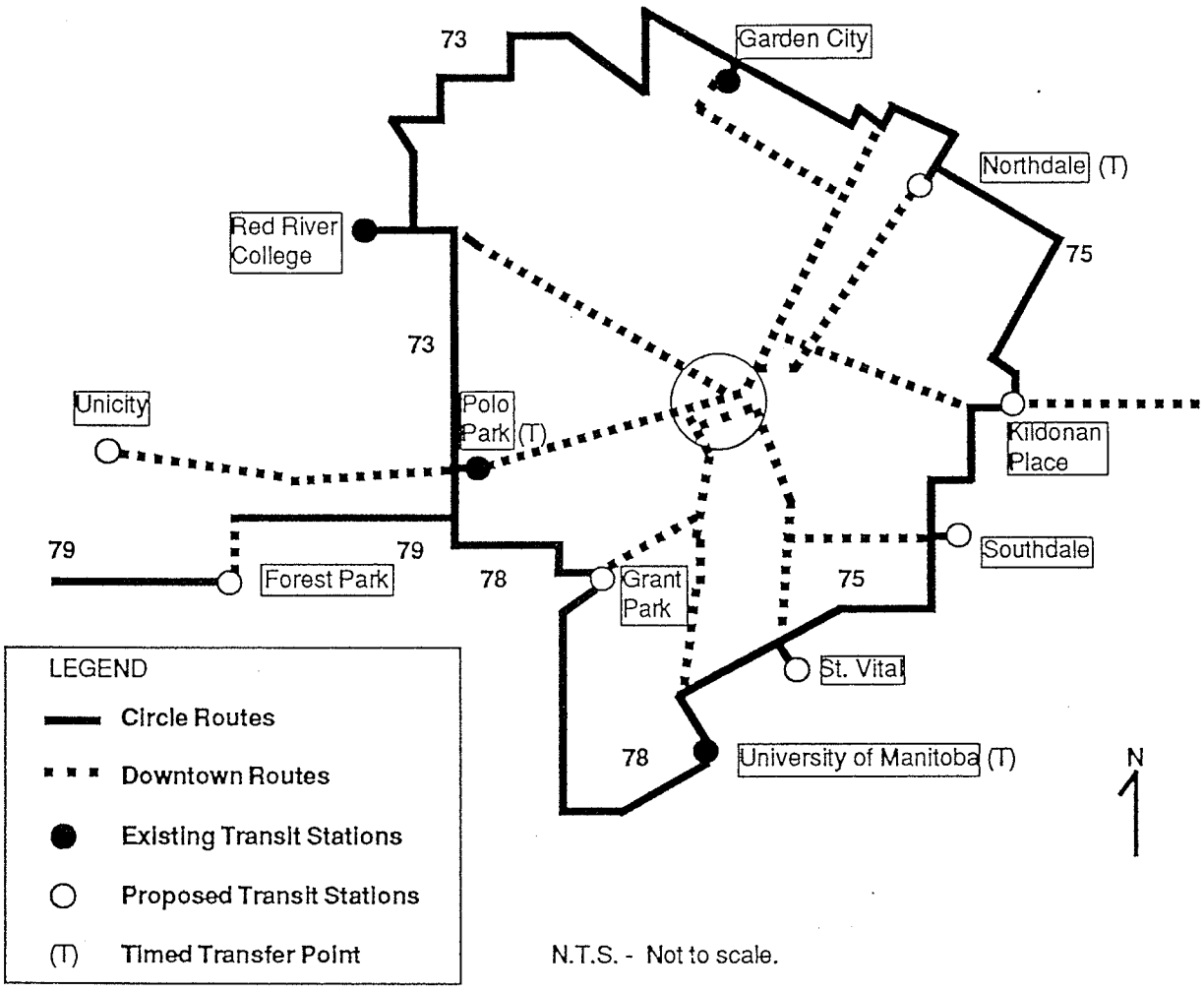
to regional shopping malls, while also centralizing transfers throughout the system at one a handful of locations. The operating costs offered in the long-term by these facilities are attractive to transit properties considering such a development. In Winnipeg, the existing stations at Polo Park and Garden City have proven their utility to not the user of the transit system, but to the shopping mall owner and the transit system.

In determining the location of new transit stations around the city of Winnipeg, an analysis of the current points of heavy transferring on the system's various routes was undertaken. The easiest way to determine this was to review the current issue of the system map and plot the points of convergence where many through and local routes met. Then in consultation with transit officials regarding transfer loads at these points, confirmations of sites bearing potential for transit station development was undertaken.

The next major factor in the analysis of these sites was to determine the close approximation of the nearest regional shopping mall. In the analysis of Winnipeg, seven potential sites were identified for transit station development. After the seven potential sites were plotted onto a transit system map of Winnipeg, along with the two existing shopping centre based stations and the two post-secondary institution stations, a unique opportunity presented itself. The development of a circumferential route which would circle around in areas outside downtown of Winnipeg. This route would connect nine of the proposed eleven transit stations in the system (four of which already exist) by routes that are already in operation. The route 73 Leila, 75 Lagimodiere, 78 Waverly, and 79 Charleswood would all link the proposed circumferential network with the exception being in the north end of the city. Here the expected completion of the Kildonan Corridor bridge in late 1990 would allow for the final link, or extension of existing routes, to complete the network. These seven locations are identified in Figure 30.

FIGURE 30

PROPOSED WINNIPEG CIRCUMFERENTIAL TRANSIT NETWORK



Transit Station Planning and the Planning Process

Goals and objectives are general statements that articulate a desired future state of affairs. The goals and objectives for transit station planning can be summarized as follows:

Goal: To provide on-site transit access to all regional shopping centres in the city of Winnipeg.

Objectives: Minimize walking distances for shopping centre customers who use public transit.

Minimize diversions for through passengers travelling on transit.

Maintain schedule adherence of the transit service.

The process of transit station implementation and master planning requires a systematic approach. The implementation process is larger in scope than the actual transit station master plans and provides the transit planner with a framework for station development. After there is a commitment from the government at both the civic and provincial levels, along with funding arrangements, then the implementation process should begin and according to the following steps:

1. **Goals and Objectives** - clearly defining generally what it is to be accomplished in the future.

2. **Demand Study** - Briefly review and examine the key transfer sites throughout the system, the site relation to regional malls, and if passenger activity and bus traffic warrants a station. Mall owner participation required.

3. **Station Circulation Facilities Analysis** - develop a preliminary site plan after determining the demand. This can be done by using the framework established by Petersen and Braswell and available in Appendix A of this practicum.

4. **Community Participation** - an integral part of the planning process to support and review preliminary findings. This would involve the participation of other municipal agencies, mall owners, and citizen interest groups. The format for such a forum would be the public meeting setting.

5. **Development of a Transit Station Master Plan** - with specific design considerations based on the findings of the previous three steps. The plan will also outline clearly the funding base for the projects. The public should have ample time to review and understand the plan, and their reactions should be seriously considered.

6. **Implementation** - of the final plan.

7. **Review Process** - should be develop to monitor the master plan and re-assess its implementation in relation to future planning of the system.

Development of Transit Station Facilities Policy Program

RECOMMENDATION TWO

That the adoption of the *Transit Station Facilities Funding Program* be undertaken by the City of Winnipeg and supported by the Provincial Department of Urban Affairs.

The need to develop an ongoing policy that will allow for the further development of transit stations in the City of Winnipeg is evident. This policy would not only identify funding sources for the implementation of stations, but also propose a time framework in which the rational addition and development of each site would take place. The program would be undertaken by the transit system and involve the planning section of transit to negotiate with the various developers and owners of shopping malls with the goal of implementing this program.

Financing Formula

The precedent set by the development of the Polo Park and Garden City transit stations serves as an excellent example of how future stations should be developed in the city of Winnipeg. The previous formula had the developer/owner of the mall pay the majority of the costs associated with station construction and the city and the province pay a corresponding share on 50-50 cost share basis. It is proposed that the developer of future facilities pay 75 percent of the construction costs with the city and province each contributing the remaining 25 percent of the costs.

City Responsibility

The City of Winnipeg would be required to make a commitment by council, at the request of the transit department, for the implementation of the *Transit Station Facilities Funding Program*. This commitment would mean endorsement for the construction of

seven additional transit stations around the city of Winnipeg as described by table 7 and presented in figure 26. This would allow the planning section of the transit department to actively pursue the development of these facilities by entering into negotiations with the developers and owners of regional and community malls where the proposed station sites are to developed. Also with the commitment to the development of stations for the transit system would be the allocation of appropriate resources, based on the established financing formula prescribed, according to the implementation as outlined in table 6. The city would request the Provincial Department of Urban Affairs to become a partner in the development of these stations and share in their costs as was previously done with Polo Park and Garden City.

Provincial Responsibility

Financial assistance to the city of Winnipeg for urban transit is provided by the Department of Urban Affairs and comes through three separate grant programs: *The Urban Transit Capital Grant, The Innovative Urban Transit Demonstration Projects Grant,* and *The Urban Transit Operating Grant.* Of these programs it was the *Innovative Urban Transit Demonstration Projects Grant* that provided the monies for the construction of the Polo Park and Garden City Transit Stations in 1986.

The objective of the *Innovative Urban Transit Demonstration Projects Grant* is to help increase the efficiency and effectiveness of the transit system in Winnipeg in order to facilitate an increase in ridership. The program grant supports Plan Winnipeg's transit-containment option and covers 50 percent of the net approved cost of the specified project. It is from this grant that on-going financial support for the proposed *Transit Station Facilities Funding Program* would be obtained.

Transit Responsibility

The role of the Transit Planning Section in this would be to initiate all discussion with the mall developers and owners with the goal of siting a transit transfer station on the mall property. All technical aspects of the proposed project would be the responsibility of the transit planning section, with the cost sharing of the construction of the station carried out as described by the financing formula in this practicum.

TABLE 7

STATION IMPLEMENTATION SCHEDULE

STATION	ROUTES	TYPE	PRIORITY
Existing:			
Polo Park Centre	11, 12, 21x, 22x, 24x, 26, 66, 78, 79, 97	Regional Mall	1986
Garden City Centre	17, 18, 71, 73	Regional Mall	1986
University of Manitoba	60x, 62x, 75, 76, 78	Post Secondary Educational Inst.	1984/ 1990
Proposed:			
Kildonan Place	12, 47x, 48x, 75, 87, 90, 92	Regional Mall	1991
Southdale	16, 50, 51, 57x, 75	Community Mall	1992
St. Vital Centre	14, 16, 54x, 55, 58x, 75, 76	Regional Mall	1993
Northdale	11, 41x, 85, 90	Community Mall	1994
Unicity	11, 21x, 22x, 24x, 66x, 81, 82, 83	Regional Mall	1995
Forest Park	66x, 98	Community Mall	1996
Grant Park	64, 66x, 78	Community Mall	1997
Upgrade:			
Red River Community College	26, 27, 28, 66, 73	Post Secondary Educational Inst.	1991

Considerations in Planning and Design of Station Facility Amenities

The following planning and design guidelines must be viewed as just that; guidelines. They were developed as an attempt to define those elements that can optimize convienence and comfort for the transit passenger while reducing any complex and potentially dangerous situations on route and at the transit station. In developing transit stations it must be remembered that each station site will have a unique set of characteristics which will best serve transit riders, the transit authority, and the shopping mall owner.

Social Aspects

When dealing with the social aspects of planning transit stations, the essential point to remember is that of the user who must use the station on a regular basis. Such factors as a harsh climate, the need to transfer easily between buses, and the concern for safety and security are all elements which influence a passenger's, or a potential passenger's, perception of a "good" transit system.

Shelters

RECOMMENDATION THREE

Transit shelters should be heated, provide relief from the wind, have seating available, and schedule information. These shelters must be located at all transit station sites.

In cities that experience harsh climatic conditions it is important to develop a transit station that is appropriate for conditions existing throughout the four seasons. For example, Winnipeg's temperature during the winter is below an average of 0 degrees celsius five months a year, yet it can top the 30 degrees celsius mark in the summer season. The city has a annual frost free period of approximately 100 days. As a consequence, Winnipeg is characterized by a wide range in climate. Summers are hot, spring and fall often wet and damp, while winter experiences periods of heavy snow accumulation, the formation of ice,

and high wind chill values.

Planning for on-site amenities is of importance. The on-site waiting area at the transit station should provide shelter facilities. The shelter facilities should provide relief from wind, have seating available, schedule information, and should be heated to provide some relief from the cold winter temperatures. Accordingly, these facilities should be constructed of vandal-proof materials so as to continue to be functional for as long as possible before replacement is necessary.

Information and Signage

RECOMMENDATION FOUR

Signs must clearly define the bus stop and routes that stop there. Directional signs (maps) must also be available. Telephones should be located on site. Pavement textures defining platform, stop, and pathways should be incorporated into the design of the station.

Transit stations must have adequate signage that clearly identifies where the main bus platform and bus stops are so that passengers can transfer with a minimum of difficulty and easily determine their correct route of travel. According to Cantilli and Fruin, the average human receives most of his/her direct information stimuli through visual means. In fact, they state, that short-term memory experiments have shown that visual presentation is more effective than aural presentation.[79]

Since the average waiting time for the majority of transit patrons will be approximately 10 minutes, then visual presentation of information is desired. The use of an overall system map, frequency tables, schedule posting, large and clearly marked bus stops, are relatively inexpensive and effective means of communication. However, the means by which the blind use for finding their way provides alternatives for information dissemination. In addition to the visual, aural and tactile means must also be incorporated into the station

[79] Cantilli, Edmund J., and John J. Fruin. "Information Systems in Terminals." Traffic Quarterly. April 1972, p. 232.

design. Telephone information systems to convey schedule information and the texture of the passenger waiting platforms can assure the passenger finds the right route to his/her destination.

Communication media must provide essential information that the patron can grasp within seconds, preferably without breaking his/her stride when transferring buses especially during rush periods. In this context, a secondary information display should be provided with more detailed signs in case the patron does become disoriented and needs reassurance about routes and connections at the station. However, the total amount of information being received by the station passenger is very great. Cantilli and Fruin suggest that there is a limit to how much a person can interpret at one time, and that limits on certain types of information - such as a limit on excess commercial advertisements - are needed.[80]

The Polo Park Transit Station uses larger than normal bus stop signs with giant alpha-numeric characters to aid passengers in locating their route. Each stop has its own telebus automated telephone schedule number which provides individual route information. The choice of both concrete and coloured inter-locking paving stones help to define the shopping centre to transit station pathway, as well as bus stops on the platform. At the Garden City Transit Station, free telephones directly linked with the telebus system provide patrons inside the mall with easily obtained transit schedule information.

Security

RECOMMENDATION FIVE

Architectural features should minimize dark areas and make the station visible to street and mall security. Vandal-proof materials should be used during construction.

It is important that all users of the transit system feel secure on the site of the station, because there will be times when very little activity occurring at the facility. Sufficient lighting on the station site at all hours, and architectural features and design that minimizes

[80] Ibid. p. 234, 244.

dark areas will help in public and police surveillance of the site. Also, the adjacent shopping mall has its own security system which may watch over the activity at the station.[81]

Economic Justification

RECOMMENDATION SIX

Transit station implementation should be pursued where high levels of route convergence and transfers occur. Where possible, stations should be developed in conjunction with high activity centres and land uses such as regional or community shopping malls. Development should be a joint activity of the mall owner/developer, the transit authority and a senior level of government.

The primary reason for justifying the implementation of a transit station at a regional shopping mall is the optimization of operating costs for the transit authority. Other reasons include increased benefits for mall patronage and the potential lower capital construction costs if implemented under a joint development scheme between transit property, mall owner, and a senior level of government. However, the main reason is to keep operating costs minimized while providing transit service to the mall.

The ideal situation is to provide better transit service to regional shopping centre at a minimum cost. Naturally, the building of a transit station would incur a short-term investment, but this investment is returned by a reduction in the number of late running buses due to mixed-traffic operation and traffic congestion at rush periods. Compared to operating in the parking lot with other traffic, an exclusive transit station offers better on-time performance of buses while in the shopping centre area. This gives the mall an increase in patrons (as demonstrated by the Polo Park and Garden City Transit Station Survey in this practicum) and offers minimized operating costs and better delivery of service for the transit authorities.

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[81] Fruin, J. "Environmental Factors in Passenger Terminal Design." Transportation Engineering Journal. Vol. 98, No. TE1, February, 1972. p. 98-99.

The Technical Council Committee of the Institute of Transportation Engineers recommends three points of action for transit authorities when considering delivery of better bus service to regional shopping malls while also containing increased operating costs to a bare minimum:

> 1. Penetrate the shopping centre site with transit service only when the mall building is located at a distance from the street, and when trips by bus to the shopping mall warrant it. In this case, a route should enter the site if 50 percent or more of its riders are destined for the mall.
>
> 2. Minimize the additional route travel time and distance, particularly for through routes, when transit penetration is justified. To reduce inconvenience to through passengers a maximum additional time of three minutes and a maximum additional distance of 500 metres (1650 feet) are appropriate. The need for additional vehicles for through routes are not necessary if these guidelines are followed.
>
> 3. Minimize the additional operating when penetration on the mall site is necessary. This includes negotiating with the mall owner for provision of on-site amenities and exclusive use of private roadways. If the owner refuse such measures, but wishes transit service, then request 50 percent of any additional gross operating costs incurred to the site.[82]

Legal Considerations

Among the legal considerations taken into account when implementing an exclusive transit station is the obtainment of a formal easement from the developer or shopping centre owner. An easement, by definition, is the right enjoyed by one landowner over the nearby land of another owner, and is usually obtained for a special purpose rather than for the general use and occupation of land. The holder of a right of way may pass over the land of another in order to access his/her own property. Once an easement is granted to someone, the future owner of the land cannot interfere with his/her right to enjoy that easement.[83]

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[82] Technical Council Committee. "Transit Service to Regional Shopping Centres." ITE Journal. July, 1986, p. 21.

[83] Smyth, J.E., and D.A. Soberman. The Law And Business Administration In Canada. Scarborough: Prentice-Hall Canada Inc., 1983. p. 562.

The term "easement" is also applied to the statutory right that is given to most public and private utility companies. Under statute by law, the utility company has the right to run pipes, wires, etc., overhead or underground of various landowners in an area. Because the utility has the right to regularly maintain their infrastructure by entering onto the various lands, then this type of arrangement closely reflects an easement. However, this arrangement is not truly an easement situation because the utility company normally does not own land in the area where its infrastructure traverses, and does not reflect the dominant tenement and servient tenement arrangement of landowners that is required for a true easement.[84]

Further considerations are highlighted by the example BC Transit provided surrounding the placement of its transit exchanges (stations) in Vancouver. Other considerations are that the transit property is liable for its operations and passenger safety within the easement where the station is located. Another is that agreement to use the access roadways to ingress and egress the station is obtained from the shopping mall owner. Finally, the transit authority be saved harmless for the design features of the development which are outside of its control.[85]

As a final note, if the implementation of a transit station is a joint development between multiple parties, such as the transit authority, the mall owner, and a senior government department, then an agreement defining the responsibilities of each party would have to be drafted.

Design Options

In most situations the most appropriate transit station design is the oval or rectangular island as proposed by Vukan Vuchic, and utilized the most by the cities cited in Chapter 3. Even though it is recognized that each station site has its own unique set of characteristics, such as roadway access and shopping centre setback, the rectangular island offers the

[84] Ibid. p. 563.

[85] Glen Leicester. Service Planning Manager. BC Transit. Nov. 22, 1989.

transit authority the best design in terms of passenger safety and convienence, along with unobstructed and safe operation of vehicles. The island also centralizes the station function so that the area can become a strong visible sight in the context of the surrounding developed area.

Petersen and Braswell offer some general considerations when a transit property plans for a transit station. They suggest that bus facilities, such as stations at malls, should be designed to accommodate future changes that may occur in route patterns. The number of terminating and through bus routes will vary over periods of time and the station should be able to be adapted such changes. Bus passengers definitely should not be required to cross any roadways open to general automobile traffic unless such a crossing is controlled by means of signal devises or pedestrian crossing. Through routes should be accommodated in the station only if this action does not complicate the station area or cause delays of buses. If this cannot be secured, then "thru-routed" buses should stop on-street by the station with walking transfers easily completed.[86]

Access

RECOMMENDATION SEVEN

Priority of access for safety reasons should be determined as follows: pedestrians, bus routes by type of service, taxi service, and finally Park and Ride space for automobiles.

When determining access to the transit station it is important to sort all traffic to the facility by type. The pedestrian is given top priority, for safety reasons, when designing the station. The next order is the transit vehicle which must be sorted by type of vehicle (i.e. size) and type of route. Again, terminating or local service must be assured a space in the station, while through routes should only be accommodated if the station space permits. Roadways surrounding the station should be analyzed to ensure that bus operations are not

[86] Peterson, Stephen G., and Robert H. Braswell. "Planning and Design Guidelines for Mode Transfer Facilities." Traffic Quarterly. July, 1972, p. 408.

severely hampered and that schedule adherence can be maintain in the rush hour periods. Taxis and other jitney operations can be afforded some parking space at the station to give patrons full choice of mobility when at the station. Parking facilities for cars using the Park and Ride concept at the station should be given lowest priority and only allocated if station space permits.

Bus Bays

RECOMMENDATION EIGHT

The sawtooth bus bay should be employed in all transit stations, preferably surrounding a oval or rectangular island (only if the number of bus routes exceeds five).

The simplest type of bus loading bay or berth is designed so that all the vehicles line up at some desirable spacing; this spacing is determined by the type of operation. If all vehicles are to move without severe interference, they must be able to position the rear door close to the curb and to then move into the travel lane. This is accomplished either by lining the buses up in a straight line along the curb and behind one another, or by incorporating a sawtooth bus bay design which allows the bus to line its rear door to a curb while having its back end tailed-out. Passengers can therefore board and alight the bus at curb level from the platform and the bus can easily move on with very little difficulty.

Timed Transfer Connections

RECOMMENDATION NINE

Time transfer should be implemented only where a transfer between a infrequent to infrequent feeder or infrequent feeder to frequent main line route is essential. This should be done only at certain sites throughout the system.

Synchronized interface is important in situations where a connection between a frequent and infrequent route are essential to some transit patrons. Transfers between two frequent

routes, however, do not entail any long amount of waiting time. Winnipeg Transit currently utilizes time transfer at a few key on-street locations in its systems and should expand this service to other locations around suburban Winnipeg.

Intercity Carrier Interface

There may be some need to allow intercity bus carriers to operate into selected transit stations at regional shopping malls in order to facilitate transfer interface between modes. Greyhound Lines of Canada Limited, the national intercity bus carrier, would be willing to allow some of its buses to stop at the Polo Park Transit Station and the proposed Southdale Transit Station provided there is enough room to accomodate them. Greyhound management felt this situation would be good for passengers from nearby rural Manitoba towns travelling to locations in suburban Winnipeg who could also utilize Winnipeg Transit to finish their trip, or visa versa. However, management expressed concern over delays of buses in stations, schedule adherence on runs, and any interference between Winnipeg Transit and Greyhound buses.[87] Grey Goose Bus Lines, Manitoba's regional carrier, stated that it would not be interested in this type of operation. The reasons for this decision according to Grey Goose management were: 1. Grey Goose operates a large number of schedules and uses too many different routes in and out of Winnipeg to effectively utilize the suburban transit station stops; 2. Concerns over schedule delays and interference between intercity and urban transit buses.[88]

Context

RECOMMENDATION TEN

The transit station should stand out as a memorable image.

The siting of transit station facilities must take into account a large number of factors above and beyond those which are directly associated with the efficient operation of

[87] Garry Peppler. Assistant Regional Manager. Greyhound Lines of Canada Limited. December, 1989.

[88] Kurt Enns. Vice President and General Mgr. Grey Goose Bus Lines (Manitoba) Limited. March, 1990.

buses. These include community impact, availability of land resources and context in relation to the surrounding environment. The design of the transit station facility should be easily identifiable both as a "foreground" building in the shopping mall area and as part of the overall transit system. The station facility will be significant in the community - it is located in a high activity area and will independently generate traffic. The usage of the standard transit system logo elevated on a tall sign post and the colour and the materials utilized in construction of the station area should leave the both the transit patron and passing public with a distinct image.

RECOMMENDATION ELEVEN

The City of Winnipeg should adopt and implement planning principles which encourage transit friendly goals and objectives.

The City of Winnipeg through the Environmental Planning Department, Streets and Transportation Department, and the Transit Department would pursue the implementation of official and secondary plans which recommend land use mixes and urban forms that support a high density of development in clusters around transit station areas, and promote the development of self contained neighbourhoods that are condusive to increased transit ridership. In specific, density bonuses could be used to encourage private developers to cost share transit infrastructure and projects.

Summary of Options

To conclude this chapter, two possible actions surrounding the implementation of transit stations in Winnipeg are reviewed. The two options offer two different approaches to the design and development of stations along with two different operating schemes for Winnipeg Transit at these facilities. The two options employ the general guidelines outlined earlier in this chapter for design of station.

Option A

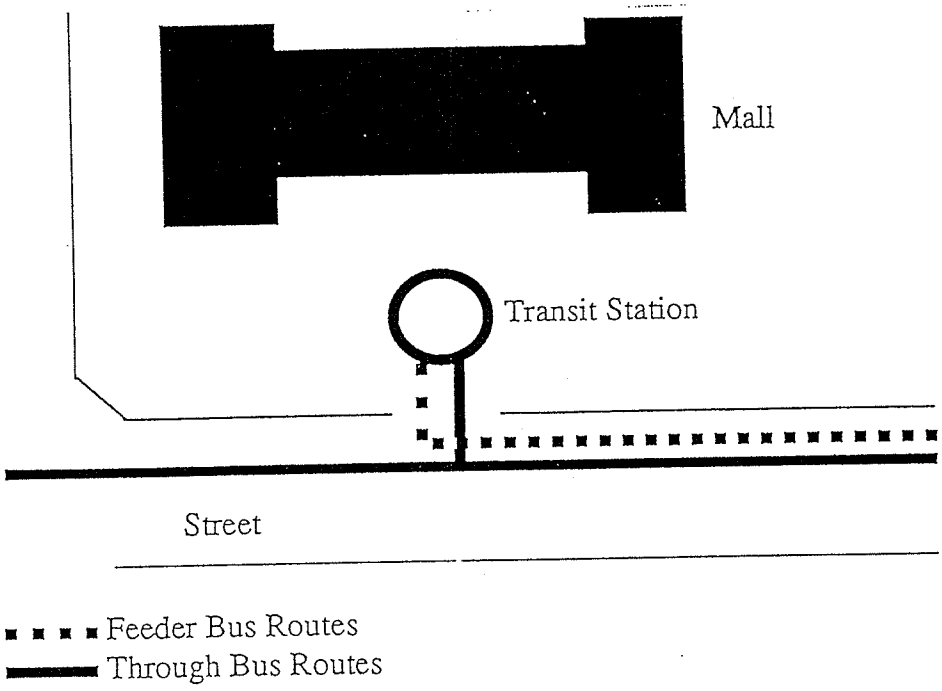
Option A would have Winnipeg Transit operating all of their terminating routes and through main line routes running into a station sited at a regional shopping mall. This would mean that the terminating and feeder bus routes would be located on a central rectangular island in the station area, and the main line through routes located in bus bays encircling the outer edge of the station area. Time transfer would be employed between infrequent feeder to infrequent feeder bus routes. Main line Haul and terminating and feeder routes would all operate into the large station. The design of the station in this Option would follow all of the general guidelines outlined in this chapter of the practicum. Examples of this type of transit station were found in the Westwood Mall Station in Mississuaga, the Terminus Les Saules in Québec City, and the Southgate Transit Centre in Edmonton.

FIGURE 31

TERMINATING FEEDER AND MAIN LINE ROUTES IN STATION AREA

CONCEPTUAL PLAN

Option A



Option B

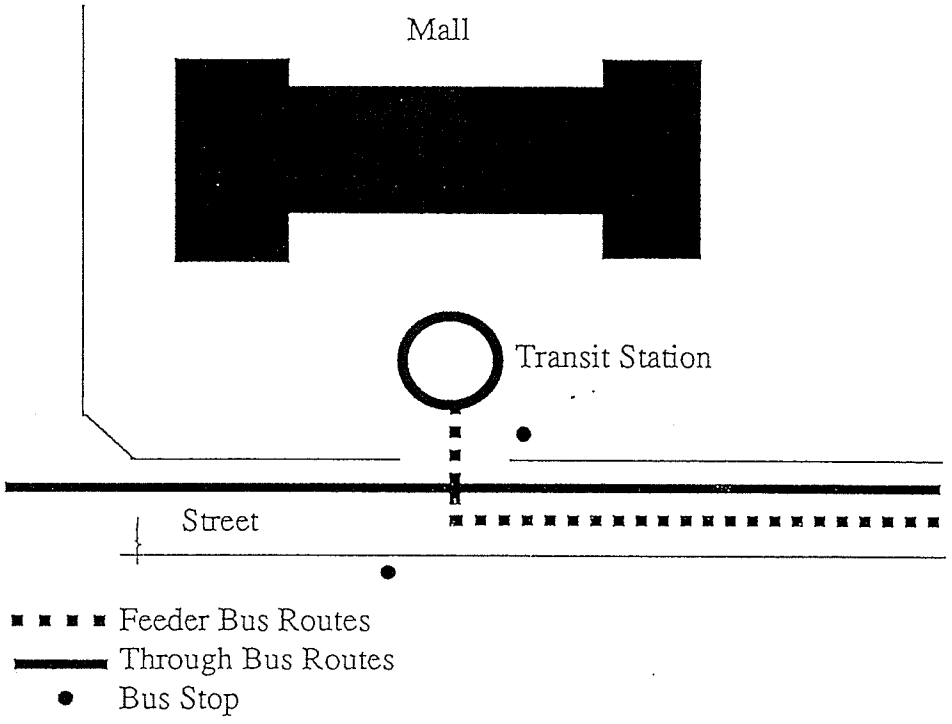
Option B would have the Winnipeg Transit system operating just their terminating routes into a station sited at a regional shopping mall. This would mean that the terminating and feeder bus routes would be located on a central rectangular island in the station area. Time transfer would be employed between infrequent feeder to infrequent feeder bus routes. Only the terminating and feeder bus routes would operate into this moderately size station, with main line route stopping on-street nearby the station in order to facilitate transfers and shopping centre access. The design of the station in this Option would follow all of the general guidelines outlined in this chapter of the practicum. Examples of this type of transit station were found in the Polo Park Station in Winnipeg, the Square One Station in Mississuaga, and the Brentwood Mall Exchange in Burnaby.

FIGURE 32

TERMINATING FEEDER ROUTES IN STATION AREAS

CONCEPTUAL PLAN

Option B



CHAPTER 6
Conclusion

"Since one kind of communication can substitute for another, a circulation plan seeks an optimum balance of modes, not blind reliance on a single one."

Kevin Lynch and Gary Hack, Site Planning, 1986;193

This practicum has examined the placement of exclusive public transit stations at regional commercial shopping malls. The investigation of existing station locations in the city of Winnipeg, and in the cities of Vancouver, Edmonton, Mississuaga, Ottawa and Québec City. An evaluation of current station planning practices and implementation was done with the review of basic planning and design principles involved, and with the utilization of passenger and operator surveys.

Secondly, the practicum assumed that there is an underlying link between mass transportation and land use in Canadian cities. This linkage was explored briefly in Chapter 2 and further developed throughout the practicum by studying case examples from other Canadian cities where station development and land use were closely linked. The Implementation and Recommendations contained in Chapter 5 proposed to recognize this linkage by having all transit stations proposed for Winnipeg to be located at regional shopping malls which are in essence high activity centres or "regional town centres."

This practicum does not attempt to design the "best" station layout or advocate a "final" design that can be applied to every situation in every city. Rather, it attempts to identify planning and design guidelines which can be used to aid transit planners in developing stations for their systems. Although the investigation and recommendations have largely related to the Winnipeg situation, there are general concepts in station planning and design which may be utilized by other cities across North America.

A summary of the planning and design guidelines outlined in this practicum are:

Policy:

That the adoption of the Transit Station Facilities Funding Program by the City of Winnipeg and supported by the Provincial Department of Urban Affairs.

System:

Transit station implementation should be pursued where high levels of route convergence and transfers occur. Where possible, stations should be developed in conjunction with high activity centres and land uses such as regional or community shopping malls. Development should be a joint activity of the mall owner/developer, the transit authority and a senior level of government.

That Winnipeg Transit actively begin pursuing development of seven transit stations around the city of Winnipeg in co-operation with the owner/developers of regional and community shopping malls nearby these proposed sites. These stations should be built at the rate of one per year starting in 1991 and ending in 1997.

In conjunction with station development, Winnipeg Transit should make necessary route modifications so that a circumferential route utilizing 9 of the 11 final station locations in the city could be implemented.

That all transit stations and their locations be clearly marked on future issues of the Winnipeg Transit Route Map and Service Guides.

Land use:

The City of Winnipeg should adopt and implement planning principles which encourage transit friendly goals and objectives.

Amenities:

Transit shelters should be heated, provide relief from the wind, have seating available, and schedule information. These shelters must be located at all transit station sites.

Signs must clearly define the bus stop and routes that stop there. Directional signs (maps) must also be available. Telephones should be located on site. Pavement textures defining platform, stop, and pathways should be incorporated into the design of the station.

Architectural features should minimize dark areas and make the station visible to street and mall security. Vandal-proof materials should be used during construction.

The transit station should stand out as a memorable image.

Priority of access for safety reasons should be determined as follows: pedestrians, bus routes by type of service, taxi service, and finally Park and Ride space for automobiles.

The sawtooth bus bay should be employed in all transit stations, preferably surrounding a oval or rectangular island (only if the number of bus routes exceeds five).

Time transfer should be implemented only where a transfer between a infrequent to infrequent feeder or frequent main line to infrequent feeder route.

The continued usage and utility of exclusive transit stations and terminals can be projected into Winnipeg's future, as the operation of a bus-based transit system will remain the norm. Only slight variations in this type of system are likely to occur in the next ten years, such as the change of motive fuel from diesel to methanol (currently under test in Winnipeg and Lethbridge by the Federal Department of Energy, Mines and Resources) or electricity (as was planned for in an 1982 consultants study for Winnipeg Transit for the conversion year 1987). Other variations that are likely to occur will be the use of innovative transit vehicles, such as the articulated (60 foot) bus, in addition to the standard 40 foot bus in use today.

A switch to a fixed guideway system, such as light rail or heavy rail trains, is unlikely to occur in Winnipeg's future transit transportation plan. The use of the busway concept and exclusive bus lanes,whether curb side or centre median in orientation as were described in Plan Winnipeg, will be the choice mode of rapid transit adopted for the future.The Southwest Transit Corridor (Busway) along with the downtown Graham Avenue Transit Mall are expected to be constructed between 1993 and 1994. Exclusive bus lanes on Portage Avenue and Main Street are expected to be implemented also around 1993 and 1994.

The variations and changes to Winnipeg's transit system as described above can be integrated quite easily with the current transit station designs. With the conversion of motive fuel, methanol powered buses will require no modification to the current transit station planning and design practices in Winnipeg. However the use of the 60 foot articulated bus for higher capacity and lower operating costs will require that transit station bus bays be changed to accommodate the larger vehicles. If the introduction of trolley or electrically powered buses becomes feasible then transit stations will have to accommodate the overhead wire infrastructure that goes along with this type of technology. The busway, exclusive bus lane, and transit station concepts can all be linked into improving the operation of the Winnipeg Transit System as a whole, and together provide a better quality of service delivered to the users of the system.

The Planning of public transportation in conjunction with land use planning presents the opportunity to improve our cities, our mobility and our quality of life. The opportunity for transit planners to move in this direction rests with their ability to re-enforce the notion that a more balanced transportation system for the city of the future is important. Clearly, transit planners will have to achieve that goal by implementing various actions that deliver better transit service to the population, It is hoped that this practicum will be useful to both practicing professionals and to students of city planning who wish to ensure the continued development of public transit in the urban environment.

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APPENDIX A

Procedure for station circulation facilities analysis

The following steps suggest a procedure to arrive at conceptual plans for the circulation facilities needed at at transit station:

Step 1. Evaluate the raw data to determine if the walk trips from zones close to the station have in fact shown up as walks. Sometimes network sensitivity in computer processing is not great enough to get true mode selection from close-in zones.

Step 2. Using the network loadings, after the close-in walk trips are removed, determine the number of buses required in the peak hour. An appropriate assumption is to divide the number of passengers at the maximum load point by 50, thus giving an average load factor for the hour of 100 percent (assuming 40 foot [12 metre] buses).

Step 3. Prepare a sketch showing the number of buses on each preliminary route that enters and leaves the station.

Step 4. Evaluate the loadings on the bus routes at the station by comparing the loadings along a route to see if there is reasonable similarity of vehicle requirements along the route, to see if some routes might better be terminated rather routed through, and to see if some different route combinations might give more uniform loadings. Adjust routes accordingly in conjunction with bus operations specialists.

Step 5. Test various routings for bringing buses into the station area, considering direction of path, street pattern and need for changes, and traffic volumes.

Step 6. Test various concept plans for the station area to achieve the best balance of the guidelines presented earlier, considering the relative importance of each type of traffic and the possible traffic patterns.

Step 7. Work back and forth between steps 5 and 6 to achieve the configuration of facilities which comes closet to meeting the needs without excessive impacts on the surrounding area.

Step 8. Work with architect and other agencies to develop final station plan.

SOURCE: Petersen, Stephen G. and Robert H. Braswell, "Planning and Design Guidelines for Mode Transfer Facilities," Traffic Quarterly , July 1972, p. 417-418.

APPENDIX B

Survey forms

Winnipeg Transit Station Boarding/Alighting Count

Date:______________ Route:______________

Location:______________ Checker:______________

Weather:______________

Scheduled Ar. Time	Actual Ar. Time	ON	OFF	Into Mall
TOTALS:				

THE UNIVERSITY OF MANITOBA
FACULTY OF ARCHITECTURE
Department of City Planning

February 2, 1990

To whom it may concern:

The following survey is designed to evaluate the **Polo Park** and **Garden City** transit stations in order to improve the operational effectiveness of transit at regional shopping malls in Winnipeg. The survey was prepared by Alex Regiec, a Master's student in the City Planning program at the University of Manitoba.

By participating in this survey you will help Alex in his research into transit stations in Winnipeg. The results from this survey will be used in his practicum, and will be used to develop policies for the improvement and fututre implementation of transit stations in Winnipeg. The survey takes approximately five to ten minutes to complete, and can be mailed back to Alex in the self-addressed stamped envelope included with this letter.

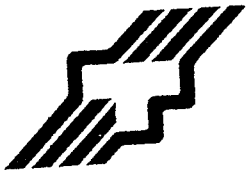
Thank-you for your time and co-operation.

Sincerely,

Basil M. Rotoff
Professor
Dept. of City Planning
Univeristy of Manitoba

William B. Menzies
Supt. of Transit Planning
City of Winnipeg Transit System

Polo Park and Garden City Transit-Transfer Station Study



Operator's Survey

This study has been undertaking to determine how effective the **Polo Park** and **Garden City** transit stations have been in improving transit operations at regional shopping malls. The purpose of this survey is determine the stations' operational effectiveness from the view of the drivers who use them.

This survey was developed by Alex Regiec, a Master's Student in the City Planning Program at the University of Manitoba. This survey will be used in his research work into transit stations.

Please answer each of the questions by circling one of the numbers that best represents your answer.

Example:

12. Are there any conflicts with automobile traffic at this site?

No conflicts 1 2 (3) 4 5 Many conflicts

After you have finished this questionnaire, please return by simply placing it into the self-address stamped envelop provided and drop it into the nearest mail box.

Section A: The Polo Park Transit Station

1. Does this station help you to maintain your schedule during rush hours?
   Very helpful 1 2 3 4 5 Not helpful

2. How would you rate entering and exiting this station?
   Easy 1 2 3 4 5 Difficult

   If it is difficult, then please describe briefly:

_____

_____

_____

_____

Please turn to next page...

3. Are there any conflicts with automobile traffic at this site?
   No conflicts 1 2 3 4 5 Many conflicts

   If there are many conflicts, then please describe briefly:

_____
_____
_____
_____

4. Do you find that most passengers and pedestrians obey the designated crosswalks in the station area?
   Observe 1 2 3 4 5 Do not observe

5. Do you feel the station is safe for both passenger and bus traffic operation?
   Very safe 1 2 3 4 5 Not safe

Section B: The Garden City Transit Station

6. Does this station help you to maintain your schedule during rush hours?
   Very helpful 1 2 3 4 5 Not helpful

7. How would you rate entering and exiting this station?
   Easy 1 2 3 4 5 Difficult

   If it is difficult, then please describe briefly:

_____
_____
_____
_____

8. Are there any conflicts with automobile traffic at this site?
   No conflicts 1 2 3 4 5 Many conflicts

   If there are many conflicts, then please describe briefly:

_____
_____
_____
_____

Please turn to next page...

9. Do you find that most passengers and pedestrians obey the designated crosswalks in the station area?
   Observe 1 2 3 4 5 Do not observe

10. Do you feel the station is safe for both passenger and bus traffic operation?
    Very safe 1 2 3 4 5 Not safe

Additional Comments you may have about the transit stations at Polo Park and Garden City:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Optional:

1. NAME: _____
2. Number of years
   with Winnipeg Transit:_____

Thank-you for participating in this research.

Glossary of Transit System Terms

Articulated Bus - an extra-long (60 foot/18m) bus with the rear body section connected to the main body by a joint mechanism which allows the vehicle to bend in curves and has a continuous interior.

Bus Lane - a traffic lane on-street for exclusive use by buses.

Busway - entire roadway reserved for buses only.

Direct Operating Cost - All the expenses incurred as a result of the system operation including salaries, wages, services, materials, utilities, liability costs, licenses, taxes and miscellaneous (net of recoveries).

Express Service - transit line with long spacings between stations and/or stops that has high operating speed, and serves long trips. Operates on the same street or right-of-way as local service.

Level of Service - overall measure of all service characteristics that affect users.

Mode - a transit system category characterized by specific technological and operational features. Examples: Local street bus, Busway, Rail rapid transit.

Park and Ride - when transit passenger drives to a transit station and parks his.her automobile in the station's parking lot and finishes trip by transit to destination.

Productivity - the quantity of transportation output per unit of consumed resource. Example: Passenger Kilometres per unit costs of operation.

Revenue Passenegrs - Revenue passengers are defined as passengers riding oneway from a point of origin to a final destination within the service area of the transit system being used.

Revenue Vehicle Hours - Total number of hours actually operated by revenue vehicles during a full year in regular passeneger service including scheduled and unscheduled hours but excluding hours consumed by deadheading, maintainence and training purposes as well as contract and charter services.

Revenue Vehicle Kilometres - The number of kilometres travelled by the active revenue vehicles for the full year while in regular passenger service EXCLUDING deadheading, maintainence and training kilometres, and auxiliary service kilometres.

Station - off-street, sometime on-street, at-grade facility for stopping of transit vehicles to board and alight passengers. Usually has platform, sheltered waiting area, information, and related facilities.

Stop - on-street location where transit vehicles pause to pick-up and discharge passengers enroute. It has a sign and basic schedule information with sometimes a shelter and a bench.

Total Vehicle Kilometres - Total number of kilometres travelled by the active revenue vehicles for the full year INCLUDING deadheading, maintainence and training kilometres, and auxiliary service kilometres.

Transfer - change between vehicles of the same or different modes (intra- and inter- modal respectively) in the course of passenger travel.

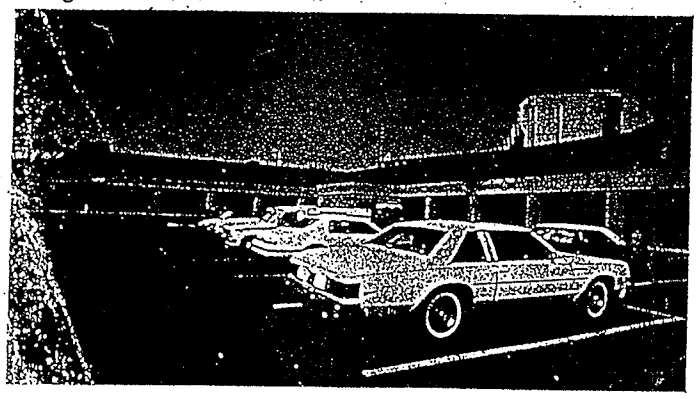
Transit centers key to passenger flow

Twelve years ago, the Orange County Transit District (OCTD) embarked on an ambitious campaign to construct a network of transit centers throughout the county. The centers would serve as anchor points for transit service in areas of the county where travel demand is the highest. In addition, future opportunities for joint development with the private sector could be served by using the air-rights or adjacent land where appropriate.

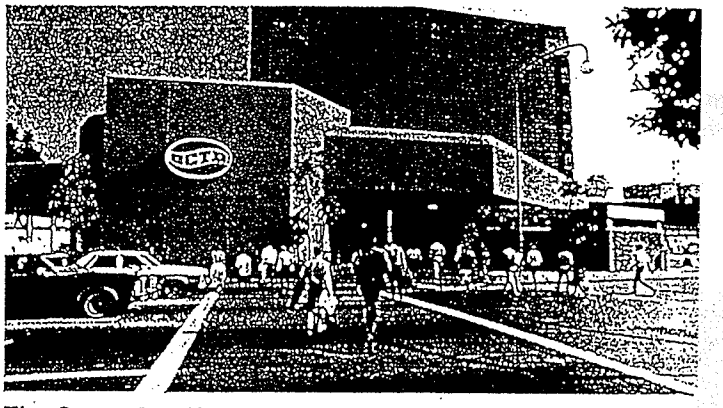
When building a transit center, OCTD keeps several things in mind. Along with providing a focal point for transit service in major activity centers around the county, the transit centers provide a safe, clean and comfortable area for waiting and transferring passengers and also auto parking for carpoolers and transit patrons. In addition, the district interfaces with other transportation systems such as Amtrak, Southern California Rapid Transit District (SCRTD), intercity and airport bus services.

Currently, OCTD has four existing transit centers operating within the county. They are:

- Fullerton Transit Center: Located in downtown Fullerton near the existing Amtrak station, this facility was developed in conjunction with the city's redevelopment efforts. Three OCTD routes and Amtrak serve this facility.
- Laguna Beach Transit Center: Located in downtown Laguna Beach, this facility provides space for two OCTD routes, three Laguna Beach Municipal Transit Lines routes and Greyhound.
- Santa Ana Transit Center: This facility, completed in early 1984, is easily OCTD's busiest center. Sixteen of OCTD's routes and one SCRTD route serve the center. More than 10,000 passengers are served daily. The OCTD parking structure adjacent to the terminal provides parking for bus riders, carpoolers, civic center employees and visitors. A private developer has completed construction of a six-story office building above the terminal.



The Laguna Hills Transportation Center includes a park-and-ride lot.



The Santa Ana Transit Center is OCTD's busiest center. A six-story office building is situated above the center.

- Laguna Hills Transportation Center: Located adjacent to the Laguna Hills Mall, this facility was opened in March 1987. It serves five OCTD routes and more than 1,000 passengers per day. There is also parking for approximately 180 cars.

In addition to operating transit centers, the district has also coordinated with Caltrans in the development of park-and-ride lots for carpoolers and transit riders. They are located in Fullerton near the intersection of Interstate 5 and the Riverside Freeway, in Orange west of the Costa Mesa Freeway and north of the Mall of Orange, in Fullerton on Magnolia, just south of the Fullerton Park-and-Ride and in San Juan Capistrano east of the San Diego Freeway.

By building transit centers and working with Caltrans in coordinating park-and-ride lots, OCTD is spending taxpayers' dollars in a way that provides a significant benefit to the traveling public. OCTD's Santa Ana terminal is the best example of this. Prior to the opening of the terminal, the central county transfer point for OCTD routes was the corner of Sixth and Flower streets near the civic center. It was contributing to an already-congested area. Now, traffic in downtown Santa Ana flows more smoothly and passengers have a secure and comfortable waiting area. The terminal was a necessity, as OCTD carries 10 percent of the peak-hour traffic into and out of downtown Santa Ana.

The transit center program will expand considerably in the next few years. Currently, OCTD has three transit centers in the design phase: the Golden West Transportation Center, located near Golden West College; the Newport Center Transportation Center, located in the Newport Center commercial/office development; and the Huntington Center Transportation Center located on Pacific Coast Highway and Lake Street.

In addition, sites in Orange, San Clemente, Brea and Irvine are being considered as potential locations for OCTD transit centers.