

**Testing the Benefits of On-street and Off-street Rapid Transit Alignments:  
Implications for Winnipeg's Southwest Rapid Transit Corridor**

**By**

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**A practicum submitted to the Faculty of Graduate Studies in partial  
fulfillment of the requirements for the Degree of Master of City Planning**

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## Abstract

With the uncertainty of future energy supplies and the impacts of global warming, rapid transit is becoming increasingly important as part of the transportation mix in North American cities. The conventional choice for rapid transit alignments are off-street corridors such as rail and highway right-of-ways. More recently, cities are locating rapid transit projects along arterial street right-of-ways, to influence more transit-supportive development rather than low-density, single use environments common throughout North America. Promoting transit alignments that provide the best opportunity for this type of development, known as development-oriented transit, is essential for influencing a change in urban transportation habits and building more resilient cities.

This research analyzes the benefits of these alignments by studying the Euclid Corridor Transportation Project and Red Line in Cleveland, and the Central Corridor and Hiawatha Line in Minneapolis/St. Paul. Visiting these cities and interviewing professionals associated with the projects revealed the benefits of on-street rapid transit by comparing ridership, development potential, placemaking, travel time and safety of both on-street and off-street rapid transit. On-street rapid transit provides the best opportunity for a long-term vision for city building through the creation of dense, mixed-use transit-oriented corridors where people can live, work, recreate, access services and shop.

Results and potential implications were presented to professionals in Winnipeg associated with the Southwest Rapid Transit Corridor (SWRTC). The goal was to understand the implications of the findings for the SWRTC and if on-street rapid transit would work along Pembina Highway. Respondents disagreed that an on-street solution was appropriate, which revealed contradictions between the findings from key informant interviews and literature reviewed versus focus group responses.

The SWRTC is designed as a flexible route network system that will allow mixed traffic buses to pick up riders in their neighbourhoods and use the dedicated busway to bypass north-south traffic congestion. This plan is focused on minimizing travel time for a suburban to downtown commute, rather than development potential. This research has found that rapid transit alignments should be focused on transit supportive development and providing direct access to places people need to go on a daily basis. On-street rapid transit provides the best opportunity to do so.

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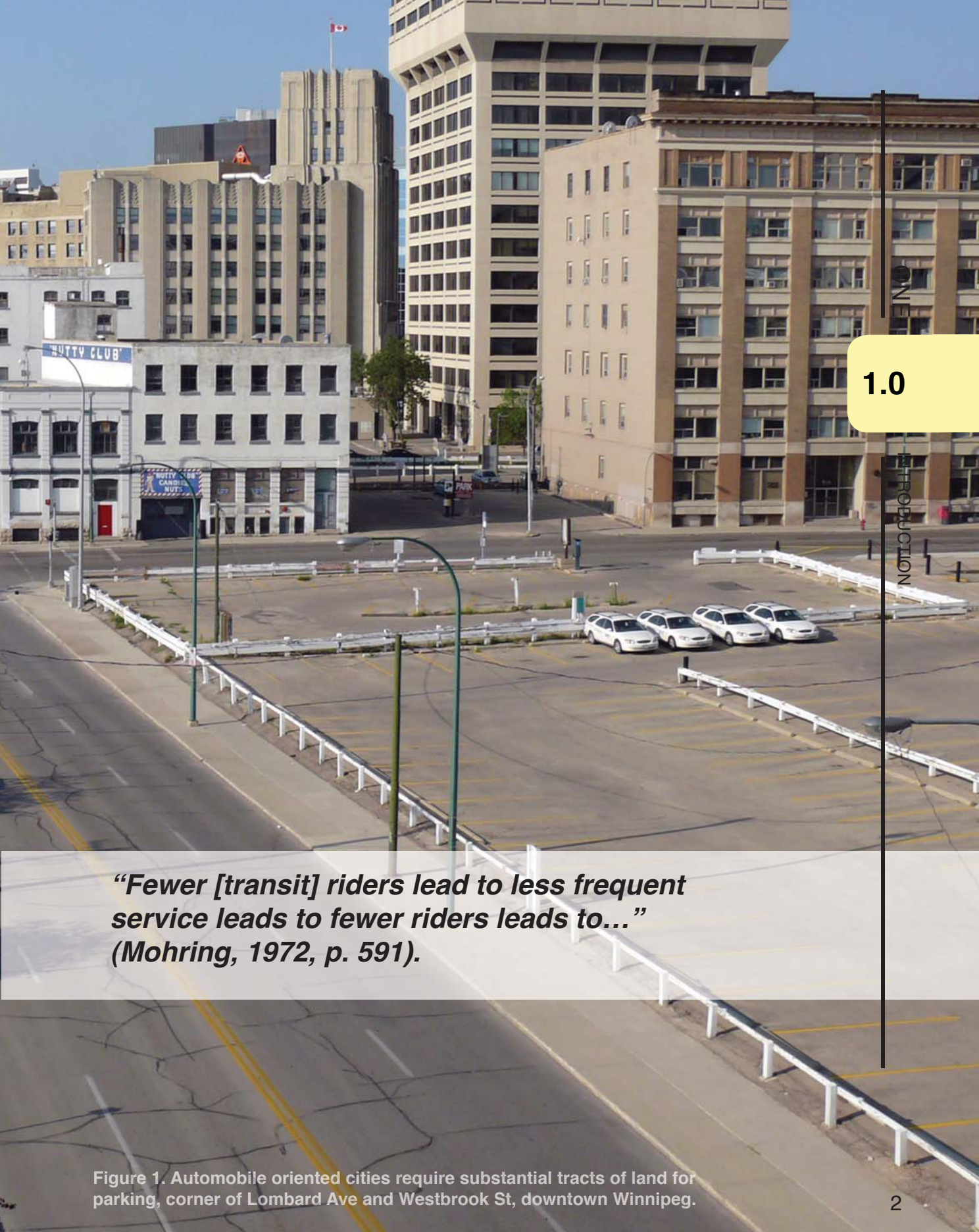


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# Introduction





***“Fewer [transit] riders lead to less frequent service leads to fewer riders leads to...”  
(Mohring, 1972, p. 591).***

Figure 1. Automobile oriented cities require substantial tracts of land for parking, corner of Lombard Ave and Westbrook St, downtown Winnipeg.

Rapid transit and supportive development can provide an avenue for change in the built environment to transit and pedestrian oriented places, rather than low-density, single use development patterns, reducing North American automobile dependence. Worldwide, cities with the highest use of public transit have the lowest greenhouse gas emissions, while cities with the highest CO<sub>2</sub> emissions have the highest emphasis on automobiles, with the most roads and parking provisions (Roseland, 2005, p. 108). Rapid transit is often discussed as an alternative to the automobile as a mode of urban transportation, with cities all over North America planning and implementing rapid transit projects. With the uncertainty of future energy supplies, the world economy and the impacts of environmental degradation, cities must grow, develop and change in a way that allows us to be resilient to an uncertain future (McMurry, 2010, p. 22). Since World War II, the automobile has been the primary mode of transportation, and cities are designed and planned to accommodate it, as illustrated in low-density suburban residential and big-box development patterns. Shifting urban transportation habits in North America, requires rapid transit to offer a similar level of convenience to that of the automobile. People's day-to-day transportation needs are complex, disconnected, and most

conveniently served by automobiles. A shift in urban transportation habits requires rapid transit lines to be located in corridors that most conveniently connect users, with the development potential to create the meaningful destinations they need to visit daily. To facilitate this, North American cities and their planners and designers must rethink the way rapid transit is integrated into existing built environments.

A shift in urban transportation choice requires a shift in city planning and design. Transit cannot be considered a secondary afterthought, tucked away along an underused rail or highway right of way. Rapid transit should be more than connecting downtown with suburban areas in the fastest means possible. It should be about conveniently connecting people and meaningful destinations while influencing residential, commercial and institutional development along the entire transit line.

## **1.1 Research Problem**

Integrating rapid transit into mature cities, designed with the automobile as the dominant mode of transportation, is a challenging and expensive prospect. Grade-separated subway systems and monorails are costly and highly disruptive to build. These are most appropriate for large



Figure 2. Central Corridor alignment, University Ave, Minneapolis / St. Paul.

high-density cities like Toronto and Vancouver. The more common option, which smaller cities tend to choose, is to integrate rapid transit along existing highway and rail rights-of-way (ROW). However, these alignments limit the ability of rapid transit to service the areas with the highest ridership potential. They generally do not take advantage of existing built-up areas where people already live or frequent, nor of redevelopment opportunities. In many cases, these alignments require transit stations to be located in stagnant environments, leaving passengers with long walks through areas of limited interest, creating safety concerns for pedestrians.

Rather than using an off-street rail or highway corridor, rapid transit lines should be integrated into existing built up areas with convenient access to stations (Figure 2). This is usually best achieved by adding rapid transit to arterial street ROWs. Redeveloping along existing alignments and implementing transit-oriented development (TOD) increases ridership and is integral to changing North American transportation habits.

Winnipeg, Manitoba, is implementing its first rapid transit line, the Southwest Rapid Transit Corridor (SWRTC), along an underused rail corridor that loosely parallels Pembina Highway. This practicum attempts to reveal an

alternative for the SWRTC alignment, and argues it should be located within the Pembina Highway ROW. Locating the SWRTC alignment along Pembina Highway would maximize efficient pedestrian access to existing residential and commercial sites, and create the most suitable situation to implement transit-oriented development principles. This would increase ridership for the transit line by providing convenient access to existing and new destinations for current transit riders and new discretionary riders who switch to using transit.

## 1.2 Purpose Statement

This practicum provides an understanding of on-street and off-street rapid transit alignments. The purpose of this practicum is to understand the benefits of rapid transit alignments, integrated within existing arterial street rights-of-way with laterally separated dedicated lanes. This is achieved through analyzing the following benefits of on-street rapid transit: transit-supportive and transit-oriented development is maximized; placemaking potential increases; travel times are competitive; and environments are safe. All of these benefits increase ridership. Testing this hypothesis will create a body of knowledge demonstrating benefits

of on-street transit alignments. These findings are to be presented to local professionals in Winnipeg to understand implications for the SWRTC. The ultimate goal of this practicum is to influence the alignment of phase two of Winnipeg's SWRTC.

## 1.3 Research Questions

There are four main questions guiding this practicum research:

1. What is transit-supportive and transit-oriented development, including: the benefits, what works, what are the limitations and the relevant urban design principles?
2. What are the options for transit alignments in existing urban areas? How does transit alignment choice maximize ridership and development potential? What is development-oriented transit?
3. What are the benefits of rapid transit alignments that are integrated into:
  - A) Existing street rights-of-way and built up areas; and
  - B) Off-street rights-of-way such as rail or highway corridors.
4. What are the implications for the Southwest Rapid Transit Corridor in Winnipeg?

## 1.4 Significance to the Profession of City Planning

This practicum creates a body of knowledge, which presents an analysis of on-street and off-street transit alignments. This practicum brings together evidence from other cities that locating rapid transit alignments in existing built-up urban areas, within arterial-street ROWs, should be a key component of city building. The existing literature explores transit alignments, ridership and the process of developing around them. However, the existing literature does not compare on-street to off-street alignments in any detail. Interviews and discussions with planners, engineers and city officials from other cities provide the opportunity to share knowledge and cultivate national and cross-border partnerships. The practicum strives to provide insight into why Winnipeg has not entertained the idea of on-street rapid transit.

## 1.5 Literature Review

The literature review (chapter 2) precedes the research methods chapter (chapter 3) as the latter evolved primarily out of the literature review. Reviewing past research is an important part of the creation

of knowledge (Cooper, 1998, p.1). With digital data storage and the Internet, researchers have access to a virtually endless number of works, and knowledge of research on many topics. The importance of a comprehensive and accurate literature review is increased because of the huge amount of research (Cooper, 1998, p. 1). Compiling past research provides a researcher with information about a certain topic and reveals conflicts within existing research. Highlighting conflicts and identifying gaps in the literature review acts as the impetus for further research (Cooper, 1998, p. 25).

The literature review for this practicum focuses on two types of transit development: transit-supportive/transit-oriented development, and rapid transit alignments. Exploring the research on TOD provides a better understanding of why it is an important element of city building. The benefits of TOD are intended to be understood through investigations, based on: urban design principles, how congestion is reduced, environmental benefits, an alternative to sprawl, increased land values, user safety and physical activity, and increased transit ridership. The limitations of TOD shall be reviewed with respect to barriers to implementation, and transit adjacent development.

Available transit alignments in existing urban areas will be reviewed to understand how they affect transit-supportive and transit-oriented development. Development-oriented transit — or how the alignment accommodates development — and on-street transit alignments shall be given special attention in this practicum. Additional research methods are discussed in chapter three.

## 1.6 Limitations of the Research Environment in the Winnipeg Context

This practicum is being performed in a context where major limitations are imposed, in the form of existing City of Winnipeg planning policy and demographic trends. Section 1.7 discusses research limitations of this practicum, while this section represents potential limitations to on-street rapid transit in Winnipeg.

Capital region planning, the City of Winnipeg Development Plan and the City Zoning By-Law hinder, rather than support, development of a comprehensive transit corridor along Pembina Highway. As Dunphy et al. (2004) note, “supporting policies for transit district planning include the adoption of appropriate zoning, the provision of infrastructure,

and the granting of incentives for development” (p. 56). Extensive redevelopment of transit corridors and the implementation of TODs do not occur without planning policy initiatives to support them. Policies that provide incentives for development in a prescribed area along Pembina would promote development. More importantly restrictions on green field development, such as an urban growth boundary, would help focus infill development along the Pembina corridor. The Province of Manitoba and the City of Winnipeg have identified the need for a capital region plan to coordinate regional and City of Winnipeg goals. This plan would need to address limits on expansion to focus growth along the Pembina corridor.

Along with development incentives, the Pembina Transit Corridor would require transit-supportive zoning. Mixed-use neighbourhoods need flexible zoning regulations that address the following: mix of uses in single buildings; activities occurring during day and night; private use of public space (street patios, special events, etc); and shared and reduced parking (Gosling, 2002, p. 16).

At the time of this practicum, Winnipeg’s development plan, *Our Winnipeg*, is under review. The creation of transit-oriented development



guidelines (section 4.1.11) is part of this process. The plan does not discuss transit corridor analysis and does not list on-street alignment as a potential corridor for rapid transit. Also, the *Transportation Master Plan* will be completed after *Our Winnipeg*, representing a disconnect between rapid transit planning and city building goals (see section 4.1.10). Integrating rapid transit and land use planning would best be achieved if the development plan and transportation plan were created in concert rather than one after another.

A second limitation of this practicum is Winnipeg's slow growth. As of 2006, the City of Winnipeg had a population of 633,451. In 1991, the population was 615,215, representing an increase of only 2.8% (Statistics Canada, 2006). The housing market in Winnipeg is mostly for single-family detached homes. Residential development in Winnipeg is focused on single-family homes rather than higher density forms of development. Between 1997 and 2008, the construction of new dwelling units, not including semidetached homes and row houses, was 13,999 single-family detached homes and 7,986 apartments (City of Winnipeg, 2009). In 2006, the City of Winnipeg's average number of people per dwelling unit was 2.4, while in 1996 it was 2.5 (Statistics Canada, 2006). As the population increases, many

more single-family detached homes are being built. However, the average number of people per dwelling unit is decreasing. The result is more homes being built with fewer people living in them. Even as family sizes become smaller and the population ages, there appears to be a limited market for higher density housing. Using this as a barometer for housing demand, it seems to be difficult for the city to intensify density along Pembina Highway (or the CNR line), to create a comprehensive transit corridor where people could live, work and play along a single transit line. This practicum argues this problem is compounded by creating a second transportation corridor parallel to Pembina Highway. This further diffuses development into two mixed-use corridors, making it difficult to add residential and commercial density around rapid transit stations, while maintaining these uses along Pembina Highway.

## 1.7 Limitations of the Research

Rapid transit project design and implementation is undertaken by a team of professionals, including, but not limited to, planners, designers, engineers, politicians and economists. It would be beneficial if the practicum could address cost projections, detailed road capacity

and traffic engineering research. These issues will not be addressed by this project. Other limitations to this research include a comparison of only two precedent cities, analysis of a short list of issues, lack of rapid transit mode review and lack of community engagement.

Two cities, Cleveland and Minneapolis, which have on-street and off-street rapid transit projects, will be used to compare the benefits of each. Following this, the results will be presented to focus groups in Winnipeg to understand potential implications for the SWRTC. The focus group portion of the research has limited the number of study cities included as part of this practicum. Additional examples would allow a more thorough analysis. Also, comparing on-street and off-street rapid transit alignments requires a framework for analysis. This analysis will require a short list of the most important issues to compare rapid transit projects. A more expanded list of issues would allow a more detailed analysis.

Another limitation of this study is the decision not to include an examination of transit technology. Choice of transit mode, be it Bus Rapid Transit (BRT) or Light Rail Transit (LRT) does effect many issues including, but not limited to, demand

and station location when planning a rapid transit line. Although important when realizing a rapid transit project, technological details regarding mode of rapid transit are not of concern for this study. Both are viable within the Winnipeg context. The focus of this study is on alignment choice. However it is important to discuss people's general preference for LRT over BRT. Light rail is perceived to be a modern and prestigious form of travel, while buses are perceived to be an inferior option, meant for students and people who cannot afford automobiles (McLinden, 2006, p. 68; Langdon, 2005, p. 10). These perceptions are common in North American society and developers recognize people's desire for light rail, and are more inclined to take risks in TOD investment centered on an LRT line. The permanence of rail tracks also ensures the alignment will not be moved, decreasing risk for developers and investors (Langdon, 2005, p. 10). The City of Winnipeg is planning bus rapid transit. However, there have been comments by the city administration that a preference for light rail transit exists (Kives, 2009, para. 5).

This practicum is designed to understand the benefits of on-street and off-street transit alignments. The next step would be to bring these ideas to the community. The planning process of this practicum

research will not include community engagement, a further limitation. If this project were to become a reality, an extensive community engagement program would be required. The creation of a transit-oriented corridor along Pembina Highway would directly affect local residents, businesses, landowners and transit riders. Indirectly, the corridor will affect all Winnipeggers. The community should be able to provide input on the plan itself and also on policies, which support it.

## 1.8 Biases

The practicum researcher holds a bias that building a rapid transit alignment, laterally or grade-separated, along an existing main arterial street provides the best opportunity for transit-supportive and/or transit-oriented development, and is therefore the more appropriate alignment choice. This bias has been cultivated during three years of planning study, and supported by various publications and rapid transit plans and projects. On-street rapid transit alignments are a better solution than off-street alignments for urban rapid transit to influence long-term change in travel and development patterns. Dense, mixed-use transit-oriented corridors, where people can live, work and serve daily needs, can compete with the level

of convenience automobiles offer, and fundamentally change the way North American cities grow. When discussing institutional biases for analyzing various transit alternatives, Bruun (2007), says “Planners will tend to investigate possibilities they best understand and where their analytic powers are strongest” (p. 21). Noting this bias, the practicum researcher will need to maintain a keen level of rigor to sustain an objective research process.

## 1.9 Document Overview

**Chapter two** explores the literature on transit-supportive and transit-oriented development, and transit alignments.

**Chapter three** describes research methods and how and why they are used.

**Chapter four** provides a historical overview of transit planning in Winnipeg, starting in 1959 and concluding with the current SWRTC plan. This provides the context for this research, which expands on the research problem.

**Chapter five** analyzes the benefits of on-street versus off-street rapid transit by discussing various rapid transit projects. These findings are

then compared to the SWRTC. This information is based upon published materials and key informant interviews of professionals involved with rapid transit projects in Minneapolis/St. Paul, Minnesota and Cleveland, Ohio, which has population growth patterns especially in the downtown, similar to Winnipeg, Manitoba. The chapter concludes with findings and opportunities for further research.

**Chapter six** analyzes the focus group results, which endeavors to understand the implications of on-street rapid transit in Winnipeg.

**Chapter seven** is the conclusion, which includes a summary of key findings, the importance of this practicum research to the planning profession, biases and limitations that arose during the project and, finally, potential future research directions.

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ONE

**1.0**

INTRODUCTION

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An aerial photograph of a suburban residential area during winter. The houses are densely packed in a grid-like pattern, with snow covering the roofs and ground. A large, stylized yellow number '2' is overlaid on the right side of the image. The background shows a mix of residential and commercial areas, including a parking lot and some industrial buildings.

**Literature Review**



Figure 3. Low-density, single-use suburban development, northwest Greater Toronto Area.



Figure 4. Single-family suburban neighbourhood northwest Greater Toronto Area.

## 2.1 Transit-Supportive Development, Transit-Oriented Development and Transit-Oriented Corridors

The development and growth patterns of cities in North America have largely been designed to accommodate the automobile, rather than pedestrians and other modes of transportation. More commonly referred to as sprawl, these singular land use environments, located

on the fringe of cities in suburban areas, are the result of society's almost total dependence on the automobile (Figure 4). Sprawl has grown extensively in North America since World War II. However, the foundations for it were laid during the Industrial Revolution, with the mass production of the automobile and the crowded and polluted environment of the industrial city. Later, government regulations, promoting and subsidizing single-family home ownership and highway development, contributed to extensive suburban sprawl in North America (Hayden, 2004, p. 10-11). Sprawl has also invaded the North American psyche, as most families strive to own a single-family home in a quiet suburban neighbourhood, trying to achieve the 'American Dream' (Downs, 1989, p. 247). Walking



Figure 5. Single-family homes Linden Woods, Winnipeg.



distances to meaningful destinations are long, and garages and driveways dominate front yards (Figure 5). Curvilinear streets are laid out to maximize the number of residential lots that can fit into a parcel of land. This promotes dead end cul-de-sacs and a disconnected street network, inaccessible by pedestrians and cyclists who have to navigate the disconnected street pattern (Figure 6). Transit services are inadequate or non-existent and distances to food shops and other amenities are so great that walking to fulfill daily requirements is not a realistic option. This form of suburban, automobile-centred sprawling development cannot be sustained for the long-term

future. Daily commuting increases traffic congestion and pollution, which is detrimental to the natural environment and people's mental and physical health. In the past, sprawling design relied on a supply of inexpensive oil. This form of urban development will be difficult to sustain, as the world supply of fossil fuels is rapidly being depleted (Kunstler, 2005, p. 67). Alternative forms of more compact development to accommodate more conservative lifestyles must be adopted. However, North American society has enjoyed a high level of technological advancement and comfort. To change land use patterns and the way people are accustomed to living,

Figure 6. Single-family suburban neighbourhood with disconnected street pattern, northwest Greater Toronto Area.



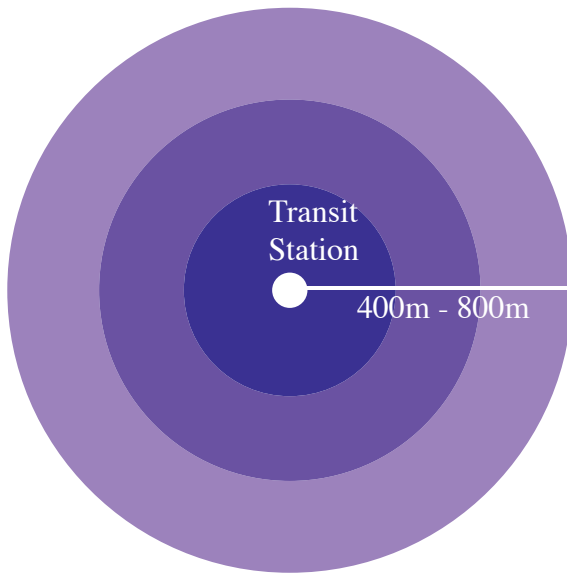


Figure 7. Transit-oriented development calls for mixed-use, commercial development to be most intense around stations with commercial intensity and residential density decreasing outward.

it is necessary to sustain modern expectations including technology, transportation, comforts and leisure.

The concept of transit-oriented development (TOD) is a prescribed form of neighbourhood design for achieving walkable, transit accessible neighbourhoods. Gosling (2002), indicates “The objective of transit-oriented development is to focus growth in a limited area and control sprawl and traffic congestion by reducing dependence on the automobile for every household trip” (p. 15). This resurging form of development allows people to live in a more environmentally sustainable manner. Within it, people have convenient access to transit, and the luxury of daily amenities within walking distance of their residences

(Figure 7). In his seminal book, *The Next American Metropolis* (1993), Calthorpe defines transit-oriented development as follows:

A transit-oriented development (TOD) is a mixed-use community within an average 2,000 foot walking distance of a transit stop and core commercial area. TODs mix residential, retail, office, open space, and public uses in a walkable environment, making it convenient for residents and employees to travel by transit, bicycle, foot, or car (p. 56).

Transit-supportive development is another term used to describe a form of urban development that is mixed use, pedestrian- and transit-oriented, and has a dense population. While TOD usually refers to a specific neighbourhood context and is somewhat prescribed, transit-supportive development is a broader and sometimes overarching term. Transit-supportive development can refer to one infill site that promotes ridership for an associated transit alignment. It can also mean this type of development along an entire transit system that may, or may not, include specific TODs.

TOD and transit-supportive development are not new concepts; the first TODs were developed in the late 1800s. Dittmar and Ohland (2004), discuss the advent of the streetcar leading to expanding development outside of city centres. Streetcar suburbs, as they were known, were centred around streetcar alignments. People were able to live away from the city centre, but had access to transit and thus the rest of the city. These developments usually included a small number of commercial amenities to help satisfy people's daily needs. As the automobile was not the predominant mode of transportation, these neighbourhoods were designed for pedestrians. It was common for developers to build the streetcar line in order to sell their residential lots and homes (p. 5).

An example of a streetcar suburb that has maintained its transit-oriented nature is Osborne Village in Winnipeg, Manitoba (Figures 8 and 9). Streetcars served River Ave, Osborne and Stradbroke Ave starting at the turn of the twentieth century. Today, the neighbourhood continues to have a mix of residential, commercial and institutional uses that are located in close proximity to one another along a busy bus route. The neighbourhood's structure and street pattern was originally laid out for pedestrians and has maintained a pedestrian orientation. One could argue that based on Calthorpe's definition of TOD, Osborne Village is a TOD, although not intentionally planned as one.

Figure 8. Natural transit-oriented development: Osborne Village, Winnipeg.

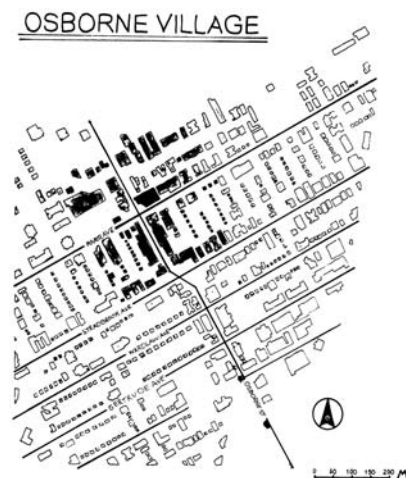
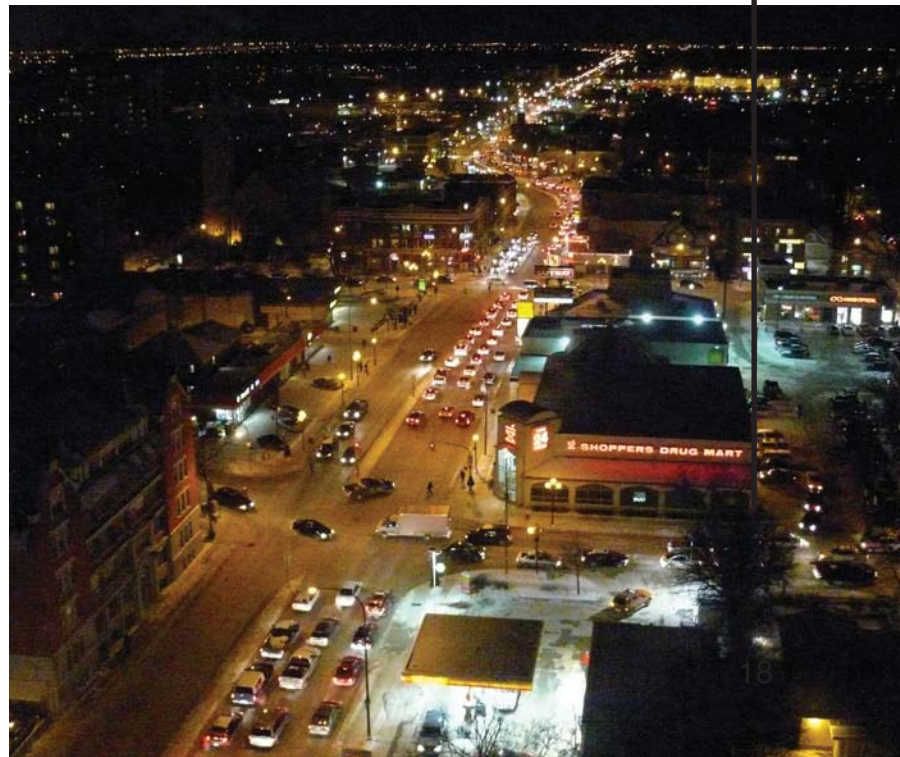


Figure 9. Osborne Street facing south, Osborne Village, Winnipeg.



The overarching goal of TOD is to provide neighbourhoods where people can walk to daily destinations and transit stations. Mixing uses in proximity to transit, designed with pedestrians in mind, reduces automobile dependence. Cities need a grand vision for TOD, as these neighbourhoods alone do little to foster change on a grand scale. Density and transit use function best when there are multiple TODs along a rapid transit line or network, referred to as transit-oriented corridors (TOCs).

TOCs provide a six to eight mile corridor where people can access their daily needs at multiple stations along

it (Cervero, 2007a, p. 136) (Figure 10). This reduces what Cervero (2007a) calls “the bane of public transit – cross haul trip making” (p. 136), or the need to make many stops in one trip spread out across a city. When this is the case, most people choose to drive as it becomes the only efficient way for them to complete their tasks within a reasonable amount of time (p. 136). If people can satisfy most of their needs along a TOC, they should only have to travel outside of it for needs that are beyond day-to-day. A comprehensive TOC reduces the need to mix all uses at each station and TOD, as long as the entire corridor provides the opportunity for people to live, work, shop and recreate, without having to transfer transit

Figure 10. Yonge Street corridor, Toronto.

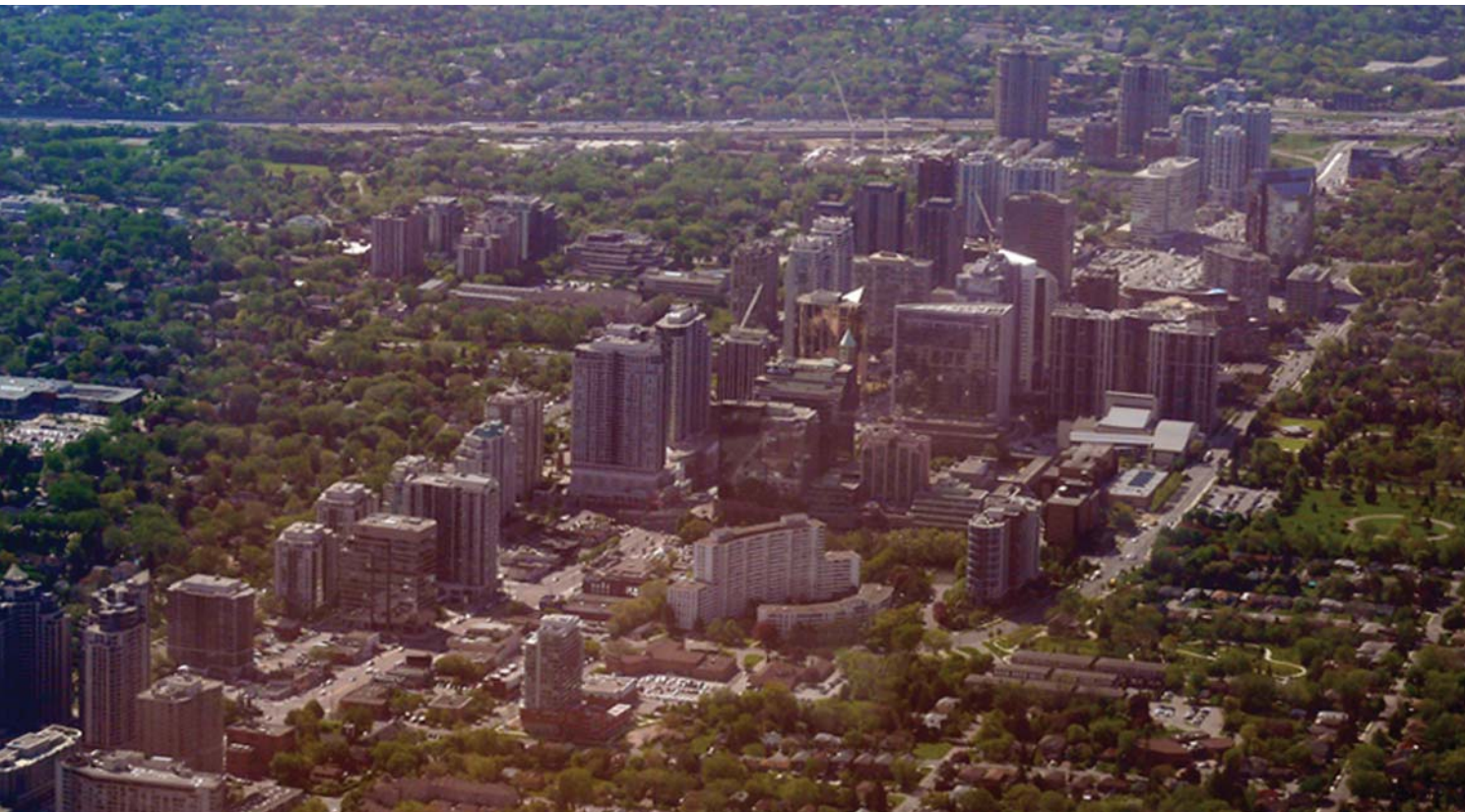




Figure 11. Nicolet Mall, Minneapolis.

vehicles or modes. This will increase ridership, as it offers a transportation experience that competes with the convenience of an automobile, at a lower price to the user.

Another benefit a comprehensive TOC provides is the potential for two-way ridership, eighteen hours per day. Rather than rush hour commuters using transit to access downtown in the morning and suburban homes in the evening, riders travel in both directions because of a mix of uses along the entire corridor, increasing the efficiency of the system. “At a corridor scale, balanced development leads to balanced travel flows, which in the case of pricey rail-transit investments means efficient use of expensive fixed-guideway infrastructure” (Cervero, 2007a, p.136). The best example of a comprehensive TOC in North America is the Rosllyn-Ballston Corridor in Arlington County Virginia, which is



Figure 12. Kensington Market, Toronto.

discussed in detail later in section 5.4.1. It has mixed uses along the whole line and has significant two-way ridership (Cervero, 2007a, p.137). Transit-oriented corridors should be the long-term goal for rapid transit alignments.

## 2.2 TOD and Urban Design

According to Lang (1994), cities that are able to create diverse pedestrian, public transit and automobile transportation networks have enjoyed a functional, human scaled built environment and increased transit ridership (p. 222).

Pedestrian scale urban form is central to urban design principles for TOD. The environment must afford convenient access for pedestrians between destinations. According to Gehl (2006) in his book *Life Between*

Buildings, streetscapes must be designed to evoke a sense of comfort (p. 137) (Figures 11 and 12). Pleasant, efficient and safe pedestrian trips promote walking and transit use. Designing such a place requires a high degree of connectivity for pedestrians. This can be achieved through a well-connected street pattern (Figure 13), which facilitates convenient walking routes in all directions (Llewelyn-Davies, 2007, p.36). A fully mixed-use neighbourhood should be encouraged, although a more commercially focused neighbourhood centre is important for convenience of access and success of businesses. These central areas

should accommodate livelier, 18-hour activity and provide close access to the transit station. In the mixed-use core of a TOD building, setbacks should be minimal. Buildings should also be permeable, with doors and windows taking up a significant portion of the façade.

A comfortable public realm, required for a transit-supportive neighbourhood, should include the concept of an “urban room.” Walters and Brown (2004), describe these as parks and plazas that should be semi-enclosed by buildings, creating a sense of comfort (p. 150) (Figure 14). Streets can also benefit from

Figure 14. City centre Brussels, pedestrian oriented urban form.



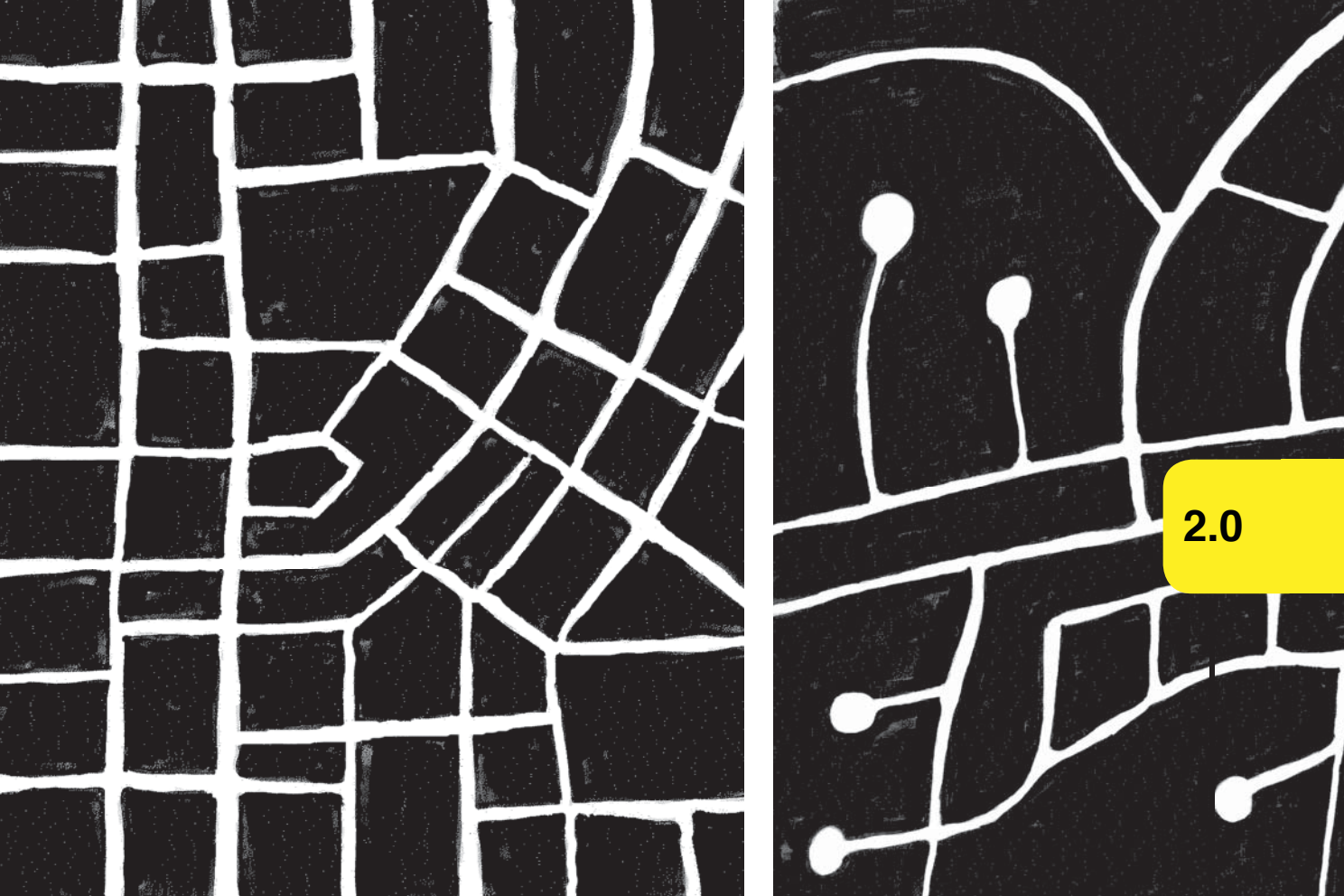


Figure 13. Connected versus disconnected street patterns.

this concept by creating a pedestrian friendly built environment that evokes a sense of enclosure and minimizes distances between buildings. Along with minimal setbacks, views of various elements of the built or natural environment can be either framed or blocked. Gehl adds to the discussion of urban rooms. Long distance views of destinations should be avoided as it makes the trip seem longer. Bends in streets or T-intersections can create a sense of enclosure in an otherwise expansive street network (Gehl, 2006, p. 141). Massing of buildings, which define a sense of enclosure, accomplishes

this by their relation to street width. A commonly accepted ratio of street width to building height is one unit of height to three of the same units of width (Llewelyn-Davies, 2007, p. 88). Massing of multiple storey buildings on the periphery of higher density, mixed-use neighbourhoods must be respectful of the surrounding neighbourhood, especially if the area is composed of single-family residences.

Density is an important factor for the functionality of TOD. A critical mass of people is required to support

2.0

the overall city transit system. Within a specific development, a certain number of people are required to support commercial activity. Calthorpe (1993) says: “average minimum densities should vary between 10 and 25 dwelling units/net per acre” (p. 64). Dittmar and Ohland (2004), promote 12 units/net per acre as a minimum density, however they recognize that higher densities are required for more intense commercial land uses (p. 38). These density requirements can be met through various forms. A mix of housing types accommodates various demographic groups with different housing needs. Singles, families, low-income groups and seniors should be able to find housing solutions in mixed-use neighbourhoods. Apartment buildings, mixed use apartment buildings, row houses and small lot, single detached houses can be combined within a TOD to satisfy these needs (Calthorpe, 1993, p. 64).

## **2.3 Benefits of TOD**

The Transportation Research Board (2004) presents a list of benefits of TOD. When exploring the benefits of TOD as part of this practicum, this list will be used to loosely guide the literature reviewed for discussing benefits of TOD and transit-supportive development. The main benefits of TOD reviewed here are: increased ridership and less traffic congestion; higher land values;

reducing sprawl and promoting environmental sustainability; and safety and physical activity (p. 122).

### **2.3.1 Increased Ridership and Reduced Traffic Congestion**

A major benefit of TOD is the increase in ridership for the transit system that follows. More people living, working and servicing other daily needs, in areas easily accessible to transit, equates to higher numbers of transit riders. According to Dunphy (2005), increasing ridership of a transit line requires high-density development around stations (p. 64). Ridership can also be used as a measure of the success of TODs. There are many examples where the implementation of TODs around rapid transit networks significantly increases transit ridership. In a report reviewing TOD, The Transportation Research Board (2004) finds that these neighbourhoods do attract transit riders. “Well designed, concentrated, mixed-use development around transit nodes can boost patronage as much as five to six times higher than comparable development away from transit” (p. 139). A study of light rail networks in California, by Cervero (2007b), shows people who live within a TOD, including a rail stop within one quarter mile, were four times more likely to use transit



than people who lived between one half and three miles from it, and six times more likely than those who lived further than three miles from a rail station (p. 2071). Another study by Lund (2006), reported on why people moved into residences within TODs in California. One third of respondents reported convenient access to rapid transit stations was one of the most important reasons for moving. Residents of TODs used transit more than the rest of the population (p. 361).

Along with residential proximity to transit, commercial offices and retail also increase transit ridership. In a survey of transit ridership in the Washington D.C. area, almost half of people working in offices located within 1,000 feet of a Metrorail station commuted to work via rail. A similar survey conducted in San Francisco revealed workers in offices near Bay Area Rapid Transit stations were 2.5 times more likely to commute to work via rapid transit than other workers in the same area (Transportation Research Board, 2004, p. 142). Cervero (2007b) notes workplace policies, such as flextime and pay parking, have an effect on transit ridership. Flextime encourages use of transit, while free parking discourages it (p. 2072).

Frequency of service is an important performance indicator, from the

perspective of the transit user. Bruun (2007) argues that all things being equal, the greater the frequency of service, the more convenient the service is (p. 52). Convenience is the crux of a successful rapid transit project and associated transit-supportive development. More riders lead to more frequent service, which is more convenient, leading to more riders and so on (Mohring, 1972, p. 591; Valentine 2004, p. 29).

Rapid transit can significantly reduce traffic congestion if it can attract new riders who would otherwise use an automobile. TOD increases ridership of rapid transit, reducing congestion. However TOD is not the only factor in promoting transit use. Transit has to be more attractive than—or at least compete with—driving. Rapid transit will consistently attract various demographics no matter the quality of the service and system. One such group, classified as transit dependant, are generally low-income people and students who have no realistic alternative to using public transit. The other main group likely to use transit is made up of those who see the greater benefit to society, the environment and themselves. This group may have the means and inclination to drive an automobile, but use transit to save money, have a desire to travel in a more sustainable way, or utilize the travel time to work or relax, rather than operate a vehicle.

This group is called discretionary riders, or those who choose to use transit rather than those who must use it (see section 5.3.1). Litman (2010) says that attracting those who may normally prefer to drive is crucial for increasing ridership and reducing traffic congestion, essentially crucial for the success of a transit system. Attracting discretionary riders is best achieved with a fast, easily accessible, competitively priced, high quality transit system (p. 3).

When a transit system is able to attract discretionary riders, Litman (2010) notes that congestion on parallel roads is reduced. He explains even a small reduction in automobiles results in a significant reduction in road congestion. "On a highway lane with 2,000 vehicles per hour a 5% reduction in traffic volumes will typically increase travel speed by about 20 miles per hour and eliminate stop-and-go conditions" (Litman, 2010, P.3). This increase in discretionary riders and decrease in traffic congestion also has limitations. Once traffic congestion is significantly reduced, driving again becomes an attractive option. Litman, and also Dunphy, discuss changing levels of road congestion as a balance. When a transit line attracts enough riders to reduce traffic congestion, some people will want to take advantage of this, relying on others to improve their

own automobile commute (Litman, 2010, p. 3; Dunphy, 2005, p. 64).

The number of discretionary and dependant transit riders increases as a city's population increases. However, cities with populations over five hundred thousand people have much larger increases in discretionary ridership than dependant ridership. Cities that have over one million residents experience an even more drastic increase (Litman, 2009a, p. 6).

It is encouraging that TODs can create situations where people are willing to use public transit. TODs are successful largely because they are able to accommodate people's transportation needs in a much more economical and sustainable manner than private automobiles. The reduction of automobile use reduces greenhouse gas emissions and reliance on fossil fuels.

### **2.3.2 Increased Land Value**

In addition to increased transit ridership, areas around transit lines and stops experience rapid growth and intensive development, resulting in higher property values. The market for dense urban lifestyles is fueled by empty nesters and young professionals, who enjoy the types of transit available in supportive

neighbourhoods. Dunphy (2005), references the Urban Land Institutes Survey: Emerging Trends in Real Estate 2005, which showed areas around transit stations having the highest level of development and investment (p. 64). In Buffalo, New York, property values around Buffalo Metro Rail stations are higher than other areas. Dwellings within one-quarter mile of a transit station can be worth \$1,300 to \$3,000 (2 to 5%) more than dwellings in other areas (Hess & Almeida, 2007, p. 1061). Residential properties along the Lindenwold Line in Philadelphia had an average premium of 6.4% (Barnick & Cervero, 1997). Increased land values around rapid transit stations are also the case in California:

Santa Clara County, California, eight to nine years after the opening of the light rail system there, they found that a location within one quarter mile of a light rail station increased land values by \$4 per square foot, and a location within one-quarter mile of a commuter rail station increased values by \$25 per square foot (Handy, 2005, p. 158).

Increased land values indicate that these areas are desirable and that TOD, from a developer's standpoint, can be successful, sound investments.

### 2.3.3 Reducing Sprawl and Promoting Environmental Sustainability

Transit-oriented development, smart growth, and the New Urbanism are all a responses to the sprawling single use environments common across North America. All of these ideologies are much the same; reduce automobile dependence through changing and updating the urban environment, by creating more pedestrian scaled neighbourhoods in close proximity to transit, with higher social capital. The three main elements to do this are adding density, mixing building and land uses, and providing convenient access to high quality public transit systems. Neighbourhoods that are specifically designed (Orenco Station, Portland, OR) or ones that have come into being more organically (Osborne Village, Winnipeg, MB) take advantage of these principles to reduce automobile dependence. They offer pedestrians access to their daily needs and convenient access to public transit. Multiple studies of travel habits of people who live in such neighbourhoods agree that these residents are more likely to use transit and drive less often than people who live in single use residential neighbourhoods (Cervero, 2007b, p. 2083; Lund 2006, p. 365; Zhang, 2006, p. 322).

The World Resources Institute estimated, in 2005, road transportation (cars and trucks) was responsible for 26% of green house gas emissions in the United States. This figure rose by over 30% since 1990 (World Resources Institute, 2007). Dense, mixed-use transit-supportive forms of development have the potential to impact green house gas emissions, slowing the effect of climate change. Reduction in automobile use will also reduce oil consumption, which is important beyond environmental and climate change issues. World oil supplies are finite and will be increasingly difficult to extract (Kunstler, 2005, p. 24). Alternative fuel sources will be required to sustain civilization in the future. Redefining the way cities develop, based on convenient access to daily needs and transit, will position North American communities to better adapt to a future without a large supply of inexpensive oil.

### **2.3.4 Safety and Physical Activity**

Along with a pedestrian oriented environment, TODs should offer other active transportation options, especially walking and cycling. This can be achieved through the provision of proper infrastructure. Sidewalks and bicycle lanes provide a safer and more accessible experience, allowing more people to feel comfortable using active

modes of transportation. People need to be safe from automobile traffic while cycling, and from both while walking. Day (2006) found that pedestrians represent 11% of all motor vehicle related deaths in America, and in cities with a population over 1 million the number of pedestrian deaths increases to 35% (p.8). Along with traffic, crime also infringes on the safety of people in the public realm and those involved in active transportation and transit use. Transportation networks, especially sidewalks, must include measures such as adequate lighting to help make them safer (Fenton, 2003, p. 13). Elements of a safe pedestrian environment are discussed in the TOD and urban design section (2.2). The safer these networks are the more people will use them and not their cars. A study for the City of Winnipeg, addressing active transportation, cited safety as the dominant issue with regards to facilities for active transportation (Marr, 2005). Improvements to existing networks and the creation of new, designated facilities are a key factor in allowing people to be safe while engaging in active transportation.

Doyle, Kelly-Schwartz, Schlossberg, & Stockard, (2006) found that people who live in safe, walkable communities will walk more often and have lower body mass indexes than suburban dwellers (p. 27). The

nature of the built environment correlates with the number of overweight people in the population. Some research shows that people who live in suburban neighbourhoods, where the automobile is the primary mode of transportation, get less exercise (Frank et al, 2006, p. 76). People who exercise less, for whatever reason, are at greater risk of being overweight. Researchers conclude that people who reside in automobile oriented, suburban neighbourhoods are more likely to be obese and/or overweight than those who live in dense, walkable urban neighbourhoods (Doyle et al., 2006, p.27; Frank et al., 2003, p. 76). Another study by Handy, Cao & Mokhtarian (2006) found that a large proportion of people who live in pedestrian oriented urban environments choose that lifestyle. Their desire to walk is the motivation, while the built environment provides the opportunity. However, this research concludes “the built environment has an impact on walking behavior even after accounting for attitudes and preferences” (p. 55). There is a definite link between lack of walking, access to transit and obesity.

Pedestrian scaled TODs offer a built environment, which promotes walking and healthier lifestyles. Transit-oriented developments are ideal neighbourhoods for seniors. The density of businesses and

other establishments can provide health care and other services in close proximity to their dwellings. Walkable neighbourhoods provide easy accessibility and convenience that would promote active lifestyles for seniors. In implementing the Fastracks light rail transit network in Denver, Colorado, senior females over 65 years old viewed the LRT as an avenue to maintain their independence (Osher, 2006, p. 104).

## 2.4 Political and Public Resistance of TOD

A common criticism of transit-oriented development is that it may exclude low-income segments of the population. Generally, low-income groups are less likely to live in TODs (Lund, 2006, p. 365). This can sometimes be the case as land values in and around TODs rise and drive up housing costs. High land values can destroy the desired mixed-use nature of a TOD. Dittmar and Ohland (2004), address this as they warn that if land values and rents rise too high, there is danger that only premium office space, expensive retail stores and wealthy residential buyers will be able to afford to be there (p.190). Lindbergh City Centre, a TOD in Atlanta, Georgia has experienced such a rise in land values. The surrounding neighbourhoods have also increased in value. Extensive

development in and around the area has driven up land values and rents so high that many of the original low-income residents cannot afford to continue living there. As a result, recommendations are for policy controls to be enforced by municipal governments to prevent gentrification. Incentives to preserve existing housing and build new low-income housing should be part of any TOD policy (Dittmar & Ohland, 2004, p.190).

The Transportation Research Board (2004) describes four barriers unique to TOD. These are congestion, a controversy between node and place, parking, and the mixed-use formula. TODs tend to increase traffic simply because they intensify land use, be it commercial or residential. This can cause community opposition to TODs. Arguments for greater good or long-term implications seldom carry much weight when dealing with local residents concerned about their property values and daily lives (p.103).

“Nodes versus places” represents the different concerns various professionals have regarding transit stations and surrounding neighbourhoods. Transit officials see stations and surrounding areas as nodes for transit, while planners and designers see them as places. A nodal

view has function as the top priority, while a place view requires the top priority to be form. In reality, both are important and must be designed in harmony to achieve success (Dittmar & Ohland, 2004, p. 47; Transportation Research Board, 2004, p. 104).

Parking is an issue, because parking requirements set by municipal planning authorities often include more parking than is needed. Also, the financing from lending institutions, which developers depend on, demand the same amount of parking as in more automobile centered developments, as these are proven models. However TODs require less parking and shared parking is encouraged. Large barren-surface parking lots destroy the comfortable pedestrian oriented public realm that is required for successful TODs. Mixing uses is a lost art for developers, as these companies usually focus on a single form of development. Some are proficient in single-family homes or condominiums or strip malls, building a singular experience and gearing their company for such. Many do not have experience in both residential and commercial projects necessary for TOD. Many organizations involved with development are geared to one form or another and have little experience or desire to undertake mixed-use projects. The number of comparable, mixed-use projects is substantially

less than the prevalence of single-use development that has been the standard for over half a century. Developers and money-lenders rely on examples of successful, comparable projects to mitigate risk in a development project (Transportation Research Board, 2004, p. 107).

Another danger to the success of TODs is the phenomenon of Transit Adjacent Development (TAD). A TAD is generally about one quarter to one half mile from a transit stop. However the development is not oriented to transit, nor to pedestrians. It is essentially development near transit, but fails to be transit-supportive (Arrington, 2008; Dunphy et al., 2004, p.5). Many developments, which are intended to be TODs, are not designed properly and become TADs. The other main reason TADs exist is the location of transit alignments. It is inefficient and difficult to create transit-supportive environments around stations, along a transit alignment that is away from built-up areas, residential and commercial areas.

To minimize construction costs, transit systems—particularly those constructed since the 1970s—have often been built along freeways or existing rail lines, in some cases using new alignments and in others reusing or sharing transportation corridors. As a result, some new transit stations are at locations—freeway medians, railroad corridors—where private development does not just happen by itself (Dunphy et al., 2004, p. 55).

In general there are more examples of TAD neighbourhoods, because TODs infringe on zoning by-laws, and are technically illegal in many cities. One way this has been addressed is through TOD overlay zones, which are amendments to zoning by-laws, which allow for the specific elements of TOD (Arrington, 2009). It is important not to lose sight of the objectives of TODs and their design guidelines. TODs work well in networks that can provide a wide range of amenities and employment opportunities. TADs can stunt the growth of these networks. Also, on a more grand scale, the failure of TOD can strengthen the arguments against them and thus against rapid transit.

## 2.5 Transit Alignments

There are three types of transit alignments based on common ROWs in urban areas. The first is grade separated, such as a monorail or subway, the second is a lateral separation, and the third type is mixed traffic. Laterally separated transit systems typically follow an existing transportation alignment. These can be both off-street and on-street, however on-street, laterally separated systems have dedicated lanes, sometimes separated by a median (Figure 15). These differ from grade separated ROWs because they still have to cross intersections or other impediments at grade. The Euclid and Central Corridors, and the Spadina Avenue streetcar line in Toronto are examples of laterally separated, on-street transit alignments. The Hiawatha LRT line in Minneapolis is an example of a laterally separated off-street transit alignment. The third type of transit ROW is mixed traffic (Figure 16), where buses and/or streetcars follow the flow of automobile traffic (Brunn, 2007, p. 49).

Each type of ROW has advantages and disadvantages. The two extremes are grade separated and mixed traffic. Grade separated transit lines offer the fastest service, as they are not affected by automobile traffic and

in turn do not impede automobile traffic. This unhindered form of rapid transit offers a high degree of reliability of service. Users can count on travel times being the same for every trip. These types of transit alignments are the most expensive to implement in existing built up areas. Construction of a grade separated rapid transit line also disrupts residential and commercial operations along the line.

Bruun (2007) discusses the various types of transit alignments. Mixed traffic systems are a much slower and more unpredictable type of transit. They are affected by traffic congestion, intersections that include vehicle and pedestrian crossings, and traffic accidents. Travel times vary from trip to trip, although generally do not deviate from an average range of time. The advantage these modes offer is their connectivity to the rest of the urban fabric. They are connected to other transit routes and connected to existing development. Grade separated transit lines usually still follow an existing street ROW and provide a high degree of connectivity. In Toronto, the Yonge Street Subway line runs under the street ROW and stops are directly integrated into the urban fabric (p. 49).

Mixed traffic systems are more dynamic, as stops are more frequent. They also allow riders to interact with the street and built up areas. Below or above grade however, riders do not see what is happening on the street



or what sort of development exists. A subway rider could pass under a commercial retail store that interests them every day and never even know it was there, while mixed traffic systems allow for urban exploration.

Bruun (2007) also discusses laterally separated rights-of-way, which include the median between mixed traffic, and grade separated rapid transit ROW. Laterally separated alignments are faster than mixed traffic, however they are not as fast as grade separated routes. Dedicated lanes allow for steady speeds,

Figure 15. Dedicated streetcar lane, St. Clair Avenue, Toronto.



Figure 16. Mixed traffic bus, Winnipeg.



uninhibited by automobile traffic; however cross streets and possibly traffic lights require stopping (p. 49). A measure to maintain higher speeds is to decrease the amount of access to the main transit/auto ROW, locating stops at major intersections. Transit priority technologies may also reduce unneeded stops and increase overall efficiency. Laterally separated alignments can follow either on-street ROW or off-street ROW. Off-street ROWs allow rapid transit vehicles to operate faster than on-street ROWs and minimize unnecessary stops if they are given priority at cross streets. Grade separations or required stops for crossing traffic, similar to that of heavy rails lines are common priority measures. Laterally separated alignments also have the benefit of operating on existing ROWs and in built up areas, with less cost than grade separated versions. Laterally separated lanes do sacrifice some speed, however their cost, efficiency, and connection to the urban fabric make them a viable solution.

## **2.6 Development-Oriented Transit**

Transit-oriented development prescribes how the built environment should take form around transit stations. Development-oriented transit refers to a transit alignment's ROW and the potential for transit-

supportive and oriented development that the ROW can accommodate. The development potential along new transit alignments often is limited by alignment choice, which is often based upon financial considerations. The most cost effective transit alignments are usually those along off-street ROW, with limited development potential. There is agreement among research transit and TOD specialists that these decisions, based upon least cost, affect the potential for increasing ridership and transit-oriented development (Dunphy et al., 2004, p. 21; Langdon, 2006, p. 13; Newberg, 2006, p. 76). On-street choices for transit alignments maximize the potential for developments that support rapid transit. The type of alignment chosen for rapid transit is crucial for rethinking the way cities are designed.

To succeed, transit-oriented development needs a quid pro quo from transit in the form of development-oriented transit. Transit advocates and managers need to work to improve transit's image and to plan new transit lines to maximize their development Potential (Dunphy et al. 2004, p. 21).

Litman (2008) discusses often-disparate interests between transit

riders and decision-makers. Transit users place high priority on comfort and convenience of their transit choices. However transit decision-makers are usually more focused on more tangible aspects such as transit speed, operating costs and construction costs (p. 14). The process of implementing an on-street alignment is more complicated than along an existing off-street corridor. Digging a subway line is disruptive to the street and adjoining buildings and their users. Integrating a transit line onto an existing street has complicated planning and engineering work involved. The off-street option is based on travel times, while on-street is more rooted in convenience and development potential. Transit-supportive development along an on-street alignment will allow for people to live in very close proximity to the transit corridor and stations. According to TOD standards, people must live within one-quarter to one-half of a mile from a station. Even though people who live up to a ten-minute walk (one-half mile) from a station are more likely to use transit than those who live nowhere near a station, ridership further increases with convenience. Close and direct proximity of a rapid transit station to residential and commercial sites increases ridership. JHK and Associates found in a study of transit commuters in Washington D.C., that 63% of residents of an apartment

complex located 300 feet from a transit station commute via rapid transit. Only 24% of residents from a building located 3,800 feet from the same station commuted via rapid transit (as cited in Transportation Research Board, 2004, p. 143).

The administration in the United States at the time of this practicum has taken notice of the importance of convenience of existing and new development for transit riders, and is taking a more development-oriented transit approach to funding requirements. As part of the Federal Transportation Administration's (FTA) New Starts process (the mechanism by which municipalities obtain federal funding for transit projects), transit projects are assessed using a cost-effectiveness rating. This and other ratings in this process are assessed on a scale of low, medium-low, medium, medium-high and high. Beginning in 2005, projects were required to achieve at least a medium cost effectiveness rating to be admitted into the New Starts program (Wood, Zimmerman, & Poticha, 2009, p. 17). In January 2010, the U.S. Federal Transportation Minister announced changes to the criteria of the FTA New Starts program. In recognition of the importance of connecting meaningful destinations and development potential, the restrictions enacted in 2005, which focused heavily on cost, are to be rescinded. In addition to travel time

benefits, the new criteria will focus on economic development, community development and environmental benefits (Federal Transportation Administration, 2010a, para. 3).

Rapid transit alignments should be located on existing street ROWs that provide infill development potential. Living within close proximity to transit stations increases ridership of the transit line, which increases convenience, and efficiency of the transit system. Transit alignments that do not take advantage of existing built up commercial and residential areas often fail to provide the opportunity for transit-supportive development (Dunphy et al, 2004 p. 173; Langdon, 2006, p. 13; Valentine, 2004, p. 26).

## **2.7 Chapter Summary**

Transit-oriented development is a prescribed form of development, which focuses on a neighbourhood scale. While this is important, many infill opportunities along existing arterial streets are single sites, or less than a block in size. These areas are too small to create comprehensive TOD. More transit-supportive developments that are not formally TODs are appropriate for these sites. New transit corridors should include TODs where possible, and be

mindful of TOD principles for transit-supportive infill development.

This practicum is motivated by a discrepancy between the current goal for the Winnipeg SWRTC project versus recent developments in rapid transit design, specifically Transit Oriented Development. The plan for the SWRTC narrowly defines transit as moving suburban residents to and from downtown, reinforcing the conventional North American approach to traffic planning. However, this practicum recommends a different set of goals for transit-supportive development implemented in existing urban areas, with a specific focus on the SWRTC and city-building. These goals are based on a review of the literature, the successes and limitations of various rapid transit projects, along with site studies of progressive transit projects in Cleveland and Minneapolis.

Research points toward a number of ways in which transit and transit-supportive development should be implemented effectively in existing urban areas. Transit alignments must maximize the opportunity for transit-supportive development and redevelopment. Integrating transit along existing arterial streets provides the greatest opportunity for this. By working within existing urban infrastructure and development,

transit alignments can create this opportunity. However, many cities have aligned new rapid transit projects with rail and highway corridors, contrary to the recommendations highlighted in the literature review. The SWRTC in Winnipeg is an example of this, as it is being implemented along a rail corridor rather than the main arterial street that parallels it. These disparate ideas outline a need for further research of these issues to understand if the SWRTC has found the best solution.

Literature reviewed influenced the practicum researcher's perspective on rapid transit alignments. Understanding rapid transit and transit-oriented and supportive development revealed issues essential for the success of rapid transit projects (see section 3.1). This influenced issues to be compared during scheduled interviews about Cleveland's Euclid Corridor and Minneapolis/St. Paul's Central Corridor.

3

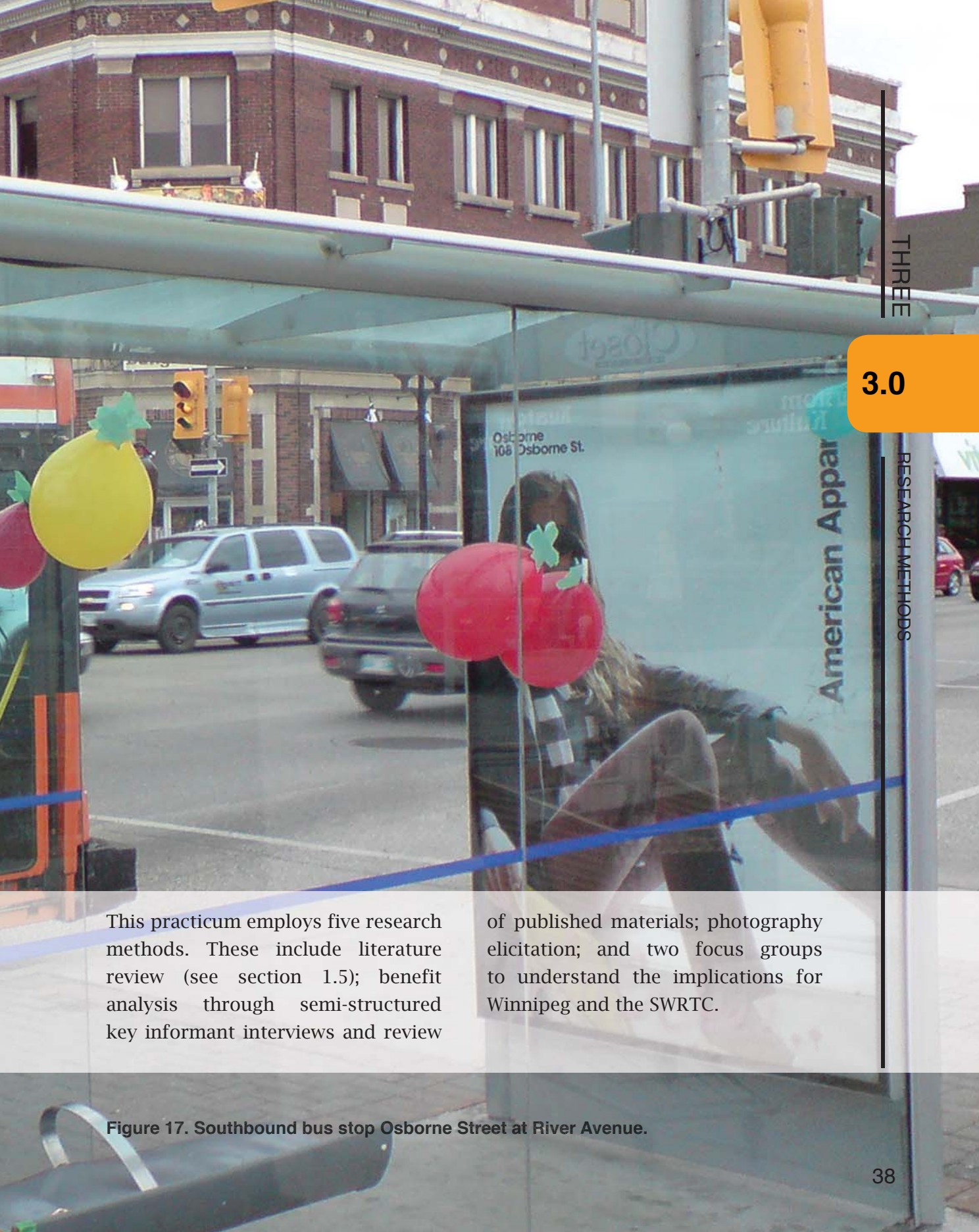
# Research Methods

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3.0

This practicum employs five research methods. These include literature review (see section 1.5); benefit analysis through semi-structured key informant interviews and review

of published materials; photography elicitation; and two focus groups to understand the implications for Winnipeg and the SWRTC.

Figure 17. Southbound bus stop Osborne Street at River Avenue.

### 3.1 Rapid Transit Alignment Comparison

Comparing rapid transit alignments will assist in identifying the benefits of rapid transit. The comparison draws upon cost benefit analysis (CBA), which Litchfield (1996) describes as “a process of investigation and reasoning designed to assist a decision-maker to reach an informed and rational choice” (p. 83). In this case, the benefits of rapid transit projects will be analyzed to demonstrate if and why on-street rapid transit alignments provide more benefits to users, to the areas served by transit lines, to cities, to transit agencies and to the transit project itself, than off-street alignments. The scope of this practicum requires a manageable short list of benefits to compare rapid transit alignments. These benefits must be within the scope of city planning as other professions are incorporated in rapid transit planning (see section 1.7). It is necessary to draw upon various sources to define these criteria. Common rapid transit project goals, SWRTC objectives, and cost-benefit analysis have generated the criteria for this benefit comparison.

A project analysis outcome is meaningless without stated goals. Goals should be as explicit as possible. Since goals can be of a general or even somewhat nebulous nature, specific, quantifiable objectives must be selected to measure progress towards these goals (Bruun, 2007, p. 23).

Explicitly stated goals of the SWRTC project are somewhat unclear. However the Rapid Transit Task Force publication, titled *Made in Winnipeg Rapid Transit Solution* (2005), outlines overall system objectives. Objectives, as follows, are ranked in order of importance:

- Increase ridership and attract new riders (modal shift),
- Strengthen the local economy and encourage economic development,
- Support downtown revitalization,
- Improve environmental outcomes (environmental mitigation),
- Fiscal and social responsibility,
- Provide for more compact urban development (transit-supported land development) (p.45).



Along with the objectives of the SWRTC, transit literature will be reviewed. Bruun (2007), provides a list of common goals for transit systems:

1. Reducing operating subsidies,
2. Reducing travel time,
3. Relieving congestion,
4. Focusing development in selected areas,
5. Transforming the environment of an area,
6. Improving mobility for transit dependant users,
7. Improving transportation system safety,
8. Improving scheduling,
9. Providing an alternative to complement road congestion pricing,
10. Reducing energy consumption and greenhouse gas emissions,
11. Reducing pollution, and
12. Preserving ecological services (p. 11).

Along with the stated objectives above, CBA defines criteria for benefit analysis and tests the hypothesis that on-street transit alignments provide more significant and comprehensive benefits than off-street transit alignments. Conventional CBA is used to measure monetary outcomes of various options. However, for the purposes of this practicum,

a CBA guide manual, the Victoria Transportation Policy Institute's (VTPI) *Transportation Cost and Benefit Analysis Techniques, Estimates and Implications*, Second Edition (Litman, 2009b) is used to gather and compare goals with CBA criteria. Schofield (1989) describes how benefits and costs can be used to understand and compare issues important for rapid transit projects. "In general terms, benefits are defined as contributions towards, and costs as detractions from, project or programme objectives" (Schofield, 1989, p. 1).

Another such guide that could be used as a framework is The Transportation Research Cooperative Program (TCRP) Report 78, *Estimating the Benefits and Costs of Public Transportation Projects: A Guide Book for Practitioners* (2002). Although the TCRP report seems to be a comprehensive guide, the VTPI publication will be the resource that draws upon CBA to define criteria that will guide this practicum. The VTPI guide is constantly updated, as recently as January 2009, while the TCRP report is a static document. Another determining factor is the accessibility of the report's author, who has agreed to field questions regarding the VTPI guidebook. The VTPI also provides an exhaustive library of transportation research made available to anyone online, as long as the author's work is attributed. The guidebook presents

16 costs associated with transit systems. Elements to be compared will be derived from this list and from transit project goals and objectives previously stated.

Comparative issues for transit projects listed in the VTPI guidebook are as follows:

- Vehicle Costs,
- Travel Time,
- Safety and Health,
- Parking,
- Congestion,
- Roadway Facilities,
- Roadway Land Value,
- Traffic Services,
- Transportation Diversity,
- Air Pollution,
- Noise,
- Resource Consumption,
- Barrier Effect,
- Land Use Impacts,
- Water Pollution and Hydrologic Impacts, and
- Waste Disposal (Litman, 2009b)

The criteria used in this practicum for comparing benefits of rapid transit projects was tested during the key informant interview process (see section 3.2) and refined. Prior to beginning interviews, based on the previously noted lists of goals and important issues of rapid transit projects and knowledge gained of

rapid transit issues from the literature review, the following initial short list of comparative transit benefits has been generated:

1. Increasing ridership (affects intensity and level of benefit of the other issues),
2. Development Potential (residential and commercial),
3. Pollution mitigation and decreasing resource consumption,
4. Travel time and traffic congestion reduction,
5. Transportation diversity (multi-modal),
6. Alternate value of rail, hwy corridors etc, and
7. Safety (from crime and crashes)

The practicum researcher has found these benefits, based upon previously noted sources, to be the most significant for comparing on and off-street rapid transit alignments. This initial short list was used during the interview process to guide discussions (see Appendix B: Key Informant Interview Guide). The following provides a discussion about this list of seven benefits, while the final list of benefits used to compare rapid transit alignments, presented later in this section, provides additional discussion about the importance of

ridership, development potential, travel time and safety.

Ridership was revealed as a core issue after understanding other benefits of rapid transit. Increased ridership enhances gains from other benefits. Increases in ridership are cyclical as more riders enhance the level and frequency of service, which in turn attracts more riders. Attracting a strong ridership base requires rapid transit to directly serve areas people live and need to go on a daily basis. People who live near rapid transit stations are much more likely to use it (see section 2.3.1).

The literature review shows transit-oriented and supportive development potential is a key factor in maximizing ridership. This also represents an alternative form of urban development rather than low-density, single use environments (see chapter 2). Just as TOD promotes ridership, development-oriented transit promotes TOD (see section 2.6). Transit alignments that provide the opportunity for TOD along with the benefits of TOD itself led to the inclusion of development potential in the initial short list of comparative benefits.

Pollution mitigation and decreasing resource consumption is one of the macro benefits of rapid transit

and TOD for all of humankind and the natural environment. Changing people's urban transportation habits from highly consumptive and polluting automobiles to more sustainable forms of public transit will help North America be more resilient with an uncertain future ahead (see section 2.3.3). Gains in pollution mitigation are highest for rapid transit alignments that promote high ridership. More people using rapid transit will equate to less automobile trips, decreasing overall fossil fuel consumption and greenhouse gas emissions.

The literature reviewed revealed the importance of travel time. Minimizing travel time and reducing traffic congestion is a conventional goal for rapid transit projects (see section 2.6), as fast, reliable service attracts riders (see section 2.3.1). The literature review also shows that different types of rapid transit alignments offer different travel time gains (see section 2.5).

Transportation diversity refers to amount of choice in modes of transportation. It is listed by the VTPI guide and initially seemed important. However, as discussed in more detail later in this section, transportation diversity was found to be less crucial in comparing on and off-street rapid transit than other issues discussed.

The practicum researcher was involved with previous work discussing the alternate value of rail and hydro corridors. The project promoted mixing green infrastructure uses to intended uses of these corridors in the form of active transportation, naturalization for wildlife habitat, storm water management and education and also community gardens (Baker, Mahé and Wiseman, 2009). Discussed later in this section, this issue was found to be of less importance than others.

Finally, safety was included in the initial short list as a result of the literature review. Safety influences people's choices, if the public realm or rapid transit is unsafe, people are more likely to seek other means of transportation and less likely to use rapid transit (see section 2.3.4).

As the interview process progressed, placemaking was introduced by a key informant as an important issue for rapid transit projects (RIP). Placemaking, in the case of transit-supportive development and pedestrian oriented environments, around rapid transit stations is a matter of urban design. The Department of the Environment, Transport and the Regions (United Kingdom) define urban design as:

The relationship between different buildings; the relationship between buildings and the streets, squares, parks, waterways, and other spaces that make up the public domain; the nature and quality of the public domain itself; the relationship of one part of a village, town or city with other parts; and the patterns of movement and activity which are thereby established (as cited in Walters & Brown, 2004, p. 109).

The Project for Public Spaces defines Placemaking as:

...not just the act of building or fixing up a space, but a whole process that fosters the creation of vital public destinations: the kind of places where people feel a strong stake in their communities and a commitment to making things better. Simply put, Placemaking capitalizes on a local community's assets, inspiration, and potential, ultimately creating good public spaces that promote people's health, happiness, and well being (Project for Public Spaces, 2010, para. 2).

Most places are defined by their historical context and character. As places evolve over time, meaning is derived from the history of the place. Some argue that places cannot be made but rather existing sense of place can be expanded upon, influencing urban design decisions.

Contextual design pays attention to the framework of new development in a multidimensional way—reflecting a consciousness not only of the surrounding urban scheme but also of the evolution of the area over time, the economic and financial stakes involved, and the contributions of physical and social aspects to the built environment (Zyscovich & Porter, 2008, p. 9).

Creating an attractive, pedestrian oriented environment is a key component for successful transit-supportive development and station area design and planning. Placemaking has been added to the list of issues as a key component in comparing benefits of rapid transit alignments.

As interviews progressed, pollution mitigation and transportation diversity were removed from the list

of comparative benefits. It was found these two issues were better suited to compare the benefits of having rapid transit over not having it, or rapid transit versus automobiles. The benefits of both of these issues are commensurate with ridership; the more people using transit the greater the overall reduction in green house gas emissions and greater the transportation diversity. Comparing environmental benefits between transit projects is revealed in increases in discretionary ridership. Electric modes of rapid transit are more environmentally sustainable than those powered by combustion engines. However, the difference is negligible compared to ridership. More people using transit, who would otherwise drive a car, increase environmental benefits, as automobile emissions and pollution are reduced. Transit with higher ridership can be viewed as more energy efficient and a more effective system for reducing pollution. For the purposes here, comparing environmental issues is redundant, as the greatest benefits can be observed through ridership (Litman, 2009a, p. 47).

The alternative value of rail and highway corridors as community green spaces and active transportation paths is a bonus to using arterial streets for rapid transit alignments. However, many of these benefits could still be realized with rapid

transit alignments included in off-street ROW. As interviews progressed it was found that this was not as significant as the other issues listed and was removed from the final list of benefits.

The final list of benefits used to compare rapid transit alignments are the most important issues within the scope of this practicum research and of a city planner's realm of expertise. The comparative benefits of rapid transit projects to be discussed in this practicum are based upon the literature review, key informant interviews, the *Made in Winnipeg Rapid Transit Solution* (2005), Bruun's *Better Public Transit Systems* (2007) and the Victoria Transport Policy Institute's, *Transportation Cost and Benefit Analysis Techniques, Estimates and Implications*, Second Edition (2009). The list is as follows:

1. Ridership
2. Development Potential
3. Placemaking
4. Travel Time
5. Safety

As previously discussed in this section, placemaking has been added, and pollution mitigation, transportation diversity and the alternative value of rail and highway corridors were found to be of less importance than other issues. The final list use to analyze

the benefits of on-street and off-street rapid transit alignments (see section 5.3) was streamlined to include these five issues.

Increasing ridership is an important goal for any rapid transit project. It is the overarching benefit that makes for a successful rapid transit project. All other issues have the potential to increase ridership or detract from it. More riders equates to increased efficiency, service and overall success of the transit line. Increasing ridership is the most important objective stated by the *Made in Winnipeg Rapid Transit Solution* (2005). Attaining high ridership is the key component for a transit project as it affects all other benefits. Bruun's list of benefits that stem from increased ridership includes: reducing operating subsidies, relieving congestion, improving mobility for transit dependant users and improving scheduling. A factor for increasing and sustaining ridership is the potential for transit-supportive development around stations along a rapid transit line.

The literature reviewed outlines the significance of development potential around rapid transit projects for increasing ridership of the transit line. Transit-supportive and oriented development has the potential to reduce automobile dependence, as those living in close proximity to

stations are more likely to use rapid transit (see section 2.3.1). Along with proximity to rapid transit stations, a high quality pedestrian environment encourages people to walk and use rapid transit as a primary mode of transportation (see section 2.2). Development potential is addressed by the *Made in Winnipeg Rapid Transit Solution* (2005) through the following objectives: strengthen the local economy and encourage economic development; support downtown revitalization; and provide for more compact urban development (transit-supported land development). The VTPI CBA guidebook addresses development potential through land use impacts. Also, Brunn's list includes focusing development in selected areas and transforming the environment of an area.

Creating an attractive public realm with environments conducive to pedestrian comfort is crucial for generating ridership and transit-supportive and oriented development around stations. After reviewing an earlier list of transit benefits that did not include Placemaking, the key informant interview process revealed it would be important to include Placemaking as part of the comparative criteria. Streetscape, public amenities and good urban design should be a component of rapid transit projects. Cities are rarely able to fund such improvements to the

public realm as stand alone projects, however they should be incorporated into rapid transit investment (RIP). Placemaking is addressed as a benefit through land use impacts in the VTPI manual. Brunn's list includes changing the environment of an area and Winnipeg's objectives include providing for more compact urban development (transit-supported land development).

Daily travel requirements are becoming more distant with people living sometimes great distances from their workplaces as North American cities continue to expand with low density, single use suburban development. These trips are also complex as modern society offers a wide variety of options for where people spend their time and services they use, which are located sporadically throughout the city. One means of attracting rapid transit riders is providing a fast trip, especially for daily commutes. As transit has to compete with the convenience and speed of automobiles, providing travel time that is comparable or better than the automobile is important for the success of a rapid transit project. Bruun (2007) discusses travel time as reducing it, relieving congestion and improving mobility for transit dependant users (p.12). The VTPI guide also mentions travel time and congestion reduction as part of its list of issues.

Safety from crime and crashes are final issues for comparison in this practicum. Safety from crashes requires attention, as the environments of on and off-street alignments are so different. However, the literature often discusses safety from crashes as an auto driver versus a transit rider (Litman, 2009b). Appendix G presents key design and engineering considerations for on-street rapid transit that increase safety from crashes by minimizing potential conflicts between pedestrians, cyclists, rapid transit and automobiles. The importance of pedestrian comfort and safety from automobiles was revealed in the literature review as part of high quality urban design (see sections 2.2 and 2.3.4). Attracting discretionary riders has drastic effects on ridership gains for rapid transit projects. Fear of crime can be a considerable deterrent for discretionary riders who can use their automobile to alleviate this fear. Safe pedestrian environments around rapid transit stations are a key factor for attracting new transit riders (Litman, 2009b, p. 5.3-22). Along with the VTPI, Bruun also discuss safety as an important issue for rapid transit projects.

A final issue that is always considered as of the utmost significance when studying rapid transit alignments, which is beyond the scope of this practicum and a planner's general

scope of work, is cost. Financial issues are difficult for municipal governments to overcome and tend to drive the decision-making process. However difficult, these concerns can be short-sighted. Rapid transit projects are long-term investments that can have a dramatic effect on how cities grow, develop and operate.

Relying extensively on ridership and cost alone illustrates only part of the benefits of transit investments. A local decision to build a transit line is as much, if not more, about connecting people to jobs, education and cultural opportunities and stimulating economic development, as it is about the expected cost of the capital expenditure. (Wood et al., 2009, p. 21)

It is unclear if Winnipeg's SWRTC is a result of financial issues alone or whether other issues have prevented a conversation about, and study of, a potential on-street rapid transit solution. The answer to this question is discussed in chapter seven, which presents the results of the focus group interviews with professionals in Winnipeg. Again Wood et al., discuss financial considerations of transit projects that highlight



the disadvantages of choosing less expensive off-street alignments.

In some instances, the reason for placing lines in existing rail corridors is that construction impacts to existing users are minimized. Transit projects located in the center of arterial streets, such as Houston's, cause a disruption to businesses during construction and create ancillary costs to reconstruct streets and utilities, and reprogram and replace traffic signals. These costs are often included in the capital transit budget but effectively reduce the (FTA) "cost effectiveness" rating of a project and are what cause many cities to look at alternatives to street-running transit through the districts for which it would be most useful. Unfortunately, this "cost shock" causes many cities to choose alignments that do not maximize potential ridership, but serve to lower costs and provide less connected service. (Wood et al., 2009, p. 26-27)

This issue of "cost shock" and its negative influence on the long-term outcome of rapid transit lines is being

recognized by the FTA in the United States. A press release outlines how the Federal Transportation Administration (2010a) will be expanding the evaluation criteria for applications to the New Starts program, a mechanism for awarding federal funding for rapid transit projects in the United States:

FTA will immediately rescind budget restrictions issued by the Bush Administration in March of 2005 that focused primarily on how much a project shortened commute times in comparison to its cost... The FTA will now evaluate the environmental, community and economic development benefits provided by transit projects, as well as the congestion relief benefits" (para. 3&4).

FTA Administrator Peter Rogoff is also quoted in this release as saying: "This new approach will help us do a much better job of aligning our priorities and values with our transit investments. No longer will we ignore the many benefits that accrue to our environment and our communities when we build or expand rail and bus rapid transit systems" (para. 4). These

changes to transit funding criteria point toward a commitment by the US federal government to promote progressive, city building rapid transit projects. The FTA has recognized the benefits of on-street rapid transit and is proving it by updating the type of rapid transit projects they intend to encourage in the United States.

Of the 43 transit projects listed in the “White Paper” all the projects that have a transit-supportive land use rating of medium-high and high are aligned within an existing street ROW, excluding those that are long distance commuter transit (Federal Transportation Administration, 2010b).

The analysis of benefits will be conducted by gathering data through publications and semi-structured key informant interviews. For comparative purposes, two cities and their transit projects are studied:

- The Hiawatha and Central Corridor transit lines, Minneapolis/St. Paul, Minnesota; and
- The Euclid Corridor Transportation Project and Red Line, Cleveland, Ohio.

The Euclid line is a new, laterally separated bus rapid transit line that has been incorporated into the ROW

of an existing arterial street, while the Red Line is a light rail transit (LRT) system that follows an off-street rail corridor. The Hiawatha line is a laterally separated LRT line following an off-street alignment. The Central Corridor is a planned laterally separated on-street LRT line.

## **3.2 Key Informant Semi-Structured Interviews**

As part of the data gathering process for analyzing benefits, leading experts from some precedent cities will be interviewed. These include public sector planners and engineers involved with rapid transit. An interview guide has been designed (Appendix A) to direct the semi-structured interviews. Alasuutari, Bickman, and Brannen (2008) highlight why this form of data gathering is appropriate, “Semi-structured interviews, which allow probative follow-up questions and exploration of topics unanticipated by the interviewer, facilitate development of subtle understanding of what happens in the case and why” (p. 218). The flexibility of semi-structured interviews should accommodate the opportunity to explore similar and unique benefits of different rapid transit projects.

Having the option of exploring new ideas and discussing unforeseen

issues has the potential to yield valuable results. However, being semi-structured, these types of interviews require comprehensive preparation. The ability to improvise well during a session requires training and preparation. The interviewer could miss information if he or she is not able to react and adapt quickly during the session (Wengraf, 2001, p. 5). Wengraf (2001) describes semi-structured interviews as “high-preparation, high-risk, high-gain, and high-analysis operations” (p.5). The risk is limited, in this case, because of the structure the three guides provided in advance of designing interviews. As well, the transit projects will be well researched before interviews occur.

Semi-structured interviews supplement published materials when assessing benefits surrounding rapid transit alignments within the precedent cities. Interviewees will be asked to comment on the rapid transit project’s goals, outcomes, and decision making, essentially factual information that otherwise cannot be obtained through published materials. Each interviewee will be asked different questions within the interview guide, depending on details specific to the respective transit project.

To provide a degree of anonymity for interviewees, respondents will be coded as follows “R” for respondent, a number to differentiate each person and “P” for a planner or “E” for engineer to denote their professional background: for example, R1P, R1E. The University of Manitoba, Office of Research Services requires that the Research Ethics Board approve research involving human subjects. As part of this approval interviewees are required to sign a consent form. The consent form for key informant interviewees is included as Appendix D.

### 3.3 Transit System Engineering and Design

For the practicum, understanding how rapid transit systems are integrated into existing ROWs and how they interact with these environments and with other modes of transportation adds credibility when discussing on-street rapid transit alignments. This section deals specifically with on-street transit alignments, intended to address barriers to implementation. The intent is to address concerns regarding on-street transit alignments. When discussing implications for Winnipeg, these details highlight how rapid transit could be integrated within the Pembina Highway ROW. As part

of the semi-structured interviews, engineering and design details are discussed to provide an understanding of how these systems function. The interview guide (Appendix A) outlines what the interviews intend to reveal about engineering and design of on-street rapid transit alignments. Photography will also be used during on-site tour(s). This record will be used to assist the reader in visualizing on-street rapid transit.

### **3.4 Photo Elicitation**

Photography will be used to record rapid transit projects discussed in this practicum. Prosser (1998) discusses two main forms of photographic research, “first as an adjunct or complement to an ethnographic field diary, or, second, to systematically record visual detail with emphasis on reproducing objects, events, places, signs and symbols, or behavioural interactions” (p. 123). This project discusses progressive rapid transit alignments that run within arterial street ROWs.

Photography will assist the reader in visualizing how this works and how rapid transit vehicles interact with automobile traffic. Along with the Euclid and Central Corridors, photo elicitation will be conducted in Toronto, as the Spadina streetcar, an on-street, dedicated lane streetcar line

represents a long standing example of on-street LRT.

Photography complements other forms of research and provides a visual record of rapid transit projects. Photography documents events and, in this case, rapid transit infrastructure and vehicles, streets and the built form. This visual record will provide valuable information that is not conveyed well through written communication. Prosser (1998) discusses this concept: “We can provide a degree of tangible detail, a sense of being there and a way of knowing that may not readily translate into other symbolic modes of communication” (p. 116). In using photography as a form of data collection, it must be noted that photographs, although they can be unbiased themselves, are taken by a photographer who may have specific intentions. “The initial problem for the interpreter of photographs is how to ensure their plausibility and believability. Because cameras do not take pictures the fallibility and selectivity of the picture maker must be scrutinized” (Prosser, 1998, p. 125). This issue is not of great concern in this project, as the photographs will be used to report how transit interacts with a street from a technical perspective.

Another technique that could benefit research such as this, is to use photography to record before and after changes to the built form surrounding a rapid transit project. Using photography to visualize how an area has changed can be a powerful tool. Photos, before a transit alignment is built, compared to photos taken decades later can help people visualize the benefits of development and growth around transit projects. This could be beneficial to those who are studying transit alignments. Perhaps the most valuable opportunity before and after photos provide is helping community members visualize the change and goals of a transit corridor and associated development (Wates, 2000, p. 94). Photographs should provide great visual tools within this document but also in presenting the research findings to the focus group. Photo elicitation requires the researcher to visit Cleveland and Minneapolis/St. Paul. In doing so the researcher will tour the Euclid Corridor as a pedestrian, transit rider and automobile driver.

Touring the Central Corridor, in 2008, included a guided tour as part of the American Planning Association Annual Conference. During this trip, the researcher also toured the Hiawatha Line as a transit rider. These observations and photo records add to the researchers understanding of these rapid transit projects.

### 3.5 Focus Groups

This study involves visiting Cleveland and Minneapolis/St. Paul, interviewing professionals involved with transit projects, and conducting tours and photo elicitation in these cities, as well as in Toronto, Ontario. The findings will then be applied to the Winnipeg context. The project will endeavour to understand if on-street rapid transit is a viable option for the SWRTC and other future transit projects in Winnipeg. By engaging those involved with rapid transit, transit, and planning in Winnipeg, the focus group will be held to identify barriers and the implications of this research for Winnipeg. Zeisel (2006) highlights the advantages of a focus group over individual interviews: “Carrying out interviews in groups is a good idea if you want to identify the range of definitions of a situation that interviewees hold, find out whether a particular opinion is held at all, and save time” (Zeisel, 2006, p. 243). An issue with focus groups is what Zeisel (2006) discusses as the leader effect, where one or two people, who are more dominant and opinionated, drive the discussion (p. 243). These situations must be addressed so that all voices and opinions are heard.

Moderating the amount of time participants speak and encouraging

conflicting opinions contributes to a successful focus group interview (p. 250).

Two separate focus groups will be conducted. The first will consist of public sector planners, engineers, transit officials and transit advocates with varying professional experience. The second focus group will consist of private sector consulting planners, engineers and transit officials. Respondents have been separated into two groups to create the most comfortable environments for each group of professionals. Two separate events will allow participants to discuss their perspectives freely. This setting may result in more frank responses, as they may be less guarded with discussing rapid transit with those who work in similar environments.

Focus group respondents will be coded the same as the semi-structured interviews. The numbering system will be continued. Two new designations will be added to include transit officials "TO" and transit advocates "TA." The University of Manitoba, Office of Research Services requires that the Research Ethics Board approve research involving human subjects. As part of this approval interviewees are required to sign a consent form. The consent form for key informant interviewees

is included as Appendix E. The focus group process also requires a note taker to assist the practicum researcher in recording responses. The note taker will be required to sign a statement of confidentiality, included as Appendix F.

### **3.6 Chapter Summary**

Reviewing literature, along with a background history of transit studies in Winnipeg (chapter 4), provides the groundwork for further research. As will be noted later, the discrepancy between literature review findings and the SWRTC plan is cause for further research. On-street and off-street alignments are compared in visits to rapid transit projects in two cities, semi-structured interviews, and a review of additional studies in other cities. The benefits of the two approaches are examined using five categories of evaluation. The relationship of rapid transit to its existing environment is explored through design and engineering details discussed during the semi-structured interviews and by photo elicitation during tours. The findings are presented to a focus group of professionals in Winnipeg to understand their applicability to Winnipeg.



# 4

## Rapid Transit Planning in Winnipeg







This Chapter strives to understand why Winnipeg's first rapid transit line is under construction in 2009, while other cities have had rapid transit systems for many years. Reviewing historical rapid transit plans and studies in Winnipeg provides context for the current Southwest Rapid Transit Corridor. The following is a review of historical transit plans and studies starting with the *Future Development of Greater Winnipeg Transit System* (1959) and concluding

with the *Winnipeg Transit-Oriented Development Handbook* (2010). This section concludes by discussing how the current plan for the Southwest Rapid Transit Corridor relates to this practicum. Rapid transit has been a subject of discussion in Winnipeg transportation planning policy since 1959. However, it has never been a priority and always overlooked in the city's budget in favour of other projects.

Figure 18. Graham Avenue Transit Mall, Winnipeg.

## 4.1 Historical Context

Previous to rapid transit planning and the existing mixed traffic bus network, Winnipeg had a streetcar trolley system. This started out as a horse drawn trolley, first operated in 1882, running on a line down Main Street. Horses soon gave way to electricity and the first electric streetcar operated down the River Avenue line in 1891. The Main Street line was added later. The streetcar promoted growth and development in areas it serviced. It also serviced areas where ridership could be generated. City Council had the power to demand lines from the companies under private ownership, “anywhere within the City Limits provided a population of at least four hundred persons over five years of age lived along each half-mile of line and within a quarter-mile of each side” (Bradley, 1959, p. 8). Streetcar developers sometimes created the required population, if necessary. Bradley notes, the owner of the Winnipeg Street Rail Company purchased and developed land along Osborne Street to promote ridership for the streetcar.

Between City Council's progressive criteria for implementing streetcar lines and speculative development along them, Winnipeg was poised to create a large transit-supportive

network throughout the city. In the 1920's automobiles and buses started to satisfy a significant share of transportation needs. The streetcar system peaked in 1934, with a comprehensive network of over 120 miles of track. The streetcar, however, continued to give way to automobiles and buses. “In 1913, there were only 3,181 autos registered in Winnipeg. In 1953, there were 65,511. It was estimated this figure reached 92,000 in 1957” (Bradley, 1959, p. 24). In 1955 the streetcar made its final run (Bradley, 1959, p. 23).

The following is a review of historical plans and studies that addressed rapid transit in Winnipeg. It reveals the story of different proposals for rapid transit and explains why nothing was initiated until 2009. It begins with proposals for a subway system, discusses the city's commitment to automobile infrastructure and the future this created. The initial plans for the SWRTC, completed in the 1970's, led to the final precursor to rapid transit in Winnipeg, the *Made in Winnipeg Rapid Transit Solution*.

### 4.1.1 Future Development of Greater Winnipeg Transit System (1959)

The initial plan for a rapid transit system in Winnipeg was developed in 1959. The document provides a background study and proposal for a grade separated rail subway system. The author, Norman Wilson, was engaged to undertake a complete transit study, including rapid transit, at the request of the Greater Winnipeg Transit Commission (GWTC). Wilson reports the problem in metropolitan

Winnipeg, at the time, was congested streets. Frequent traffic jams slowed transit. As the city grew, the fear was traffic congestion would also increase. Efficient rapid transit was presented as grade separated from roads and automobile traffic. As part of the subway proposal, Wilson proposed three lines to connect various areas of the city to downtown. These lines were the Portage–North Main–Mountain Line, the Osborne–Chalmers Line and the Pembina–William Line (Figure 19). These would cross and connect to each other and to the existing bus and trolley system,

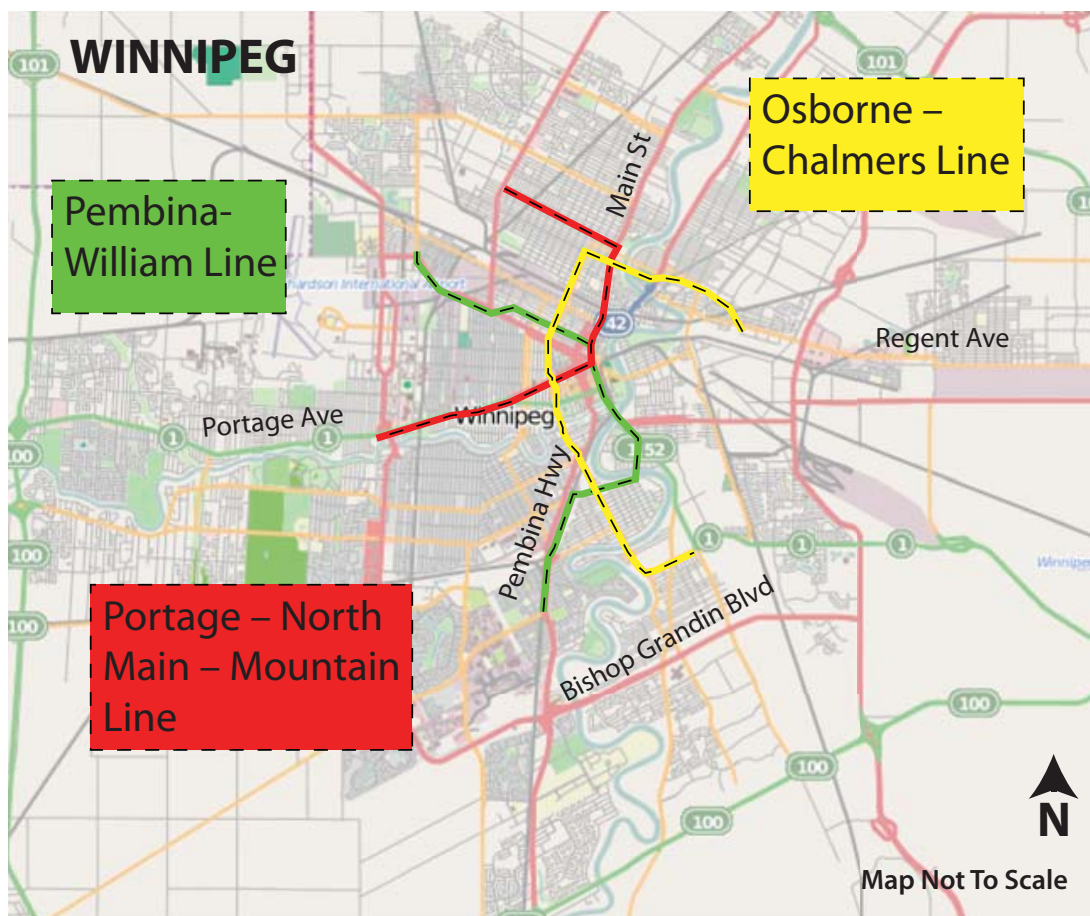


Figure 19. 1959 Wilson subway plan, Winnipeg.

which Wilson (1959) described as: “well organized ... and the frequency of service appears well proportioned to the demand” (p.41). Transfers between the new rapid transit lines and the existing system were to be free of charge, so the existing system could complement the subway. The first priority line to be constructed would have been the Portage–North Main–Mountain Line, as these roads carried the heaviest streams of traffic and most bus passengers, which were predicted to increase in the future (Wilson, 1959, p.25).

Rapid transit relieves street congestion by eliminating many of the surface transit vehicles entering the downtown, reducing loads on major streets. Wilson also notes the negative impacts of extensive downtown parking requirements, “since parking lots add nothing to the attractiveness of downtown and detract from business opportunities” (Wilson, 1959, p.3).

Wilson’s rationale for choosing a particular alignment, and the benefits incurred, seem to be consistent with current theory, where convenience and proximity to transit are of the utmost importance. “The desire of rapid transit is to pierce the nodes of most active business and human concentrations so that as many of its passengers as possible

will be delivered as close as possible to their final destinations” (Wilson, 1959, p.36). The report also indicates he saw a relationship between transit and development potential, and the redevelopment potential of existing arterials and built up areas, in his discussions of areas where the proposed system would expedite development. While the main justification for transit is reducing traffic congestion, it is interesting to see that ideas about transit and transit-supportive development were emerging in the late 1950s. A news article from 1959 discusses Wilson’s proposal and the opinion that the City would be unable to afford a subway project (Winnipeg Free Press, 1959, para. 3).

#### **4.1.2 Area Transportation Study Volumes 1, 2, 3 (1966)**

The Streets and Transit Committee of Winnipeg City Council commissioned a study in 1966 to understand what the city’s transportation needs would be twenty years into the future. The document discusses the connection between land use and transportation; essentially the need to connect single land use areas with other single land use areas.

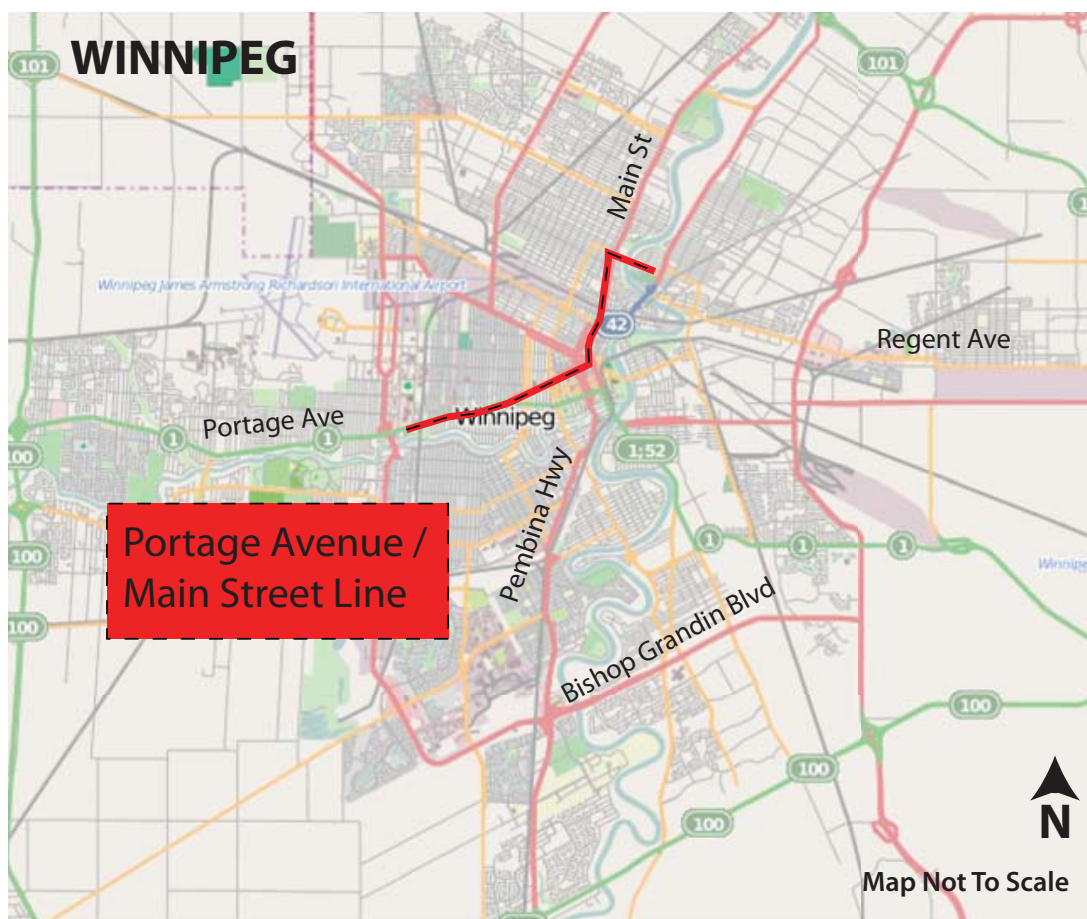


Figure 20. 1966 Area Transportation Study Subway Plan, Winnipeg.

Land use is the dominant factor in determining travel requirements in major metropolitan areas...It is the geographic distribution of these areas of activity that establishes the need for the conveyance of persons and goods between these areas which in turn is the fundamental reason for the development of a transportation system (City of Winnipeg, 1966a, p. 17).

This way of thinking about transportation, in terms of connecting single use areas, contributed to the sprawling suburban development found all over North America.

This project found that 60% of commuters used automobiles, 30% took the bus and 10% walked to work. The highest usages of transit, for work trip travel, were in fringe areas surrounding downtown, and north Winnipeg in areas with instances of high population density and low income (City of Winnipeg, 1966b, p. 24).

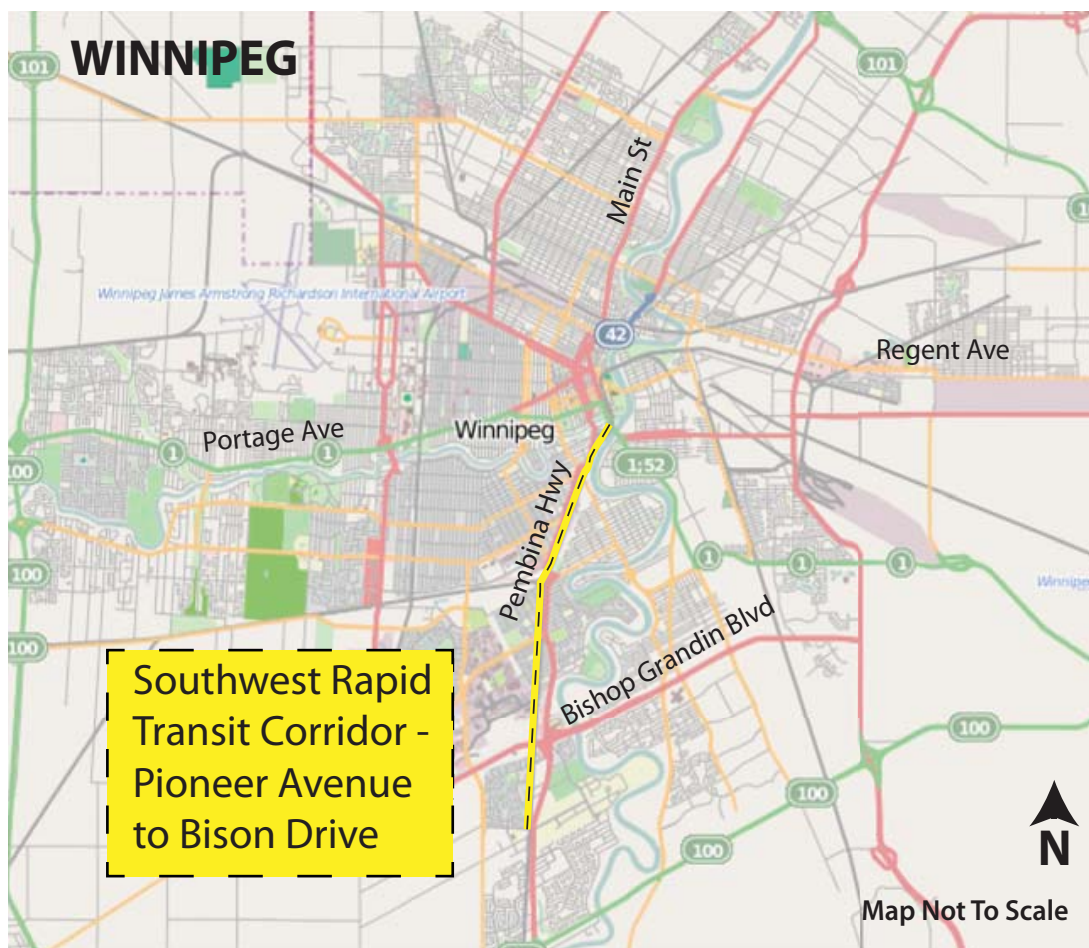


Figure 21. 1976 Southwest Rapid Transit Corridor, Winnipeg.

The research investigated mixed traffic buses, north/south and east/west subway lines, a freeway network and a grade separated rapid transit line along Portage Avenue. The plan's final recommendation proposed a grade separated transit line between Polo Park and Hespler Avenue, at Henderson Highway, running along Portage Avenue and Main Street (Figure 20). This line was coupled with a radial network of five freeways, connecting downtown with suburban Winnipeg. (City of Winnipeg, 1966c, p. 37).

Both 1959 and 1966 studies cited the Portage Avenue–Main Street corridor as the priority for rapid transit development in Winnipeg. This was the most heavily used route at the time. However, this changed by the late 1970s, when the southwest route was identified.

### 4.1.3 Winnipeg Southwest Transit Corridor Study: Report on Phase I Feasibility (1976)

This study is the initial conception of the SWRTC, at the time known as the Southwest Transit Corridor. The recommended alignment is along the CNR (now CN) rail line that loosely parallels Pembina Highway (Figure 21). This document was the precursor to the second part of this study, the phase two recommendations.

The need for the transit corridor in south Winnipeg was based on existing and predicted travel demands along Pembina Highway, using forecasts for population growth and development in south Winnipeg, based on an assumed land use strategy to maximize potential growth to complement the transit line. Information about this land use strategy was limited and there is no reference to a more complete study.

The document discusses three transit technologies for the alignment. These include a “busway (diesel bus or electric trolley bus), light rail transit [and a] fixed guideway system (Ford ACT or Westinghouse Skybus)” (De Leuw-Dillion, 1976, p. 7). The study found the busway option with diesel buses is the most economical, and

provides a level of service as good as the other options discussed (p. 60).

A public participation program was part of this study with questionnaires distributed in 1975 and 1976. The surveys found that “improvements most frequently cited were: minimize wait time 30.6%, minimize travel time 21.9%, provide bus shelters 17.9%, minimize walk time 15.9%, obtain a seat 8.8%, low fares 5.8%” (De Leuw-Dillion, 1976, p. 61). A second round of questionnaires ranked “statements reflecting objectives...in order of priority through a pairing process. The results of the ranking were: 1. Maximize safety, 2. Minimize air pollution, 3. Decrease travel time, 4. Provide high frequency of service and reduce number of stops, 5. Minimize noise, 6. Minimize energy requirements, 7. Minimize tax burden and minimize transfers, 8. Maintain fare level, 9. Obtain a seat, 10. Minimize visual intrusion” (De Leuw-Dillion, 1976, p. 62). Detailed explanation of these results is not included in the document, forcing the reader to speculate on the meaning of some of these issues. For example, safety is mentioned as the number one priority. However, it is unclear if this means personal safety from crime at stations and on transit vehicles, or safety from transit and automobile accidents.

The study concludes: “a transitway on separate right-of-way (CNR rail line) was the most feasible solution to satisfy travel demand in the corridor...the preferred technology was either diesel or trolley bus” (De Leuw-Dillon, 1976, p. 63). This solution has the least adverse effect on automobile traffic and is the most economical. The survey results mentioned above allude to people’s desire for a safe, fast and convenient transit system.

#### **4.1.4 Winnipeg Southwest Transit Corridor Study: Report on Phase II Recommended System (1977)**

Although phase one concluded that a diesel bus line on the CNR line ROW was the best option, the City directed the consultant to review the feasibility of phasing in electric powered vehicles after the busway was complete. This study, published in 1977, found converting to an electric bus trolley more feasible than to LRT or a fixed guideway system. However, it was noted that long term changes in land use and population distribution might warrant a new feasibility study (De Leuw-Dillon, 1977, p. 26).

Implementation is discussed in the document by considering construction options, which could have had the SWRTC completed by 1981. The study recognized it would be advantageous to complete the line before Pembina Highway reached its capacity (p. 27). It was concluded that the project should be completed in one phase:

1. It will attract more riders and save energy and reduce the need for more roads.
2. New development along the corridor could be oriented to the system providing initial benefit.
3. Users would enjoy improved service (De Leuw-Dillon, 1977, p.32).

The current SWRTC project is being completed in two phases, and by this account will not be able to take advantage of these benefits.

Station location is a trade-off between maximizing access while minimizing total number of stops to minimize travel time (De Leuw-Dillon, 1977, p. 52). Station locations were proposed at Bison Drive, Markham Road, Chancellor Drive, Clarence Avenue, McGillivray Boulevard, Windermere Avenue, Morley Street, Osborne Street, Stradbrook Avenue and Union Station.



The study identified these station locations using the following criteria: “pedestrian access from adjacent residential areas, access and transfer facilities for feeder bus routes, park and ride facilities, availability of suitable land, compatibility with adjacent land use and station spacing” (p. 52). Of these, the most important considerations were pedestrian access and space for parking (p. 52).

The study proposes a land use strategy to complement the transit line with the intention of increasing ridership by maximizing residential land use within the corridor. It is based upon the forecasts from the phase one document. It was noted, between then and the time of this phase two document, the City’s Environmental Planning Department decreased its population projection for the City of Winnipeg in 1991 from 731,500 to 656,000, while the average dwelling size (number of people per dwelling) also decreased from 3.0 to 2.88. The consultant argues these two statistics would ultimately cancel each other out. The demand for dwelling units forecasted in phase one was still considered valid (p. 66). However, reducing the population and dwelling unit size would negatively affect transit ridership.

Opportunities for residential growth are presented through specific

recommendations for five areas along the corridor: downtown, Roslyn Road (Osborne Village), Fort Rouge, Fort Garry and Fort Richmond. The document mentions there was much more development opportunity in the southern portion of the corridor, with little land available for further development north of McGillivray (p. 67). This was based upon the development of single-family detached homes. Multiple family residential developments were not part of the discussion for residential development, except in the Osborne Village area. However it was deemed “highly unlikely that major redevelopment will occur in the central sections of the corridor” between Osborne Village and Bishop Grandin Blvd. (De Leuw-Dillon, 1977, p. 69).

The land use strategy indicates downtown population has no effect on ridership and that commercial land uses will increase ridership. This statement is partially incorrect. Commercial land uses will increase ridership by attracting commuters who work in the downtown. However, the downtown residential population would have a direct effect on ridership. More riders will decrease the demand for parking in the downtown. With less demand on available land reserved for parking, the opportunity for residential

and commercial development is increased. More people living downtown would mean more riders on the transit line. Also, downtown residents may use the transit line for commuting or general access to south Winnipeg. If measures are taken to promote development along the transit line and in south Winnipeg, the opportunity for increasing two-way ridership would be created.

Growth in the Fort Rouge area was anticipated to occur in the Fort Rouge Yards. This development was intended to be medium to high density and be completed within a 10-year period from the time of implementation of the transit line. To facilitate this it was recommended that the City create a district plan for the area. Development in Fort Garry was limited to: redevelopment of land south of Chevrier Blvd. between the CNR line and Red River, and the redevelopment of the CNR Taylor Yards into medium to high density residential. Finally, Fort Richmond was seen as the area with major growth potential. At the time this document was written, housing construction was strong and demand was projected to increase. The study recommended, if timing was critical for development in this area, that developers should be given the flexibility in terms of density to respond to market conditions. This land use planning study misses

development opportunities that could occur along Pembina Highway. Increasing land values and new opportunities, due to proximity to a transit station, will increase demand for redevelopment.

#### **4.1.5 Plan Winnipeg Transportation Component (1981)**

The 1981 iteration of *Plan Winnipeg* addressed transportation as: “the thoroughfare system, the public transit system, the railway systems, the air systems, and the underground and overhead distribution systems” (City of Winnipeg, 1981, p. 1). The plan reveals the transit system was under financial pressure, resulting from three issues: “the need to provide service to many low density, suburban residential [and industrial] areas, the highly labour-intensive nature of the service and the increasing price of petroleum products” (City of Winnipeg, 1981, p.5).

The plan provided a recommended transportation option, which included two-lane roadways for the exclusive use of transit. These corridors included the current Southwest Transit Corridor along the CNR mainline from Pioneer Avenue to Bison Drive; an eastern transit corridor along the CPR mainline from

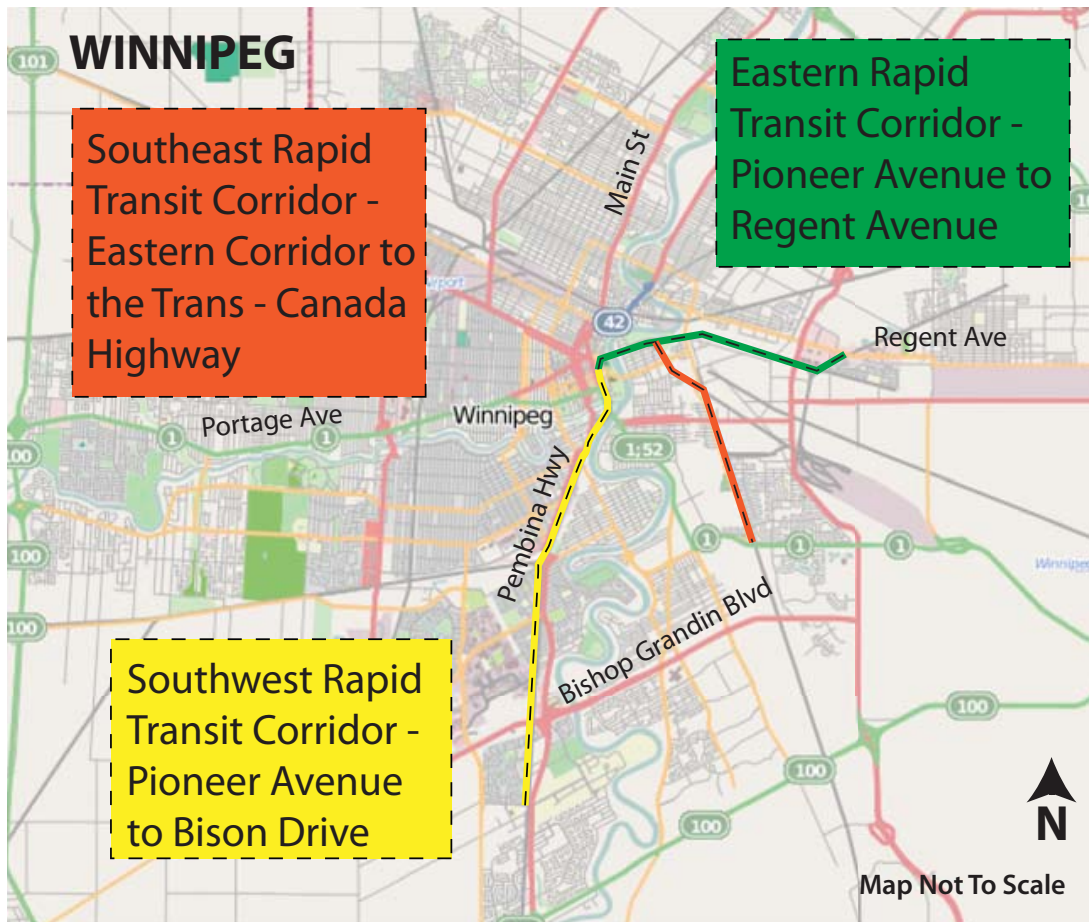


Figure 22. 1981 Southwest, Southeast and Eastern Rapid Transit Corridor, Winnipeg.

Pioneer Avenue to Regent Avenue; the southeast transit corridor along the CPR line to the Trans-Canada Highway (Figure 22); and finally a northwest transit corridor. However, a specific alignment is not identified. The plan also called for the conversion of Graham Avenue into the dedicated transit and cycling street that it is today.

During this time the City of Winnipeg undertook the Kildonan Bridge and Charleswood Bridge projects,

improvements to York Avenue, Regent Avenue and North Main Street and an extension of Bishop Grandin Boulevard. With so many capital projects focused on bridges and roads, there was not enough money for rapid transit (MacDonald, 1988, p. 7).

#### 4.1.6 Winnipeg Transplan 2010: Moving Toward Solutions (1998)

*Transplan 2010* was created as a result of *Plan Winnipeg Toward 2010*, which called for a revised transportation and land use plan. The plan was guided by three main principles: maintain existing infrastructure; commit to transit system improvements; and commit to regional street system improvements. The second principle says:

The city shall commit to transit system improvements as a second priority in those areas where transit is considered to have a potential advantage over the private automobile, namely within the downtown, at major access points to the downtown, along the major radial regional street system, and in areas of concentrated employment (City of Winnipeg, 1998, p. 4).

Rather than making transit a top priority, this policy still committed the City to a development model with a focus on the automobile.

The plan featured community consultation, something lacking in previous plans and studies. Along with five community workshops, the plan was also informed by a public survey about rapid transit (City of Winnipeg, 1998, p.7-8). The study summarizes the community engagement program by outlining what participants wanted to see: a rapid transit system, such as monorail or subway, and improvements to the street system, including wider roads and freeways. The study also reported on what respondents did not want to see: inappropriate changes to the flow of traffic, including changing traffic lights, stop signs, turning lanes and one way streets (Western Opinion Research, 1995, p .3). People were generally in support of rapid transit. However, they did not want the convenience of driving to decrease and they desired improvements to automobile infrastructure.

Providing some context for transportation trends in Winnipeg, the plan states: “Of the over 100,000 morning peak-hour work trips in 1992, 60% were made by automobile drivers, 20% by bus passengers, 12% by vehicle passengers, 7% by pedestrians, and less than 1% by cyclists” (City of Winnipeg, 1998, p. 13).

The planned transit improvements are presented as a list of policy statements, as this plan evolved from the City's development plan, *Winnipeg 2010*. The policies and recommendations include various mixed bus network improvements and deferring the Southwest Rapid Transit Corridor until after the timeframe of the 2010 plan, and should be included in the next iteration of *Plan Winnipeg*. Rail ROWs should be protected to reserve them for future rapid transit alignments.

It is interesting that all previous transportation plans and studies have favoured rapid transit and recommended some form of it, while this plan, prepared in 1998, recommends the deferral of rapid transit and the protection of ROW, for future implementation. The focus on road infrastructure improvements in this and previous plans helped create a situation where rapid transit became financially unviable. As a result, the 1998 plan recommended deferral rather than implementation.

#### 4.1.7 Direction to the Future (2000)

The *Direction to the Future Guide to Better Transit for Winnipeg* was created by a task force consisting of four city councilors and the director

of Winnipeg Transit. The document provides background information about the role of public transit in Winnipeg, factors affecting, and methods to increase ridership, recommended improvements, a multiple year transit improvement plan and recommendations on funding for transit.

In the document, public transit in Winnipeg is described by quoting excerpts from *Transplan 2010*. Also, a study of transit users is provided. At the time of this study, 39% of Winnipeggers 15 years and older never used transit, 22% used it one trip per week or less and 19% used it six or more times per week. The rest were somewhere in between one and six times per week. Another statistic from this study shows 11% of Winnipeggers over the age of 15 used transit for their daily commute to work or school, while 53% rarely used transit (City of Winnipeg Transit System, 2000, p. 22). These statistics show transit must cater to its existing users, of which a high proportion are young people, while attracting new discretionary riders.

The document recommends increasing ridership by implementing supportive conditions, and improving transit services in Winnipeg. These strategies and recommendations for transit system

improvements, focus on the existing system, than rapid transit.

The need for rapid transit is presented in terms of reducing travel times. The report indicates the Southwest Rapid Transit Corridor is the first priority for rapid transit in Winnipeg, and the City should “determine the conditions and time frames for proceeding with a busway system” (City of Winnipeg Transit System, 2000, p. 53). Previous to this, the plan provides a discussion to justify the choice of BRT rather than LRT. Other routes for future consideration are also discussed, and include “the Eastern Corridor [to Transcona], the Southeastern Corridor [to Windsor Park and Southdale], the Northeastern Corridor [to Elmwood, East Kildonan, and North Kildonan], the Northwest Corridor [to Inkster Industrial Park and the Maples], and a busway link between Grant and Portage Avenues in the CNR Oak Point subdivision that parallels Kenaston Boulevard” (City of Winnipeg Transit System, 2000, p. 53).

#### **4.1.8 Plan Winnipeg 2020 (2000)**

At the time of this practicum *Plan Winnipeg 2020* is the City’s

current development plan. It briefly discusses transportation based on four policy directions. These are: provide an integrated transportation network, commit to transit improvements, commit to traffic operations improvements, and promote mobility through principles of universal access. Within these policy areas, rapid transit is not even discussed. The policies focus on the existing mixed traffic bus transit system. Policies regarding alternative transportation promote the comfort of pedestrians and cyclists by improving conditions for each. Rapid transit is mentioned under the umbrella of infrastructure investment in a policy titled, “Direct Transit System Improvement” (City of Winnipeg, 2000). “The City will invest in a rapid transit corridor development...to significantly improve speed and provide support in the revitalization of downtown” (City of Winnipeg, 2000, p. 37). This explicit support for rapid transit is a step forward, rather than a deferral as is the case with previous plans. However, goals for rapid transit should also include attracting additional riders and development, in conjunction with rapid transit. It should be viewed as a new way of city building, rather than simply an alternative form of transportation, which may have subsequent benefits.

### 4.1.9 Made in Winnipeg Rapid Transit Solution (2005)

The Rapid Transit Task Force, established in 2005, included city councilors and local professionals with the goal of creating a “made in Winnipeg” rapid transit solution. It is the precursor to the SWRTC under construction at the time of this practicum. Infrastructure opportunities, including rail and road that could be used for rapid transit are discussed. The report also mentions that the City has purchased the Fort Rouge Yards and part of the CN line for development of the SWRTC. Road infrastructure that may be appropriate for rapid transit is presented. The task force suggested wide road ROW with large medians could be used for rapid transit. Examples they cited include the Louise Bridge/Higgins and Nairn Avenue, Empress and St. James Streets and the Disraeli Bridge. Other streets are also mentioned, not regarding rapid transit opportunities but rather automobile traffic upgrades and their costs. The Louise Bridge/Higgins and Nairn Avenue route and the Disraeli Bridge are discussed in the context of possible on-street rapid transit, while the others are merely streets that are to be upgraded, seemingly for automobile traffic. A more important discussion would have outlined an

inventory of streets where rapid transit could be incorporated. However, as noted above, the City was already purchasing rail corridors for rapid transit, showing their predetermined commitment to rail corridor alignments for rapid transit (Rapid transit task force, 2005, p. 12).

The report involved extensive public consultation. Respondents were asked about the existing and future systems. In short, respondents cited speed, reliability, frequency and comfort of stations as important factors for better public transit.

A brief history of rapid transit in Winnipeg is provided in the report. The cancellation of the SWRTC project in 2004 is discussed. The same year, a new Mayor and two new councilors were elected. Upon canceling the project, the Mayor also commissioned this study. The Mayor cited the need for more information about rapid transit in Winnipeg and thought that light rail would be a better solution than BRT. The \$50 million dollars earmarked for rapid transit was spent on community centres and buses (Welch, 2004, p. A3).

The study reviewed examples of LRTs in the United States and Canada and BRT examples from around the world. Key features of each were

presented. However it was found LRT was not a realistic option due to cost. Benefits of BRT over the existing system in Winnipeg are summarized as follows: reductions in travel time, significant improvements in service reliability, increases in frequency of service, increase in ridership, modal shift, reductions in greenhouse gas emissions, improved productivity of transit service and improved general traffic flow (Rapid transit task force, 2005, p. 33).

Stated objectives for a rapid transit system (listed in section 3.1) are based on community consultation, precedent examples, technical expertise and specific needs in Winnipeg. The document goes on to recommend a variety of transit system improvements including the “acceleration of the full Southwestern busway component into phase one” (Rapid transit task force, 2005, p. 45).

#### **4.1.10 Our Winnipeg Sustainable Transportation Direction Strategy (2010)**

Winnipeg’s review of the City’s development plan in 2010 titled *Our Winnipeg* includes supporting documents called “Direction Strategies.” One document titled *Sustainable Transportation* is in draft form at the time of this practicum.

This document also refers to a *Transportation Master Plan*, which is currently incomplete.

The document deals with all forms of urban transportation for people and goods. Weekday trips by mode of transportation are presented as follows: 64% made by auto driver, 15.7% by auto passenger, 8.3% public transit, 10.0% walk, 0.7% cycle (p. 13). There seems to be a decrease in the percentage of transit riders from the numbers reported in previous studies (see section 4.2). Discussing the existing public transit system, the document identifies transit quality corridors, which are busy arterial streets with high bus ridership. They are described as streets where transit system management (TSM) improvements have been implemented. These improvements provide more up to date information for riders and in some places allow mixed traffic buses to circumvent traffic congestion, reducing travel time (City of Winnipeg, 2010a, p. 20). Transit quality corridors include Henderson Highway, Main Street, Marion/Goulet Streets, McPhillips Street, Pembina Highway, Portage Avenue, Regent Avenue, St. Mary’s Road and St. Anne’s Road (City of Winnipeg, 2010a, p. 9).

The rapid transit component of the plan discusses the Southwest Rapid



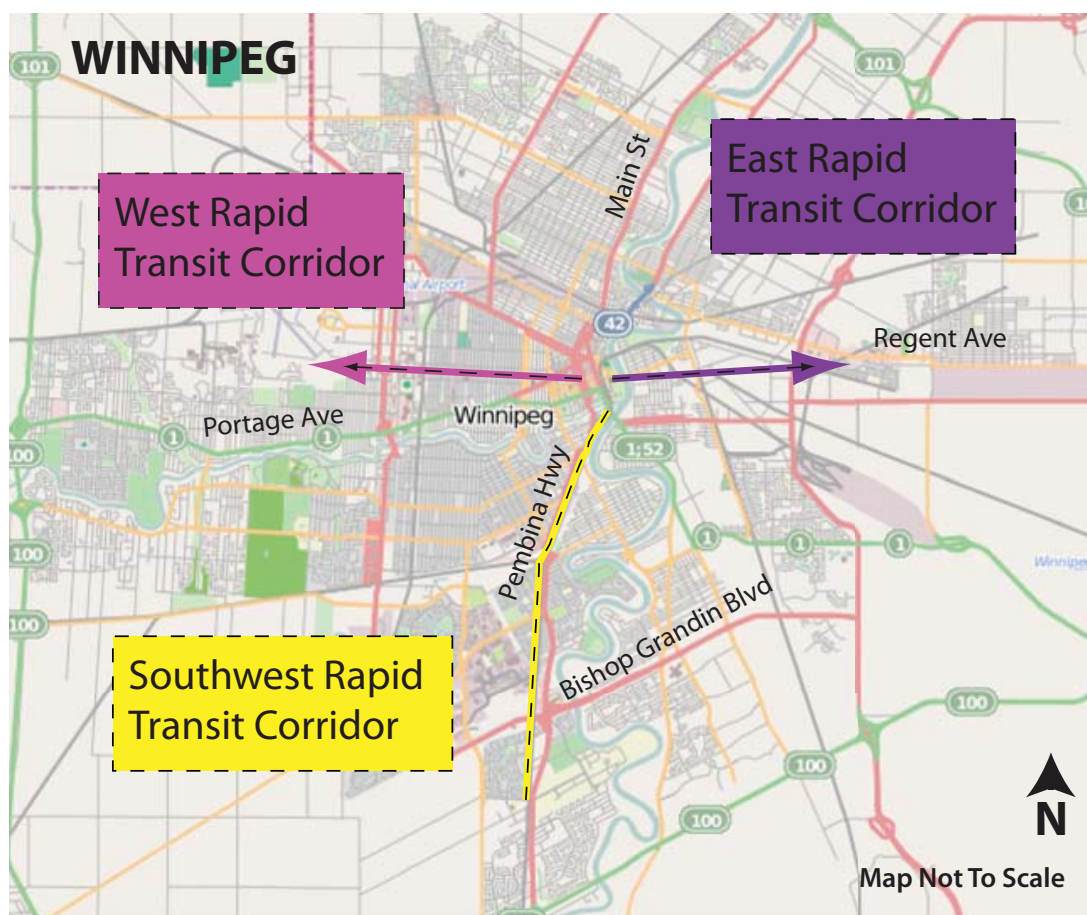


Figure 23. 2010 Southwest, West and East Rapid Transit Corridors, Winnipeg.

Transit Corridor and introduces the West and East Rapid Transit Corridors (Figure 23). The potential rapid transit modes considered for any of these corridors are not mentioned. However, these modes are discussed as being either LRT or BRT.

The final choice for technology should be made following a detailed assessment of the actual corridors to be served, operating characteristics of the technologies, the City's

financial capacity, the City's ability to implement and maintain the technology and any other determining factors (City of Winnipeg, 2010a, p. 19).

It seems that existing and future potential ridership would be an important determining factor. A reason the document does not discuss a specific mode for the SWRTC is that (at the time of this practicum) the City of Winnipeg has commissioned another study to assess the costs and



Figure 24. Phase two of the SWRTC is not defined as part of *Our Winnipeg*.

benefits of LRT vs. BRT for the SWRTC. “In February (2010), Katz announced his intention to place Phase Two...on hold until the city investigates light rail” (Kives, 2010a, para. 5).

The SWRTC discussion outlines the alignment and details of phase one but does not specify where phase two of the project will be aligned (Figure 24). “An appropriate corridor for the second stage (from Pembina

& Jubilee to the University of Manitoba) will need to be identified” (City of Winnipeg, 2010a, p. 22). The discussion goes on to consider land available for development along the corridor, however does not specify if this is just referring to phase one or includes potential corridors for phase two which are not discussed.

The West Corridor is described as connecting downtown with the airport, Red River College and Polo Park. However, there is no discussion about potential alignments or areas between downtown and these three destinations (City of Winnipeg, 2010a, p. 22). The East Corridor alignment description is just as vague but the document mentions some challenges with identifying an alignment “Beyond identifying the most appropriate corridor for rapid transit, the other challenge will be identifying how best to cross the Red River” (City of Winnipeg, 2010a, p. 22). The document does not discuss how potential rapid transit corridors will be analyzed or what criteria will be used. The document hints arterial streets may be considered for future rapid transit alignments, as it does not specify the alignment for phase two of the SWRTC and the only other reasonable corridor would be Pembina Highway. However, the study’s glossary of terms includes a definition of rapid transit and mentions grade separated and off-

street corridors, however it does not mention on-street dedicated lanes (City of Winnipeg, 2010a, p. 51). The *Transportation Master Plan* is perhaps the more appropriate document to address corridor alignments. However, this document is incomplete and absent from the *Our Winnipeg* plan release and discussion, highlighting a gap between transit planning and city building. The “City Building” section of the plan says:

...planning for the next 25 years will be critical to our city remaining livable, affordable, and desirable... it also means making sure that our city is attractive and well designed, with a range and mix of housing and sustainable transportation options...We need to strike a balance between ‘growing out’ and ‘growing up,’ offering choices from traditional, single-family neighbourhoods to more dense forms of urban housing and new neighbourhoods designed around a rapid transit system (City of Winnipeg, 2010c, pg. 25).

The plan strives to achieve more sustainable forms of development around rapid transit. However, future

alignments and criteria for choosing alignments are unknown. Without integrating land use and transit planning, *Our Winnipeg’s* goals for city building will be difficult to achieve. This disconnect, between city building and transit planning shows a lack of commitment from City Council to change development patterns and integrate rapid transit with city building, to make Winnipeg more resilient to an uncertain future.

#### 4.1.11 Winnipeg Transit-Oriented Development Handbook (2010)

The *Our Winnipeg* plan, accompanied by the *Transit-Oriented Development Handbook* is also in draft form. The *TOD Handbook* discusses the principles and benefits of TOD, the challenges of implementation, coordinating transit and development and six different TOD typologies based on urban structure, location and density (City of Winnipeg, 2010b, p. 7).

The document does not discuss which types of TOD are to be developed around the SWRTC. It would be difficult to fully predict how much and what type of transit-supportive development will occur, as the land development/real estate market will influence growth. The

document could relate back to the *Sustainable Transportation Direction Strategy*, by outlining where potential TOD typologies would be appropriate or desired for specific areas along potential corridors. One form of TOD listed in the document is known as a high frequency corridor. The *TOD Handbook* does specify that these generally coincide with transit quality corridors mentioned in the *Sustainable Transportation* document review in the previous section (City of Winnipeg, 2010b, p. 38).

The Handbook does not relate TOD to corridor analysis nor does it outline what type of corridors or specific corridors in Winnipeg are best situated for TOD, a process also known as development-oriented transit (see section 2.6). The document discusses development-oriented transit as integrating transit stations within surrounding environments and provides a discussion about how transit stations, existing neighbourhoods, and new development should relate to one another. (City of Winnipeg, 2010b, p. 14). When discussing market constraints the document cites the potential lack of land available for development as a possible barrier to the development of TOD.

Land may not be available due to the fragmentation

of land holdings or may be currently underutilized by older, less intense land uses. For example, the ability to develop land may be hindered if there are multiple land owners of small parcels that require development agreements or the purchase of land in order to secure a large enough parcel to make development financially viable (City of Winnipeg, 2010b, p. 12).

The issue of available land for development is a market constraint but it is also an issue of development-oriented transit and must be dealt with during the initial planning and corridor analysis phase. The *TOD Handbook* should link back to rapid transit corridor analysis through development-oriented transit strategies.

Like the *Sustainable Transportation* document, the *Transit-Oriented Development Handbook* also does not discuss on-street rapid transit. A case study discussion of the Rosslyn-Ballston Corridor in Arlington Virginia mentions it is the most comprehensive example of TOD in North America and discusses this success based upon land use plans and population growth (City

of Winnipeg, 2010b, p. 18). However what the handbook fails to mention is a key component of the success of the corridor, i.e., alignment choice. Interstate 66 parallels the corridor, located between 500 metres and just over one kilometre north of Wilson Boulevard and Fairfax Drive. This freeway, along with the chosen alignment, which follows these arterial streets were both studied for the corridor. The alignment following Wilson and Fairfax was chosen for its high development potential (see section 5.4.1).

## 4.2 Chapter Summary

Historically, transportation planning in Winnipeg has focused on building roads for automobiles. Once a large road network was in place, maintaining these roads was/is a significant expense. Winnipeg City Council could never commit to rapid transit and funding was always an issue. Without a rapid transit system, development has been focused solely around the automobile. This has left Winnipeg with a large, widespread, expensive road network to maintain and no rapid transit corridors to expand upon.

Transit ridership seems to have decreased over the last twenty years. *Transplan 2010* reported that 20% of morning commutes to work in 1992

were by bus (p. 13). The *Direction to the Future* (2000) study showed that 11% of daily commuters used public transit (p. 22). The *Sustainable Transportation Direction Strategy* (2010) showed 8.3% of weekday trips are made via public transit (p. 13). The current number of transit commuters may be higher, as 8.3% represents all trips, while the proportion of transit use is higher for commuting trips and lower for other trips, thus decreasing the average. Notwithstanding this discrepancy, transit ridership has decreased since the 1980's. In 1986 there were 58 million total transit trips (Kusch, 1994, para. 2) by 2003 there were 37.7 million total transit trips (Canadian Broadcasting Corporation, 2008, para. 3), while in 2009 there were 43.9 million transit trips (City of Winnipeg, 2010d, para. 9). This decrease represents an opposite trend when compared to population growth as Winnipeg's population in 1986 was just over 594,000 while in 2006 it was just over 633,000 (Statistics Canada, 2006). The drop off in transit ridership is commensurate with the deferral of rapid transit in favour of automobile infrastructure investment. The *Direction to the Future* report provides an explanation of why rapid transit has not been implemented in Winnipeg, even though it has been a recommendation since 1959.

While the Southwest Transit Corridor has been considered for implementation on several occasions by previous Councils, it has always been deferred so other transportation projects [mainly new roads and bridges] could proceed. As part of its long term financial plan, Council is committed to decreasing the City's debt from levels accumulated by previous projects. Consequently, the funding of the Southwest Transit Corridor by the City remains problematic (City of Winnipeg Transit System, 2000, p. 53).

The City's preference for automobile infrastructure improvements over rapid transit, between 1959 and 2010 when these studies were conducted, created this situation. The release of the City's development plan *Our Winnipeg* in 2010 does not coincide with the release of the *Transportation Master Plan*. This will further complicate developing a rapid transit network in Winnipeg, as city building and transportation goals are not integrated. It is apparent that a macro modal shift in travel choice in Winnipeg will require significant investment and political will.

## 4.3 Context for the Practicum

The City of Winnipeg is moving forward with a plan to implement the Southwest Rapid Transit Corridor. The corridor will connect downtown with the University of Manitoba. The project will be completed in two phases (Figure 25). At the time of this practicum, phase one is under construction along the CN rail corridor and will extend about 3.6 km from downtown to Jubilee Avenue, which is about one third of the total distance. Phase two, approximately 6 km, will complete the line to the University of Manitoba. It will most likely be aligned with the CN corridor. However, the *Sustainable Transportation Destination Strategy* (see section 4.1.10) does not define the alignment for phase two. The literature on rapid transit and transit-supportive development (see chapter 2) favours rapid transit lines located on existing streets and built up areas (Dunphy et al, 2004, p. 173). Transit lines should always take advantage of alignments, which provide direct connections to places people need to go and alignments that present a foundation for dense residential and commercial development around the transit line and stations (see section 2.6).



Figure 25. SWRTC phase one and potential phase two alignments, CN rail corridor.

Throughout the history of Winnipeg’s transit plans and studies, on-street rapid transit has never been studied. It is important to understand the implications of on-street rapid transit versus off-street rapid transit, as other cities, in particular Cleveland, Minneapolis/St. Paul and Detroit, have chosen to locate new rapid transit alignments within existing street ROW. These alignments have been chosen over rail and highway

corridors to take advantage of existing built up areas and transit-supportive development potential. The key informant interviews in Cleveland and Minneapolis/St. Paul (see chapter 5) intend on exploring the benefits of on-street rapid transit, while the focus groups (see chapter 6) strive to understand if it is a better option for the SWRTC.

# 5

## Interview Results and Analysis







This chapter provides a discussion about rapid transit projects in Cleveland and Minneapolis/St. Paul, based on the practicum researcher's tours of the project areas, and semi-structured interviews with relevant professionals in December 2009 and January 2010. Following this, two other on-street projects are discussed: the Rosslyn-Ballston

Corridor in Arlington, Virginia and the Woodward Avenue LRT in Detroit. These projects are presented through a review of published materials to highlight other cities choosing on-street rapid transit alignments. The Chapter Concludes with a discussion about potential implications for the SWRTC.

## 5.1 Introduction

The Euclid and Central Corridors were chosen for a variety of reasons. They are both comparable to Winnipeg as they are both winter cities with similar climatic conditions. Cleveland's downtown has been declining in population (Smith, 2010, para. 3). Similar to Winnipeg's downtown, most people commute to the central business district to work during the day and relatively few live there. Finally, these examples were chosen because they both have award winning rapid transit projects that use main arterial streets as their alignments. In 2007, the Greater Cleveland Regional Transit Authority was given the "Best Public Transportation System" award by the American Public Transportation Association, for their Euclid Corridor Transportation Project. The Minneapolis/St. Paul policy document, the *Central Corridor Development Strategy (CCDS)*, won the Canadian Institute of Planners "Award of Excellence for Neighbourhood Planning" in 2008. Previously, in 2007, the *CCDS* won the American Planning Association's Minnesota Chapter Honor Award.

The practicum researcher interviewed planners and engineers who were involved with the Euclid Corridor Transportation Project in

Cleveland and the Central Corridor in Minneapolis/St. Paul. The following comparison discusses on-street and off-street transit lines by relating the experiences in Minneapolis/St. Paul and Cleveland to Winnipeg and the SWRTC. The issues, selected for comparison (see section 3.1) are:

1. Ridership,
2. Development Potential,
3. Placemaking,
4. Travel Time, and
5. Safety.

Although these issues are discussed separately it is important to understand they are all interrelated and overlap does occur. A successful project must address all these issues, as they are all significant and all contribute to the success of a rapid transit project.

## 5.2 Comparative Project Briefs

The following sections provide background and contextual information about the Central Corridor in Minneapolis/St. Paul and the Euclid Corridor Transportation Project in Cleveland.

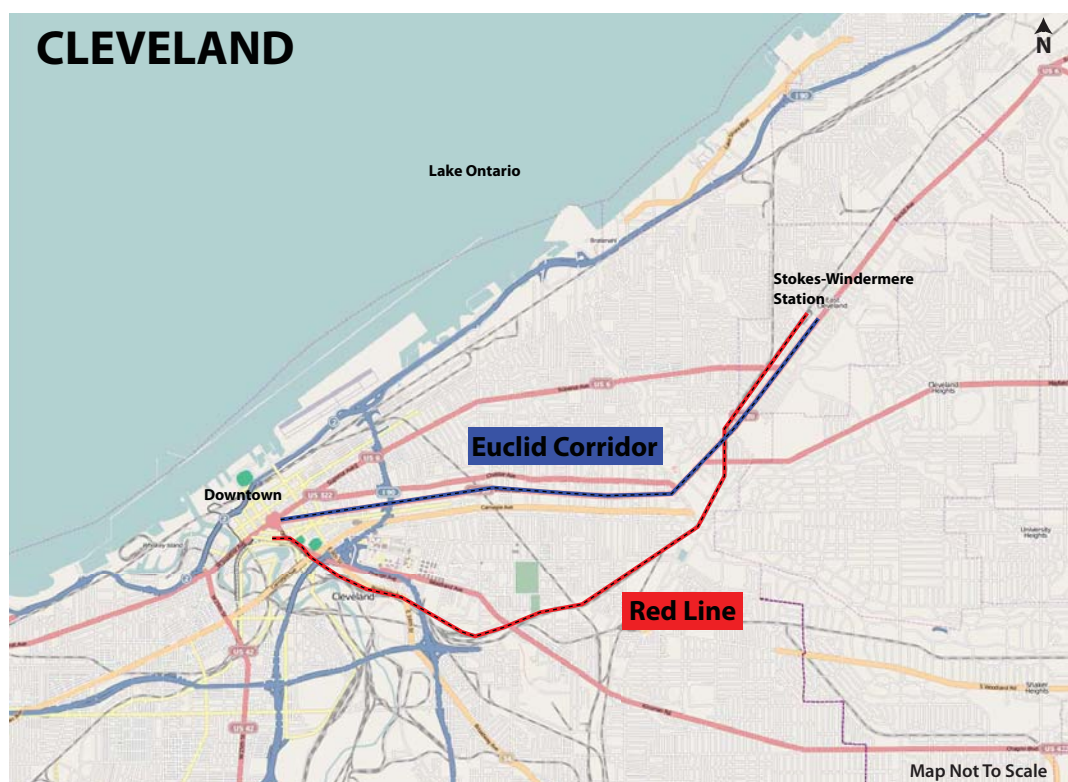


Figure 27. Euclid Corridor and Red Line alignments, Cleveland.

### 5.2.1 Cleveland, Ohio

Along with the Euclid Corridor BRT line, the Red Line LRT, which follows an off-street alignment, is also discussed for comparative purposes. The Euclid Corridor, also known as the “Health Line,” runs 7.1 miles, mostly in a dedicated lane within the Euclid Avenue right-of-way. It connects downtown Cleveland to Stokes-Windermere Station, which also serves the Red Line (Figure 27). The corridor, which opened in October 2008, serves 58 stops with 36 stations, as some stations serve east and westbound BRT vehicles and some serve a single direction

(Mikelbank, 2009c, p. 2). (Figure 29) The BRT system integrates into mixed traffic lanes with stations at curbside, rather than the centre of the street for the eastern third (approximately) of the line. The right-of-way width and existing heritage buildings do not allow for the expansion of space required for a dedicated lane.



Figure 28. Euclid Corridor Vehicle.



Figure 29, Euclid Corridor Transportation Project, Cleveland.

The dedicated lane is permeable, however automobiles are forbidden in this lane except to pass an obstruction in the general use lane. This project undertook an alternatives analysis, as required by the U.S. Federal Transit Administration (FTA). A do-nothing scenario was used as a baseline to compare BRT and various rail proposals, which included realigning the Red Line to Euclid Avenue. However,

the locally preferred alternative presented to the FTA was the BRT system along Euclid Avenue. Between the time of these studies (1990's) and the final project design, various changes and additions were made (Mikelbank, 2009a, p. 6). The final cost for the Euclid Corridor Transportation Project was \$168,400,000 (Mikelbank, 2009c, p. 4).

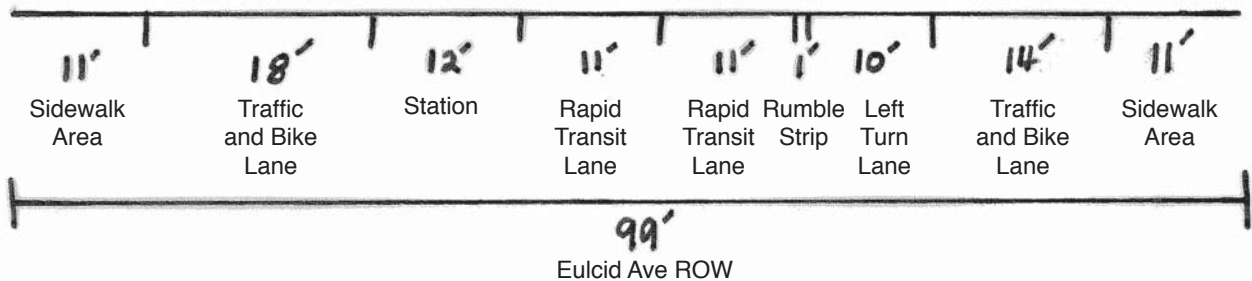


Figure 30. Euclid Corridor Transportation Project typical station area cross section. Euclid Avenue, Cleveland.

The city already has an off-street rapid transit line (the Red Line) that services the same end destinations. This alignment is struggling, and for the large majority does not service areas where people need it or the majority of places where people live or work.

The Euclid project is progressive as it uses BRT technology in a way that is comparable to LRT (see section 5.3.1 and Appendix G). Much of the rapid transit investment in the United States is for LRT. A respondent indicated that the Euclid line could provide LRT type service and comfort with BRT technology for approximately half the price a LRT project was projected to cost. This project is one of the first major BRT projects in the country, and is being treated somewhat unofficially as one of about ten demonstration BRT projects in the USA (R4E).

Opposition to the Euclid Corridor Transportation Project related to three main issues: the loss of a lane for vehicle traffic, the disruption of business during the construction phase, and a perceived loss of parking. The loss of the lane for general traffic was a major issue in the planning phase. The answer, as indicated by a respondent, was to use traffic modeling to prove that disruption would be minimal. Computer traffic

modeling was used to show that neighbouring parallel streets could absorb the traffic. They modeled the loss of one lane each way but also found that the neighbouring streets could absorb all the traffic from Euclid Avenue when they modeled Euclid with the loss of all traffic lanes. This was a crucial factor for the success of the project (R4E).

A respondent indicated that local business owners were concerned they would lose customers and profits during construction. This is an unavoidable consequence of capital construction projects. It was a difficult period for many businesses, with a 30% decline in profits reported (R2P). However, another respondent mentioned that most survived, with only a few businesses closing. Within this group that did close, it is believed that most had not been functioning at a profitable level. This was revealed as part of the construction mitigation strategy, which included a low interest loan program that required the applicant to have a business that was profitable. None of the businesses that closed would have qualified for the loan and during the entire process only one of these loans was provided. Other businesses took advantage of the situation. For example, a local fast food establishment provided a transit construction lunch special (R3E).

The key factor of the construction mitigation strategy reported by respondents was communication and scheduling. Members of the project team went out into the community and visited every business along the Euclid Line. This provided business owners with contacts and a chance to voice their individual concerns and have their questions answered. Construction schedules were distributed in this manner. A key principle of the construction mitigation strategy was providing owners with a schedule and adhering to it. As part of the construction scheduling, no one business was disrupted for more than one year. Also metered parking was removed and signage regulations were suspended. Scheduling allowed owners to accurately plan around the project. One business closed for renovations during transit line construction. The project team found the way they handled the scheduling of construction with the business owners relieved much concern (R2P; R3E).

Respondents indicated the perceived loss of parking spaces was a big issue for all business owners. There was an overall loss in street parking. However, a parking study found that side streets and lots could absorb all required parking spaces, except for eight spaces along the entire corridor. Along many parts of the

line, business owners were given the option for street parking or sidewalk widening that could include outdoor patios or other amenities (R3E).

A respondent commented that people's perception of what is going to happen or what is actually happening is always worse than the reality of the situation. Hard data about the actual amount of traffic and parking spaces, and how these could be accommodated, was required to address negative perceptions (R4E).

## **5.2.2 Minneapolis/St. Paul, Minnesota**

The planned Central Corridor LRT project will connect downtown Minneapolis and downtown St. Paul, running within the University Avenue right-of-way. Minneapolis's first rapid transit line, the Hiawatha LRT Line (Figure 31), connects downtown Minneapolis and Bloomington, running on various off-street rights-of-way. The Hiawatha Line is also discussed for comparative purposes (Figure 32).

At the time of this practicum the Central Corridor is under construction and includes 18 stations along the 11-mile corridor. In downtown

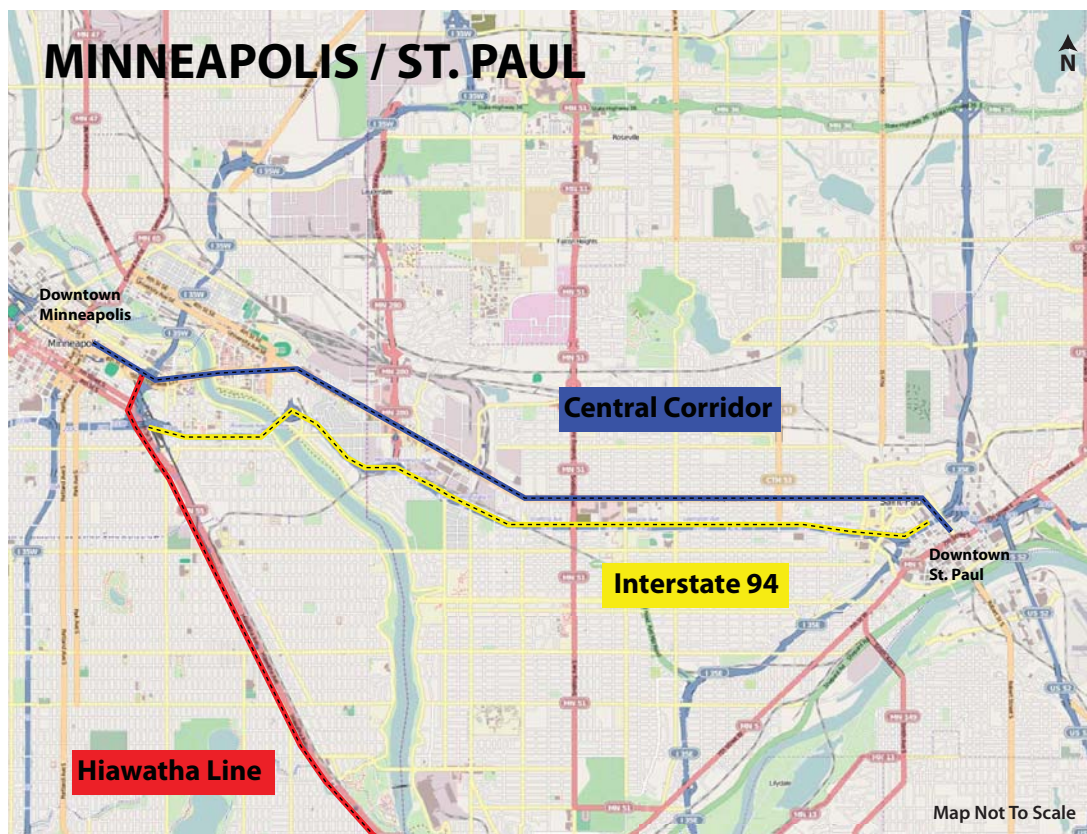


Figure 32. Hiawatha Line and Central Corridor, Minneapolis / St. Paul.

Minneapolis it shares tracks and stations with the Hiawatha Line . The budget for the Central Corridor is \$957,000,000.00 (Metropolitan Council, 2010, p. 2) while the 12-mile Hiawatha Line cost \$715,300,000.00 (Metropolitan Council, 2009, p. 2) (see section 5.5).

University Avenue (R1P). As a result of this process it was discovered that the community wanted more convenient access to transit stations. The proposed plan left some segments of the line without convenient access to stations. The resulting solution

Taking part in the *Central Corridor Development Strategy (CCDS)* involved an extensive community engagement process, which consisted of multiple public meetings, workshops, a citizen advisory committee made up of over 40 community members, and a drop-in centre and project office on



Figure 31. Minneapolis LRT vehicle.



Figure 33. Central Corridor alignment. University Avenue, Minneapolis / St. Paul.

was a recommendation as part of the CCDS for three additional stations at Hamline, Victoria and Western Streets (R1P). These suggestions were accepted and station area planning for these three stations is underway.

Initial planning for the Central Corridor started in the 1960s and was deferred until the 1980s. It was viewed as the most important corridor for transit in Minneapolis/

St. Paul. The various levels of government involved could not agree on a choice of alignment. The main routes studied for the alignment were University Avenue, I-94, and a rail line north of University Avenue. Serious consideration was given to the I-94 alignment that would have had trains running down the centre of the ROW, with stations between them below bridges that cross the highway corridor. This alignment had travel time gains over University

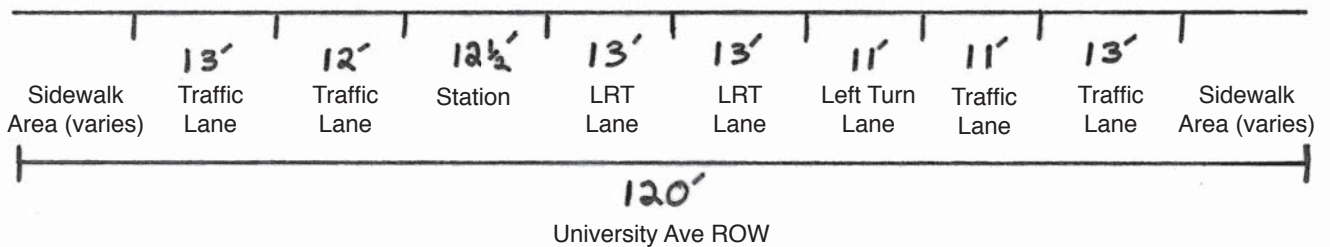


Figure 34. Central Corridor typical station area cross section. University Avenue, Minneapolis / St. Paul.



Avenue, however stations would have to be located within a desolate area in the highway ROW. Riders would have to cross bridges to access stations with little potential to create pedestrian friendly environments. This pointed to weak development potential in close proximity to the stations. It was likely that only some suburban automobile oriented development would have occurred (R5P). A document published by the Metropolitan Council of the Twin Cities Area in 1995, titled “Economic Development Potential Around Central Corridor LRT Stations” concluded University Avenue was the appropriate alignment, and the various levels of government agreed (R5P).

The Central Corridor was considered the first priority for rapid transit in Minneapolis/St. Paul. However, the project was stalled due to extended discussions on the choice of alignment (Figure 33). This allowed the Hiawatha Line to be built before the Central Corridor. The Hiawatha Line alignment is in a dedicated off-street corridor that runs parallel to Hiawatha Avenue, which is a limited access arterial with development oriented away from the street, similar to Bishop Grandin Boulevard in Winnipeg. Hiawatha Avenue was built after surrounding areas were already developed. As part of the redevelopment of this corridor, the

community demanded rapid transit be part of it. As a result much of the alignment used by the LRT line was reserved alongside Hiawatha Avenue when the freeway was constructed (R5P).

Opposition to the Central Corridor was based on two main issues: automobile access and a fear that the line would sever the community. I-94 located south of University Avenue was an urban renewal project during the 1960’s that divided the existing neighbourhood. People who experienced the disruption caused by that project were still present in the community and were concerned that the addition of the LRT line would disrupt their neighbourhood. People living there were used to the Hiawatha Line off-street LRT and did not want the same system running down University Avenue, severing their community as I-94 had in the past (R1P). Through community engagement and education, planners demonstrated how the project could revitalize and connect the community rather than divide it. This is addressed as part of the *Central Corridor Development Strategy*, which promotes community and economic development through urban design by presenting six forms of transit-supportive development specific to the corridor (CCDS, p. 41).



Figure 36. Pocket parking lot Kennedy Street, Winnipeg.



Figure 35. Pocket parking lot Spadina Road, Toronto.

LRT increases pedestrian activity and access while it decreases automobile access (RIP). Business owners generally perceive their customers as being automobile based. Parking and loss of street parking is a major issue. Business owners in the Central Corridor described street parking as their “life-line” (RIP). As one lane of traffic in each direction will be used for the LRT tracks, the lane

previously used for street parking will become a traffic flow lane, eliminating most street parking on University Avenue. Residents along the corridor also expressed concern about “hide and ride” parking issues, where commuters use free parking on residential streets and ride the LRT to their final destination. In response to concerns of business owners and residents, The CCDS called for the creation of a Parking Management Strategy, including the following solutions:

- permit parking on residential streets to combat hide and ride parking;
- amendments to zoning ordinance to include on-street parking within 500 metres of a building entrance in required parking;
- lower the required parking in the zoning ordinance; and
- payment-in-lieu from developments to fund parking ramps and encourage shared parking (CCDS, 2007, p. 89 and 93).

Municipal parking authorities should manage public parking ramps and lots, but other more creative opportunities can be implemented to replace lost on-street parking. A respondent mentioned one such opportunity by creating small parking lots to make up for lost



Figure 39. Elastic tissue. Pembina Highway, Winnipeg.



Figure 37. Static tissue. Clarence Avenue, Winnipeg.

Figure 38. Campus tissue, University of Manitoba, Winnipeg.



parking spaces. An example of this can be found in Toronto on Spadina Avenue (Figure 35) and in downtown Winnipeg on Kennedy Street, (Figure 36) where a small public parking lot is only as wide as the length of two stalls and a lane. These lots maintain pedestrian oriented design, as they minimize disruption to the building facades that frame the street, while a larger lot would create more of a void (R1P).

### 5.3 Comparing Cleveland and Minneapolis/St. Paul

The following subsections present findings from the Euclid Corridor Transportation Project in Cleveland and the Central Corridor in Minneapolis/St. Paul based on semi-structured, key informant interviews and a review of published materials.

A land classification scheme, development by Brenda Scheer (2001) is referred to in this section when discussing land use. Her framework outlines what she calls urban tissue, which exists in three forms: static, campus, and elastic. Static tissues (Figure 37) are planned subdivisions that comprise stable lots that rarely change their form over time, usually single-family neighbourhoods. Campus tissues (Figure 38) are larger areas of land, usually with multiple

buildings, owned by a single entity, such as a University campus. Finally, elastic tissues (Figure 39) are more dynamic urban lands that change uses and building form more often than the other tissues. Lot sizes vary and are usually larger than those of static tissues. Examples include commercial uses such as big box stores and fast food restaurants (p. 32).

Results of the semi-structured, key informant interviews, based upon the five categories (ridership, development potential, placemaking, travel time and safety) used to compare benefits of rapid transit, are discussed in the following five sections.

### **5.3.1 Ridership**

As noted in the introduction and literature review, ridership is a key factor for the success of a transit project. Litman (2009a) discusses transit riders in two categories: transit dependant and discretionary riders (p. 87). Transit dependant riders are just that, they need public transit to satisfy daily transportation needs, as they do not have the option to drive for a variety of reasons. Discretionary riders are those who choose to use transit even though they have the ability to drive an automobile. Later,

during the Winnipeg focus group (see chapter 6), respondents disagreed with this classification by pointing out that a grey area between the two exists, as people are sometimes transit dependant by choice while at other times they are discretionary (R6TO;R7P). However for the purposes here, to simplify the discussion, the two type classification system will be used: a transit trip taken when the option to drive existed at the time is a discretionary trip and a transit trip taken when the option to drive did not is a dependant trip.

A respondent indicated that transit projects that attract the most riders are ones that serve existing bus routes with high ridership (R2P), improving service for dependant riders. However, it is equally important to attract discretionary riders. Another respondent mentioned that transit projects that succeed in attracting these choice riders are those, which offer a modern look and feel. Also those that offer a quick ride, avoid congestion and alleviate the high cost of automobile parking tend to attract high ridership (R5P). A key factor for generating ridership is the number of meaningful destinations along the line. Rapid transit alignments should serve places where people already go, where they live, work and recreate. These alignments should also serve areas with ample development and redevelopment potential, so that

more places where people live, work and recreate can be established.

High ridership is required to maintain operating costs. Convenient service requires frequent headways (frequency of service based on time between vehicles), which promotes increased ridership. Transit ridership grows exponentially and builds upon its own success. Wood (2009) points out convenience of use is dependant on land uses surrounding the transit stations. “Transit corridors that link multiple regional destinations and housing opportunities also appear critical to achieving promised ridership and economic returns” (p. 2). People must be able to live, work, recreate, access services and shop in close proximity to rapid transit stations.

That being said, park and ride facilities also generate ridership. A mix of uses along the line promotes dependant and discretionary ridership. It is also important to locate a mix of uses along the line to promote efficiency. Rather than everyone commuting in and out of a city’s central business district, transit vehicles should be in use in both directions. A respondent indicated the Euclid Line in Cleveland serves an average of over 300,000 riders per month, which represents more than a 40% increase over the #6 bus that used to serve Euclid Avenue

(R2P). By 2025 the line is projected to serve almost 31,000 riders in an average weekday (Mikelbank, 2009a, p. 15). The line connects downtown Cleveland with a hospital, major clinic and university. These institutions are located directly on Euclid Avenue and are easily accessible from stations located to serve them. Easy access to major destinations, including large institutions, is a key component to increasing ridership for a transit line (R2P).

A respondent agreed that connecting major institutions increases ridership. This issue was part of the justification for the Hiawatha Line as there were concerns about ridership and whether rapid transit would work in Minneapolis (R5P). Another respondent confirmed the Euclid line is showing evidence of this through the higher number of boardings around the major institutions along the line (R3P). The easily accessible stations along Euclid Avenue, and the number of destinations along the line, promote two-way ridership. When personally touring the line in January 2010 between 1 and 3 pm on a weekday, the practicum researcher observed ridership to be quite consistent in both directions.

Quality of the transit system is important for attracting riders. Transit dependant riders will



Figure 40. Euclid Corridor Vehicle, Cleveland (made by New Flyer in Winnipeg).

appreciate high quality service. However, discretionary riders have the ability to demand it. A respondent reported that “glitz” is literally a key factor in attracting ridership (R5P). Another respondent agreed that modern, high quality transit systems have a positive effect on the perceptions of public transit (R2P). The Euclid project was specifically designed to mimic the sleek look of light rail. Stations are raised with interesting glass and steel enclosures that protect riders from the elements and house fully automated, digital ticketing machines (Figure 41). The BRT vehicles, supplied by New Flyer in Winnipeg, were custom designed to emulate LRT vehicles. They are sleek with a modern design. The articulated buses are longer than regular buses and are low to the ground. (Figures 40 and 28) Another advantage of the Central Corridor

and Euclid alignments being located within a street ROW is that they are highly visible (R2P). Seeing rapid transit and how it works is a constant reminder that it exists as an option for discretionary riders, and allows them to become comfortable with it.

When introducing rapid transit service, alignment choice begins with analysis of which areas would most benefit from rapid transit. Well-traveled bus routes highlight areas where rapid transit is likely to succeed. High ridership of existing mixed traffic bus routes can be traced to land uses and destinations along the route. Existing riders act as a base to be built upon for rapid transit. Both the Central Corridor and Euclid Line are intended to serve well-traveled bus routes. A respondent indicated that before the Euclid Corridor Transportation Project was

implemented, the #6 bus route served 62 stops along Euclid Avenue. This represented 20% of Cleveland's total transit system ridership (R2P).

High ridership along Euclid Avenue is attributed to the major institutions along the line and transit dependant riders living on or near Euclid Avenue. Intensifying residential and commercial development along the line will build upon this ridership base as more people will live and work in close proximity to the line.

The Red Line in Cleveland, a LRT line that follows a heavy rail corridor, which services the same two stations where the Euclid Corridor begins and ends, i.e. downtown and Louis Stokes Station at Windermere. A respondent pointed out, even with this faster form

of rapid transit, existing ridership of the bus line along Euclid Avenue remained high. Also since it opened in October 2008, the Euclid Line has experienced increases in ridership (R2P). This can be attributed to the direct connection between land uses and the Euclid Line. Destinations are easily accessible as they are oriented to and located near Euclid Avenue.

The Central Corridor is expected to serve 42,000 riders per day, with a preconstruction total of 200,000 people living within half a mile of the corridor. The existing bus routes along University Avenue serve many areas, which are considered transit dependant (Drummond, 2009).

Both the Euclid and Central Corridor alignments directly serve areas with

Figure 41. Modern station design and automated ticket machine. Euclid Corridor, Cleveland.



high transit use, meaning they serve areas where people already live, work, access services, shop and recreate. The Red Line and the other option for the Central Corridor, I-94, do not. The Euclid and Central Corridors also offer higher development potential than their off-street counterparts.

### 5.3.2 Development Potential

Transit-supportive and oriented developments are crucial to the success of transit lines. A successful transit line is one that has an effect on people's choice of transportation mode and reshapes the surrounding built environment. This is not a new

concept, as streetcar suburbs were a common form of development at the turn of the nineteenth century. TOD is a resurgence of this idea and an integral part of contemporary city design and planning. The difference between now and then is that, at the time of streetcar suburbs, these developments were growing on the fringe of the city in suburban and exurban areas. Since World War Two, development patterns in North America have focused on the automobile, creating networks focused on such. Rapid transit projects now have to be creatively introduced into this existing auto-focused infrastructure. Locating transit alignments where

Figure 42. The on-street alignment of the Euclid Corridor Transportation Project represents high development potential.







Figure 43. Institutional development along the Euclid Corridor.



Figure 44. Development along the Euclid Corridor.

development potential is high, also known as development-oriented transit, (see section 2.6) is a crucial component for a progressive transit project.

Integrating rapid transit into the existing urban fabric provides the opportunity to intensify development surrounding it (Figure 42). Dense development along a transit line provides the opportunity for people to live and work with convenient access to rapid transit.

Connecting large institutions and destinations along the transit line attracts ridership and also promotes development. This development is either in the form of institutional expansion or development that supports and is attracted by the institution. In Cleveland, all of the three large institutions previously mentioned, located along the Euclid Line, are expanding (Figure 43). A respondent indicated these institutions would likely have expanded without the rapid transit line. However, the many residential projects and smaller redevelopment projects (Figure 44) that have also emerged would never have occurred (R3E). Another respondent went on to indicate, at the time of the interview, approximately \$2.5 billion of transit-oriented development investment has occurred around the Euclid Line. Not included in this number are many more proposed redevelopment and new construction projects (R4E). A respondent also mentioned there are currently no financial incentives from government for developers, however this may change in the future (R3E). A respondent discussed master planning for the institutions along the Euclid Corridor indicating it was coordinated with planning for the transit line. Station locations and other transit related improvements took institutional future plans and growth into account (R2P).

As with attracting ridership, the permanence of the transit line is important. As previously noted, a respondent mentioned investment in sleek modern transit technology and station design has a positive effect on perceptions of transit for riders and developers. Also, public investment in transit infrastructure proves to developers that a city is committed to the chosen alignment and transit project (R2P). The permanence of the transit line, proven through significant public investment, helps to alleviate risk for development and speculation.

Public investment alone, however, is not enough to entice development along a transit line. The choice of alignment is crucial. The Red Line in Cleveland connects downtown to Louis Stokes Station at Windermere, which also marks the beginning and end of the Euclid Line. The Red Line, for the most part follows an off-street rail corridor alignment. A respondent reported there has not been significant development surrounding that line (R3E). The Red Line and Euclid Line share endpoints, however another respondent concluded that the Euclid Line has significant advantages for development and redevelopment (R2P). The on-street alignment of Euclid Avenue directly serves an existing built up area. There is convenient access to commercial and

residential sites along the street and areas in close proximity to it. Existing development and street patterns are already oriented to Euclid Avenue, creating the foundation for a safe, convenient and interesting pedestrian environment. Under Scheer's classification system (see section 5.3), many segments of Euclid Avenue would be considered elastic tissue (Scheer, 2001, p. 34). Many sites and buildings are easily adapted and redeveloped to serve and be served by the Euclid Line.

A respondent mentioned that the line being not only on-street but at grade is important. People need to see the line and be seen using it. This promotes positive perceptions of the quality and safety of the line (R2P). Riders of an at-grade line that follows an existing street are able to experience the built environment and visually see potential destinations. This increases patronage for commercial uses along the line.

As these examples demonstrate, connecting institutions and major destinations with a modern rapid transit system that follows an on-street alignment, which acts as a foundation for development and offers high potential for redevelopment, is the best option for rapid transit.



Figure 45. The 401 freeway in Toronto represents similar conditions to the I-94 freeway in Minneapolis / St. Paul, associated development is always automobile oriented.

When discussing development potential in Minneapolis a respondent mentioned the Central Corridor has high development and redevelopment potential, and development potential along on-street transit lines in general is high (R5P). There are many redevelopment sites and parking lots along University Avenue. The CCDS identifies these sites and areas and provides guidelines for transit-supportive development for five common forms of redevelopment sites found along University Avenue. At the time of this practicum, the line is under construction, as are some transit-supportive redevelopment

projects. A respondent indicated these initial projects are those that have the highest potential and are the most cost effective and simplest to redevelop (R5P).

If I-94 were the chosen alignment for the Central Corridor project, development potential would be low (R5P). The sunken highway has wide boulevards, and surrounding development has been orientated away from the ROW (Figure 45). Stations would have been located below existing bridges over the highway. Accessing these stations for pedestrians would have meant

a long walk from any point, including parking lots. It would have been difficult to create walkable environments and any sort of transit-supportive development along this ROW (R5P).

The Hiawatha Line is also experiencing related development around some stations. Development around stations is occurring in the downtown, however a respondent concluded this development cannot be fully attributed to the transit line, as redevelopment in the downtown would have happened even without the Hiawatha Line (R5P). Large transit-supportive projects are also slated for Bloomington Central Station and for Cedar Station. At Bloomington Central Station there is ample space for development and redevelopment as the land uses there are commercial elastic tissue. There are many transit-supportive projects throughout the line. Three stations along the line are found directly adjacent to established single-family neighbourhoods to the west, and Hiawatha Avenue and Minnehaha Park to the east. Development potential at 38<sup>th</sup> Street Station, 46<sup>th</sup> Street Station and 50<sup>th</sup> Street Station is limited in the single-family neighbourhoods. A respondent indicated these stations were omitted from the station area planning process undertaken at other stations (R5P). The respondent went on to

mention infill opportunities exist in these areas, with old buildings and other small pockets. Pieces of TOD are being developed here (R5P). These developments are mostly limited to smaller single buildings, and are not as significant as other sites.

Both the Euclid Corridor in Cleveland and the Central Corridor in Minneapolis/St Paul have been planned and designed to be much more than rapid transit projects. These projects are progressive examples of how transit projects can be the driving force for city building and design. They are centered on redevelopment and resurgence of heavily used corridors that have great potential for transit-supportive growth. Placemaking is also an important component to this process.

### **5.3.3 Placemaking**

Rapid transit is more than connecting where people live to where they work at either end of a line, replacing the suburban to downtown automobile commute. Rapid transit projects need to include a greater vision of city building and design. Cities must strive to create attractive, walkable environments. Taking advantage of new transit investment for more complete city building projects

creates the opportunity to improve the public realm and create desirable places when developing around the transit line.

Transit investment should be more than just infrastructure improvements. Investing in good urban design and streetscaping encourages development around transit. Respondents agreed, the transit line itself will encourage

development, however community amenities such as parks and plazas coupled with a comfortable pedestrian environment compounds this attraction. (R2P; R5P).

In Minneapolis/St. Paul, many parts of University Avenue lack amenities that will attract development. To address this, the *Central Corridor Development Strategy* discusses how the stations will integrate into the existing built environment



Figure 46. Dale Street station public amenities. Central Corridor community workshop model, Minneapolis / St. Paul.

through planning and urban design principles. The *CCDS* is accompanied with station area plans to provide more detailed planning and design. For example, the Dale Street Station Area Plan calls for a park and path system near the station (Figure 46). A respondent indicated adding such amenities to University Avenue is important to attract development (R5P). Adding these amenities, together with strong urban design components, will create a solid foundation for transit-supportive development. Pairing with the large capacity for redevelopment along University Avenue has positioned the Central Corridor LRT line to redefine University Avenue as a walkable mixed-use corridor. A respondent was confident further development will follow when public amenities and streetscaping improvements called for in the *CCDS* and station area plans are implemented (R5P).

As discussed in the previous section, Euclid Avenue also has high development potential and has experienced much development. The Euclid Corridor Transportation Project also addresses placemaking through urban design with Transit-oriented Development Guidelines and coordinated master planning of the Euclid project with the large institutions along the line. Part of the streetscaping improvements included public art. Discussing public art, a

respondent mentioned that stations are defined by public art installations indicative of the neighborhood's identity (R2P). (Figure 47) Banners along the centre median also define certain station areas. (Figure 48) In certain places sidewalks were widened to provide extra pedestrian space and allow enough space for restaurants and bars to have outdoor patios. Street planters tie the line together and complement the stations and transit vehicles, helping brand the project (Figure 49).

Respondents agreed they witnessed more people on the street last summer in downtown Cleveland than in previous years, hinting toward the resurgence of the downtown, especially Euclid Avenue, as a busy and desirable place. Along with redevelopment projects discussed in the previous section, smaller businesses are also improving their relationship to the street with new signage and paint (R2P; R3E).

These types of improvements are crucial for development potential and it is important they be implemented as part of a transit investment. A respondent indicated cities rarely have the ability to fund streetscape and public realm improvements, and these should be part of transit plans to obtain funding (R1P). This is the case with the *Central Corridor*



5.0

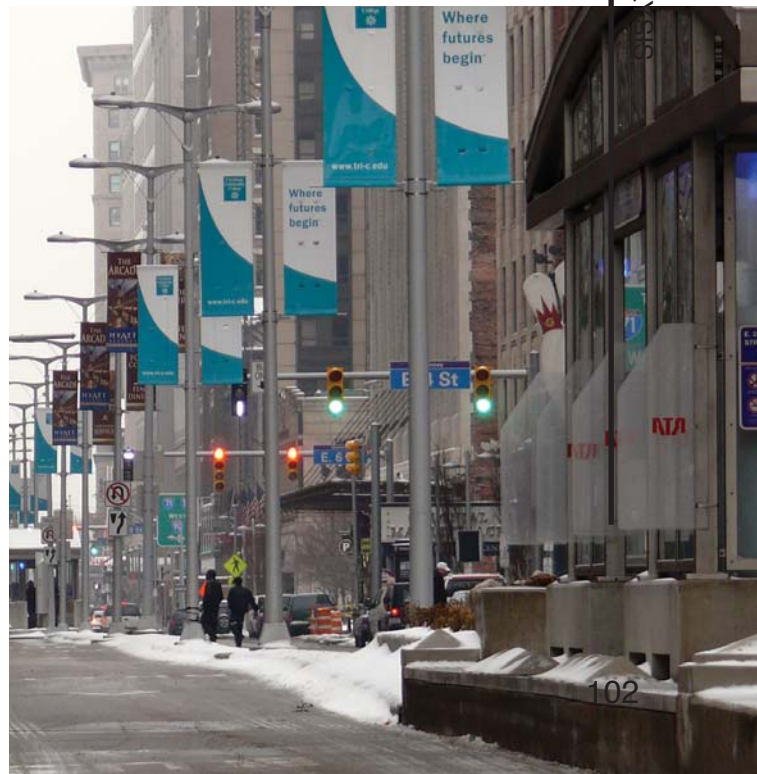
INTERVIEW RESULTS AND ANALYSIS

Figure 47. 'Cancan' sculptures promote sense of place in Cleveland's theatre district.

Figure 48. Street planters are part of the streetscaping program along the Euclid Corridor.



Figure 49. Banners help brand the Euclid Corridor Transportation Project.



*Development Strategy* and the Euclid Corridor Transportation Project, as they both include substantial streetscaping improvements.

A respondent reported placemaking initiatives around stations, along the Red Line, were very poor and there has been almost no development. The line runs through predominately industrial and some single-family residential areas. The industrial areas were described as almost abandoned (R3E), in the sense there were not many people around, or much pedestrian activity.

Placemaking would have been an issue for the Central Corridor if it had been incorporated into the I-94 ROW. Little development would have occurred, largely because of lack of space, but also as an effect of the pedestrian hostile environment around stations and their approaches. There would have been little opportunity for placemaking improvements.

Along the Hiawatha Line in Minneapolis, in station areas located in predominately single-family neighbourhoods, some infill development has occurred (R5P). However, placemaking in these environments is somewhat limited as redevelopment sites are usually small and scattered, if they exist at all. As Scheer (2001)

discusses (section 5.3), single-family neighbourhoods generally lack sites and foundation for redevelopment and more extensive transit-supportive redevelopment (p. 33).

A respondent indicated placemaking potential is always greater for on-street transit alignments than off-street transit alignments (R1P). Existing development along built up streets supports new development opportunities by acting as a base. Existing commercial, institutional and residential uses already attract people to the street, and are important supports when attracting more people and development. Along with supporting development, these uses help provide a ridership base for transit, as stations are easily accessible to buildings oriented to the street. Land uses along arterial streets, related to Scheer's categories (section 5.3) are elastic in nature, they are erratic in size and shape, tend to change ownership and use over time, and are easily adaptable to new and changing uses and building types (Scheer, 2001, p. 34). Existing built up areas will sometimes have an existing sense of place, character and history that can inform design of buildings, art and streetscaping improvements.



### 5.3.4 Travel Time

Reducing travel time has conventionally been considered one of the most significant benefits of rapid transit projects (Brunn, 2007, p. 12; Transportation Research Board, 2003, p. 7). A respondent concurred that travel time is an important factor for increasing transit ridership. A competitive overall travel time that avoids congestion attracts discretionary riders (R5P). Along with travel time, certainty of travel time is important. People must be able to consistently predict how long it will take to reach to their destination (Litman, 2009b, p. 5.2-3). Travel time increases as the number of stations and stops increases. Other travel disruptions such as perpendicular street crossings increase travel time. Transit line performance and accessibility requires a balance between speed of the line and number of stations. A good balance between these is required to maximize ridership. A respondent discussed this balance and said that it depends on the goals of the transit line. Some segments of the line are better for speed while some are better for density and development (R5P). The fastest travel times of comparative rapid transit alignments is with grade separated lines, as they only stop at stations and are able to reach high speeds. Laterally separated systems are faster than mixed traffic systems

but slower than grade separated, as they have to address lateral crossings. Off-street, laterally separated transit lines are generally faster than on-street laterally separated transit lines, as the off-street lines can achieve higher speeds and may have fewer stops (Bruun, 2007, p 49). The Euclid Corridor is designed to provide a 33-minute travel time between downtown and Stokes-Windermere Station (R2P), while the Red Line makes the same trip in 20 minutes (Greater Cleveland Regional Transit Authority, 2010). Those wanting to commute to downtown from an area near Stokes-Windermere would likely use the Red Line, however if they wanted to stop to access services along the way, they would likely use the Euclid Corridor. If the Euclid Corridor was developed before the Red Line, it is curious if the Red Line would be considered a priority?

The Euclid Line combats travel time issues with speed limits. The speed limit in the general use lane is 25 miles per hour, while in the dedicated BRT lane it is 35 miles per hour. This and traffic light signalization priorities allow the BRT vehicles to travel much faster than automobiles. Touring the Euclid Line, the practicum researcher noticed the BRT vehicles would constantly pass automobiles. This provides a constant reminder of the convenience of service the transit project provides. Yuen-Wah Li, Wener

et al. and Brundell-Freij discuss travel time and perceived travel time. “There are often substantial differences between objectively measured (clock) travel time and perceived travel time, which tends to increase with congestion, discomfort and insecurity” (as cited in Litman, 2009b, p. 5.2-4). Allowing the Euclid Corridor BRT vehicles to move faster than traffic, along with signalized priority at traffic lights, helps complement a competitive actual travel time with a perception of improved travel time.

The three additional stations, totaling 18, the community requested along the Central Corridor will invariably slow down the overall travel time of the line. A respondent mentioned, without these stations, the travel time from downtown Minneapolis to downtown St. Paul is 40 minutes, and the addition of three stations will increase travel time between five and ten minutes (R5P). The travel time of the I-94 alignment would have been approximately 40 minutes. As the Hiawatha Line with 19 stations completes approximately the same length trip (as the Central Corridor shares tracks with the Hiawatha Line in downtown Minneapolis) in 40 minutes. If speed and number of stations were the same the I-94 alignment would have been 10 or more minutes faster than the University Avenue alignment.

Balancing travel time and convenience is a complicated process, as the tipping point for riders is difficult to predict. The respondent felt the additions of these stations have the potential to deter some discretionary riders (R5P). However another respondent indicated the community felt this travel time increase was a worthy trade off, for increased convenience and accessibility. It is believed that these stations will in fact increase ridership within the community (R1P). The Euclid Corridor has had a similar experience. Another respondent discussed the #6 bus, which used to serve Euclid Avenue and stopped at almost every address and cross street. The line was slow and buses tended to bunch up, as many were required to service the demand. The respondent explained when the Euclid Transportation Corridor Project reduced the number of stops along Euclid Avenue ridership did not decrease. Users are happy with the line as it provides a good balance of stops (convenience) and speed (travel time) (R2P).

Travel time is an important factor for rapid transit. However, it seems that other benefits that arise at the cost of travel time outweigh it. Rapid transit must be part of a total package that helps create a denser walkable environment around the line, which includes meaningful day-to-day destinations. In both Cleveland

and Minneapolis/St. Paul, sacrificing travel time for development potential and convenience of use has been the case. People are willing to sacrifice some time in transit, if it means they can conveniently access stations from residential, commercial and institutional destinations. Mokhtarian and Salomon allude to this willingness to spend time traveling. “On average people devote 60-90 minutes a day to travel. Most people seem to enjoy a certain amount of personal travel, about 30 minutes a day, and dislike devoting more than about 90 minutes a day” (as cited in Litman, 2009b, p. 5.2-2). People are willing to spend some time traveling between destinations if they are able to conveniently access places they want or need to go. Travel time is always an important factor and off-street rapid transit provides a faster trip. However, directly connecting existing destinations and areas with high development potential is of greater importance. Wood et al. (2009) discuss discrepancies with ridership forecasting in the United States. The paper concludes that predicting ridership is not as accurate as it should be, with many projects superseding or not attaining ridership estimates. When predicting ridership, transit-supportive and oriented development impacts and potential must be more comprehensively understood. The FTA is developing a mechanism to assess these impacts on transit ridership (p. 31).

Based on the Cleveland and Minneapolis/St. Paul experiences, the benefit of slightly faster travel time is significantly outweighed by the added benefit of development potential and placemaking. Also, increased walking distances between destinations and transit stations deter discretionary riders who may find driving an automobile more convenient (Wood et al., 2009, p. 23).

### 5.3.5 Safety

The issues of safety of rapid transit compared here are danger from crime, and danger from collisions. It is understood that the health of people and the environmental benefits increase as ridership increases.

Danger from crime or personal security is a perception-based issue along with actual safety. Areas are deemed unsafe largely based on how safe people regard a place, rather than how safe it actually is. Personal security risks such as theft or assault are increased for transit riders over automobile drivers. The perception of safety is further affected through sensationalized media reports of personal crime. This contributes to the general unrealistic perceptions of transit safety, notwithstanding transit stations are sometimes actually unsafe (Litman, 2009b, p. 5.3-22). If the perception of transit



Figure 50. Hiawatha Line station has few 'eyes on the street.'

as being unsafe is an issue, this could decrease ridership, which will further affect the sense of safety, as there will be fewer people at stations and on transit vehicles. Increased ridership will increase safety and the perception of safety as there will be more people in the vehicles and stations. Increased off peak time ridership, especially at night, will have a substantial affect on security and perceptions of security.

Transit ridership is known to decrease in areas that are perceived to be unsafe (Litman, 2009b, p.5.3-22). If stations at off-street locations are unsafe or a perception that they are unsafe evolves, discretionary ridership will decrease, as a respondent indicated these riders fear crime (R5P) and have the option to choose alternative modes of transportation. As discussed in the

Placemaking section, respondents found there were many more people on the street in downtown Cleveland, in the summer of 2009, due to the Euclid Corridor Transportation Project (R2P; R3E). Intensifying transit service along a street, where people already use transit and where they live and work, creates more active places where people go and can feel safe because there are so many other people around. The Red Line in Cleveland does not evoke the same sense of vibrancy and safety for the same reason transit-supportive development has not occurred in any significance. The alignment does not connect meaningful destinations and does not have a foundation for transit-supportive development.

On-street, at-grade rapid transit alignments and stations have the potential to be much safer and will



Figure 51. Euclid Corridor has many ‘eyes on the street.’

be perceived as being safer than off-street stations. Along with more transit users, on-street transit alignments allow for increased passive surveillance, as existing buildings are oriented to the street and stations and other road users are present and passing by (Figures 50 and 51). Jane Jacobs discussed the concept of “eyes on the street” and maintained that streets or places with many people using and able to view the space made the space safe (Jacobs, 1961, p. 35).

Danger from collisions is an issue with both on-street and off-street transit lines. Public transit is generally safer than driving single occupancy vehicles (Litman, 2009b, p. 5.3-16). Collisions include automobiles with transit vehicles and transit riders with both vehicle types. The issues compared here are

pedestrians accessing stations and automobile interaction with on-street transit. Off-street transit vehicles could collide with automobiles when passing a cross street, aside from that they do not have much interaction. Pedestrians will have to cross transit ROW and wait at stations on both on-street and off-street projects. On-street transit will invariably interact more with automobiles, pedestrians and cyclists than off-street transit, increasing the risk of collisions.

The Houston Metro Red Line (see section 5.4) was mentioned as an on-street rapid transit alignment that had collision safety issues. Pourteau (2009) comments that crashes between LRT vehicles and other road users along the Houston Metro Red Line are partially the fault of drivers. “...Driver distraction and inattention seem to be contributing factors to the crashes, Houston METRO and the Texas Transportation Institute (TTI) are evaluating technologies that could make those crossings safer” (Pourteau, 2009, p. 42). These safety features include increased highlighting of stop signals, with the entire traffic light outlined with a red light. They are also experimenting with in ground lighting to highlight stop lines and crosswalks. METRO is also considering restricting right turns (Pourteau, 2009, p. 43). Further discussion about how rapid transit technology interacts with general traffic lanes, based on the examples

of Cleveland, Minneapolis/St. Paul and Toronto is discussed in Appendix G.

The Euclid Corridor Transportation Project recognized the project would represent a learning curve for automobile drivers, BRT vehicle drivers, pedestrians, cyclists and transit riders. The Euclid line was opened in stages as stations were completed. A respondent termed it a “soft opening” which has intended to slowly educate and get people used to the BRT system interacting with the street. The soft opening also included an extensive ticketing program intended to help educate people about how to interact with the BRT system. The ticketing program, enforced by police and transit police who were granted automobile infraction ticketing authority, issued so many tickets that the GCRTA was publically criticized for being too strict (R4E).

## **5.4 Other On-Street Rapid Transit Projects**

It is important to note the experiences and lessons from the Euclid and Central Corridors’ alignment choices are similar to those of other cities. In Houston Texas, the Metro Red Line is the city’s first LRT line. It opened in 2004 and was estimated to serve approximately 20,000 riders per day, however in 2007 it served 40,000 riders

per day. Its on-street alignment in a dedicated lane in the Main Street ROW directly connects a large hospital, three sports stadiums, museums and a zoo with approximately 245,000 jobs located within walking distance of the line. (Wood et al., 2009, p. 5). The Metro Red Line’s success is credited to its on-street alignment, routing directly through employment districts rather than passing near them (Wood et al., 2009, p. 25). Two additional on-street rapid transit projects are presented here in more detail, also through review of published materials. The Rosslyn-Ballston Corridor in Arlington County Virginia is considered the most comprehensive example of development around a rapid transit alignment in North America.

The Woodward Avenue LRT line in Detroit will be similar to the Euclid and Central Corridor projects. Detroit is also quite comparable to Winnipeg as it is a winter city and has similarities to a slow growth city, as its population has been in decline (City of Detroit, 2010, para. 22).

### 5.4.1 Rosllyn-Ballston Corridor, Arlington County, Virginia.

The Rosllyn-Ballston Corridor or Orange Line is a grade-separated subway line that follows a major arterial street alignment. In 2002 the line had approximately 80,000 weekday riders, which can be attributed to the vast number of residential and commercial uses along the line, and to proximity to Washington D.C. (Transportation Research Board, 2004, p. 245; Dittmar and Ohlund, 2004, p. 138). Although comparing grade-separated subways to at-grade LRT or BRT is sometimes an incompatible assessment, the alignment choice of this corridor is of importance. “A conscious decision by county planners, officials and citizens to locate the Metrorail along two major arterials (Wilson Boulevard and Fairfax Drive) instead of down the median of Interstate 66 created opportunities for both public and private development” (Transportation Research Board, 2004, p. 235). During a presentation in Winnipeg in 2009, GB Arrington noted that Interstate 66, which parallels the alignment, was also considered for the rapid transit line, but locating the transit alignment along Wilson Boulevard was a key factor for the vast amount of transit-supportive development surrounding the corridor (Arrington,

2009). Dittmar and Ohlund (2004) agree that the Interstate 66 alignment, which ran through predominantly single-family neighbourhoods, had less development potential than the chosen alignment (p. 144).

This project is considered to be the most comprehensive example in North America of a dense, mixed-use transit-oriented corridor (see section 2.1) (Cervero, 2007a, p. 137). Between 1972 and 2002, this rapid transit alignment has generated TOD around stations and has had 16 million square feet of office development, over 900,000 square feet of retail development, and over 11,000 residential units (Dittmar & Ohlund, 2004, p. 135). Although this type of growth is likely out of reach for Winnipeg in the near future, lessons can still be taken from this example. “TOD in the region is of a scale and scope that is much grander than elsewhere in the United States. When stripped to the basics, the lessons that the Washington (D.C.) Metropolitan Area has to offer are transferable to other places” (Transportation Research Board, 2004, p. 259). A key lesson from this project is corridor analysis should incorporate a development-oriented transit approach to promote transit supportive development. The City of Detroit, more comparable to Winnipeg (see section 5.4), has also opted for an on-street alignment for its first rapid transit project.

## 5.4.2 Woodward Avenue Light Rail Transit, Detroit

This planned rapid transit project will consist of 9.3 miles of LRT connecting downtown Detroit to 8-Mile Road. There will be 13 to 15 stations located along the alignment, which will be located within the Woodward Avenue right-of-way. It is projected to serve just over 22,000 riders per day (Detroit Department of Transportation, 2008, para. 1). The on-street alignment has the potential to generate ridership much higher than projected, echoing the outcomes of Houston's Red Line. The line is predicted to generate \$933 billion in economic development and create 12,000 jobs (Detroit Dept of Transportation, 2008a, para. 4). The *Detroit Transit Options for Growth* study considered 14 potential alignments for Detroit's first rapid transit line. The final three options were all on-street alignments and the locally preferred alternative (a requirement by the Federal Transportation Administration for funding) and publicly chosen route for the alignment was Woodward Avenue (Detroit Dept of Transportation, 2009, p. 27). This option was chosen even though there are two freeway ROW that parallel Woodward Avenue, which were considered as part of the original 14. "The Woodward LRT line was

chosen based on a comprehensive set of criteria that includes current and potential ridership on the Woodward route, potential development opportunities, capital costs, and community support" (Detroit Dept of Transportation, 2008b, p. 2). Woodward Avenue has a high degree of existing transit users that would act as a base ridership group. The study considered the alignment to be the most cost effective, based upon capital construction costs and maintenance, compared to short term and future ridership potential. Development potential along Woodward Avenue is high and only one station was considered to have less than medium or high transit-supportive development potential. The transit project will remove approximately two-thirds of street parking along Woodward Avenue. The DTOGS study addressed the loss of street parking by highlighting appropriate sites for new parking lots and facilities (Detroit Dept of Transportation, 2009, p. 28).

## 5.5 Additional Benefits of Off-Street Rapid Transit

The findings from Cleveland and Minneapolis/St. Paul show that on-street rapid transit alignments provide greater benefits than off-street alignments (see section 5.6).



Off-street rapid transit allows reduced travel time (see section 5.3.4) and represents lower risk of collision with other road users (see section 5.3.5). There are additional benefits of off-street rapid transit alignments, which are not discussed in the analysis. These include cost, hindrances to automobiles and disruption during construction. Cost is listed as a limitation to this practicum (see section 1.7), however a cursory comparison highlights a discrepancy between on and off-street rapid transit. The cost of on-street rapid transit alignments is generally higher than off-street projects. The 11-mile Central Corridor cost \$957,000,000 in 2010 while the 12-mile Hiawatha Line cost \$715,300,000 in 2004. Comparing costs over time requires an adjustment to incorporate inflation by comparing 'real cost.' The 'consumer price index' which is 188.9 for 2004 and 214.53 for 2010 (United States Department of Labor, 2010) is required to calculate 'real cost.' The cost of the rapid transit project is divided by the 'consumer price index,' which provides the 'real cost.' The 'real cost' of the Central Corridor per mile is \$405,537 while the 'real cost' of the Hiawatha Line per mile is \$315,554. Based on these two rapid transit lines, after adjusting for inflation, the on-street Central Corridor cost 22% more than the off-street Hiawatha Line. This highlights the financial

benefits of off-street over on-street rapid transit alignments. However, a formal cost benefit analysis would take into account economic and land development benefits along with many other factors, beyond the scope of this comparison, which could decrease financial benefits of off-street alignments.

In addition to cost increase of On-street rapid transit alignments, these systems also hinder automobile mobility. Rapid transit requires a significant portion of the street ROW for dedicated lanes and stations. In Minneapolis/St. Paul, Central Corridor infrastructure including dedicated lanes and stations requires 38' or 31% of the 120' University Avenue ROW. This invariably reduces the amount of space dedicated to automobiles, either at the loss of general-purpose lanes or street parking or both.

The loss of street parking was an issue for both Cleveland and Minneapolis/St. Paul. Business owners see the loss of street parking as a loss in customer base and find it difficult to see the benefits of rapid transit when presented with the loss of street parking (R1P). Both Cleveland (see section 5.2.1) and Minneapolis/St. Paul (see section 5.2.2) provided strategies to help mitigate this issue.

Along with loss of general-purpose and parking lanes, median cuts for left turning automobiles, must be closed so rapid transit is not disrupted. Left turning automobiles represent a potential hazard for on-street rapid transit and design must focus on minimizing crashes (see section 5.3.5). The Euclid Corridor project required the closure of 75% of median breaks along Euclid Avenue (R4E).

Finally, on-street rapid transit alignments disrupt business and life in general along the corridor, during construction. Both the Euclid and Central Corridors foresaw this problem and developed strategies to address it (see section 5.2.1 and 5.2.2).

## **5.6 Chapter Discussion and Implications for the Southwest Rapid Transit Corridor**

The analysis of on and off-street rapid transit alignments in Cleveland and Minneapolis/St. Paul highlighted the advantages of on-street rapid transit.

The five issues compared: Ridership, Development Potential, Placemaking, Travel Time and Safety are imperative components to any successful rapid transit project. These issues cannot

be assessed individually, but rather are complementary to one another. That being said, the success of a transit system can be traced back to ridership. Development potential, placemaking, travel time and safety all contribute to ridership. The research has found that close, convenient access between stations and meaningful destinations is a key component to increasing transit ridership. On-street rapid transit projects provide an opportunity to serve existing transit users while attracting new users who take advantage of conveniently located stations. In Winnipeg, the CN rail corridor the SWRTC will use as an alignment is closer to Pembina Highway than I-94 is to University Avenue and the Red Line is to Euclid Avenue. However, based on the experience of the Central and Euclid corridors, the off-street alignment will not provide the opportunity to generate as much development and long term ridership as an on-street alignment in the Pembina Highway ROW. The SWRTC alignment will serve those commuting from one end to the other, although it will also make accessing many destinations and potential destinations along Pembina Highway difficult.

Visibility of on-street rapid transit attracts discretionary riders, as stations are perceived to be, and actually are, safer from crime than

off-street lines. This is because on-street alignments provide a greater number of people at stations, other road users are present and there are people in existing and new buildings facing the alignment. The visibility of on-street alignments allows riders to see potential destinations, increasing commercial prosperity along the line. On-street visibility also exposes other road users to rapid transit. This visibility acts as a constant reminder for new potential riders, while educating them and increasing their comfort with rapid transit. Accordingly, rapid transit stations within the Pembina Highway ROW would be safer than those of the proposed CN rail alignment. Buildings along Pembina are oriented to the street and away from the rail line. Also, there are other road users present 16 hours per day.

While on-street rapid transit alignments have the potential to be safer than off-street alignments they are not safer from collisions. Mixing modes of transportation increases the risk of vehicle accidents. Automobile and pedestrian safety measures must be incorporated with on-street alignments to minimize crash risks (see section 5.3.5 and Appendix G).

Along with safety from crime, on-street rapid transit also provides benefits for development potential

and placemaking. Development potential is generally high along on-street alignments and is the most significant issue for generating long-term ridership. The on-street alignment of Cleveland's Euclid Avenue has advantages over the off-street Red Line, because it directly serves existing commercial, institutional and residential uses. Existing development and street patterns are already oriented to Euclid Avenue, creating the foundation for a safe, convenient and interesting pedestrian environment. The condition is the same for the Central Corridor in Minneapolis/St. Paul. The research indicated that development potential for on-street rapid transit lines is generally greater than off-street lines. Off-street lines do not provide the best opportunity for transit-supportive development, as stations are usually located in areas that do not represent convenient walking distances or comfortable environments for pedestrians. Development potential in existing single-family residential areas is low and residents in these areas tend to resist development, especially increases in density. On-street rapid transit projects can be the driving force for city building and the creation of comprehensive corridors of mixed-use development.

In Winnipeg, Pembina Highway has high redevelopment potential, similar to University Avenue in Minneapolis/St. Paul and Euclid Avenue in Cleveland. Most land uses along Pembina Highway would be considered elastic tissue as per Scheer's definition as described in section 5.3 above (Scheer, 2001, p. 34). There are numerous sites available for redevelopment along with many multiple family apartment buildings. The street also serves residents of single-family neighbourhoods on the east and west side. It is also a heavily traveled bus route that links downtown and the University of Manitoba.

With these attributes of Pembina hwy in mind, parallels can be drawn between the chosen alignment for the SWRTC along the CN rail corridor, the Red Line in Cleveland and with the considered I-94 alignment for the Central Corridor in Minneapolis/St. Paul. The Red Line alignment is for the most part mostly located many blocks from Euclid Avenue and much of it runs through industrial areas and single-family neighbourhoods. I-94 has wide ROW and surrounding land uses are oriented away from it. As discussed, the Red Line has had little influence on transit-supportive development around it and the I-94 alignment would have had the same result. This is the core problem with the chosen CN rail alignment for

the SWRTC. Although this problem exists for the entire line, only phase two (between Jubilee Avenue and the University of Manitoba) will be discussed here as phase one is under construction at the time of this practicum. The CN line runs through a single-family residential neighbourhood where the Chevrier and Clarence stations are proposed at these cross streets. These stations, surrounded by static tissue, represent little to no development potential (Figure 52). There is some elastic tissue at the Chevrier station, however this proposed station is approximately 390 metres from the centre of Pembina Highway. The proposed Clarence station is approximately 350 metres from the centre of Pembina Highway. These stations are disconnected from the existing commercial and residential uses and redevelopment sites along Pembina. They are also disconnected from the single-family residential neighbourhoods to the east of Pembina. These stations are similar to the 38<sup>th</sup>, 46<sup>th</sup> and 50<sup>th</sup> street stations along the Hiawatha Line, which are also located in predominately single-family neighbourhoods. These stations were left out of the station area planning process because there is limited development potential to plan for, as would be the case for Chevrier and Clarence stations. The only way to connect Pembina to these stations is along these collector

streets. A streetscaping program, along with higher density residential and commercial development, could create a pedestrian oriented connection to Pembina Highway. However, this is unlikely as current landowners would resist losing their homes. Rather, commercial development should be located along Pembina as it serves more potential clientele. Based on the experiences in Cleveland and Minneapolis, there will be little if any transit-supportive development surrounding these stations, while the Pembina alignment would accommodate development.

The proposed station location called Plaza Drive is located within a Manitoba Hydro transmission line corridor behind commercial uses. Hydro corridors and transmission lines do sometimes mix uses. However, building height and maintenance access issues will discourage any development with direct access to this station. This station is located approximately 350 metres from Pembina. In Euclidean measure, this is approximately 500 metres from the intersection of Plaza Drive and Pembina Highway, where many multiple family apartment buildings are located north of this

Figure 52. CN Corridor South of McGillivray in Winnipeg passes through single-family neighbourhoods, representing low development potential.



intersection. This station location will not conveniently serve the thousands of residents in these apartment buildings, where an on-street alignment would directly serve them.

South of Bishop Grandin Boulevard, the SWRTC has three planned stations: Chancellor, Markham and Bison. These stations run through multiple family housing areas behind commercial uses on Pembina. There may be some opportunity for development here, although these locations do not serve land uses along Pembina Highway. The same condition would exist at these stations as with Clearance and Chevrier, and redevelopment along the collector streets to evoke a sense of place and create pedestrian oriented connections with Pembina is unlikely.

This practicum research has found that it is important for transit investments to be more widespread than just infrastructure improvements. Investing in good urban design and streetscaping encourages development around transit. Part of the Central Corridor project included station area plans that defined the need for public amenities such as parks and plazas, which will in turn encourage development. In Cleveland, it

was reported that placemaking initiatives around the off-street Red Line were virtually non-existent. The on-street Euclid Line, however, incorporated public art, entrenching stations with the character of their respective neighbourhoods, while a streetscaping program helped define the entire corridor.

Based on these examples, the proposed alignment for phase two of the SWRTC severely limits placemaking capacity around stations compared to the capacity of an alignment on Pembina Highway. The two northerly stations of phase two, Windermere and McGillivray along the alignment, are in close proximity to Pembina Highway. However, they are located at the rear of commercial buildings on one side and single-family neighbourhoods on the other. Creative solutions for pedestrian connections and redevelopment of these sites could integrate stations with destinations along Pembina Highway. However, the single-family neighbourhoods provide no opportunity for development nor are appropriate for pedestrian oriented streetscaping improvements.

Chevrier and Clarence stations located within a single-family residential neighbourhood provide almost no opportunity for placemaking or the creation of



5.0

Figures 53 and 54. Old building stock with minimal setbacks along Pembina Hwy provides a foundation for transit-supportive development.

amenities to encourage development. Being so far from Pembina Highway makes placemaking related to the stations along Pembina unlikely. The Plaza Drive station, located within a Hydro transmission line ROW, is an area with no identity. The rail corridor alignment does not provide the opportunity for placemaking and the creation of safe, interesting pedestrian environments, integral for transit-supportive development.

Pembina Highway provides greater opportunity for placemaking that comes with the many potential redevelopment sites. The foundation for this opportunity is in the built form along Pembina Highway. In many areas there are minimal setbacks and wide sidewalks, which could help foster pedestrian oriented places (Figures 53 and 54). Like the Euclid and Central Corridors, streetscape improvements, including street furniture, plantings, art and signage, would all contribute to defining the corridor as a unique place within Winnipeg. Stations could become destinations where commercial and residential uses could flourish.



With the benefits of on-street alignments including placemaking and development potential, a sacrifice

would have to be made in regards to travel time. Reducing travel time has conventionally been considered one of the most significant benefits of rapid transit projects. While travel time is important, this practicum research has found that it is not as significant as is traditionally argued. People are willing to sacrifice some time in transit, if it means they can easily access stations from residential, commercial and institutional destinations. In both study cities, sacrificing some travel time for increased development potential, placemaking potential and convenience of use has increased ridership. Increased walking distances between the transit stations and the destinations that often accompany off-street lines can deter discretionary riders who have the option to drive.

The Euclid Line allows BRT vehicles to drive faster than automobiles in order to combat travel time and the perception of travel time. If the SWRTC were located in the Pembina Highway ROW, it would prove difficult to allow transit vehicles to move faster than automobiles, as vehicles are able to travel at 60km/h. However transit vehicles would still move faster than automobiles, as there would be no congestion. Also, they could take advantage of signalization priority technology, allowing faster actual travel times and an increased perception of faster travel time.

Theoretically travel times of an alignment within the Pembina ROW, compared with the planned SWRTC on the rail line, with the same number of stops and transit signal priority technology, could be similar. However, the off-street alignment would be faster, as there would be no pedestrian crossings and possibly shorter traffic light waiting time, as left-turning automobiles would not be an issue. At the same time, it is important to note that Walking distances to the CN corridor would increase travel time for many riders.

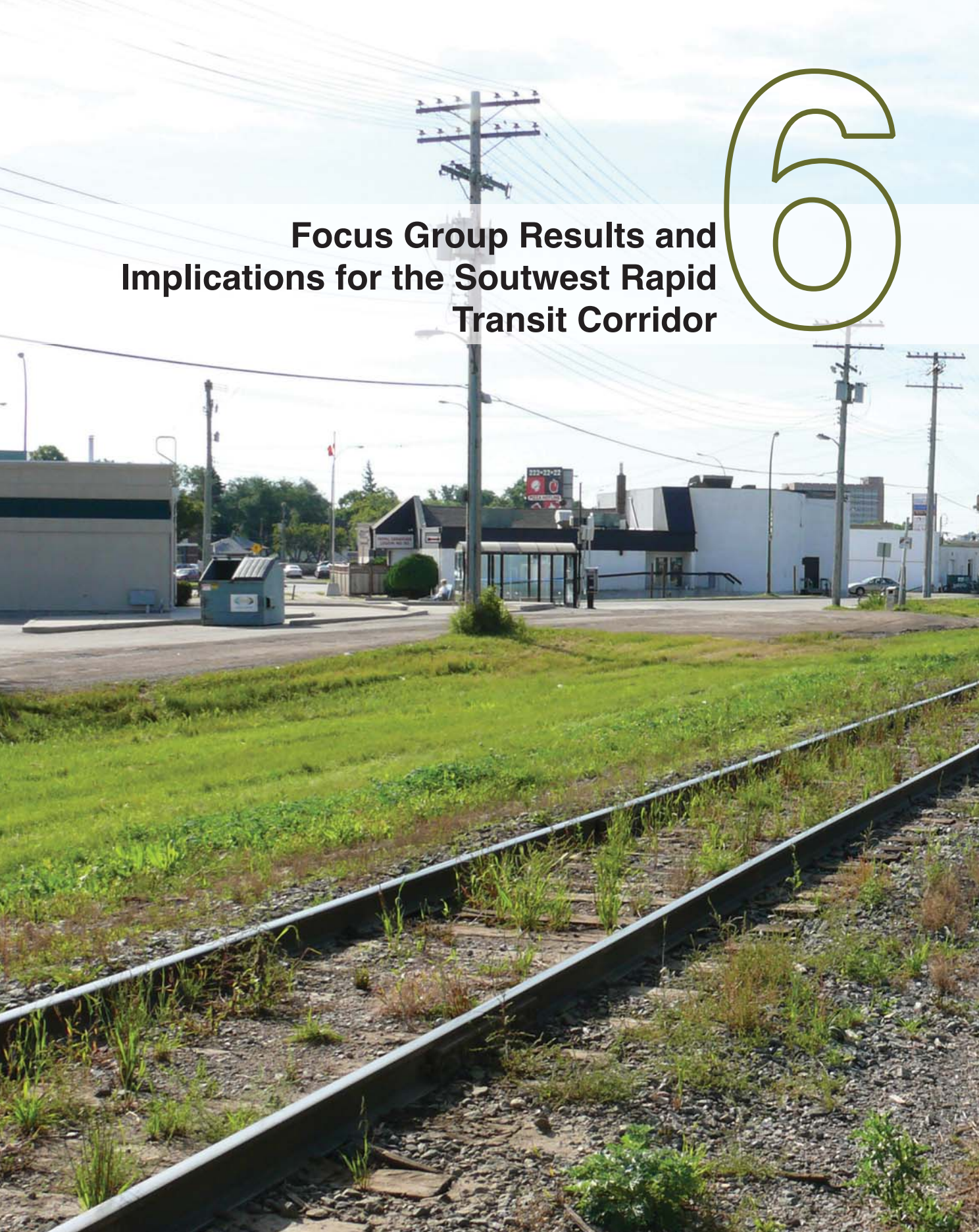
Integrating transit alignments into arterial street ROWs, and creating corridors of transit-supportive development allows rapid transit to compete with the convenience of automobiles and attract discretionary riders. On-street rapid transit will allow North American development patterns to move away from automobile oriented suburban development to a more dense, mixed-use transit-oriented corridor model.



**5.0**

**Focus Group Results and  
Implications for the Southwest Rapid  
Transit Corridor**

6





## 6.0

This chapter discusses the outcomes of two focus groups held with local professionals involved with rapid transit in Winnipeg. Previous to these results, the first section deals with potential implications for the SWRTC based on the findings from Cleveland, Minneapolis/St. Paul (section 5.3) and other on-street projects reviewed (section 5.4). These results were used to design the Focus Group Interview Guide (Appendix C), intended to both

educate in advance of, and generate discussion during, the focus groups. The guide is designed to provide results from the key informant interviews, apply them to the SWRTC and to frame questions based on gaps this practicum researcher has identified in the planning of the SWRTC. It was provided to participants approximately two weeks in advance of the focus group session.

Figure 55. CN corridor at Windermere, facing south, Winnipeg.

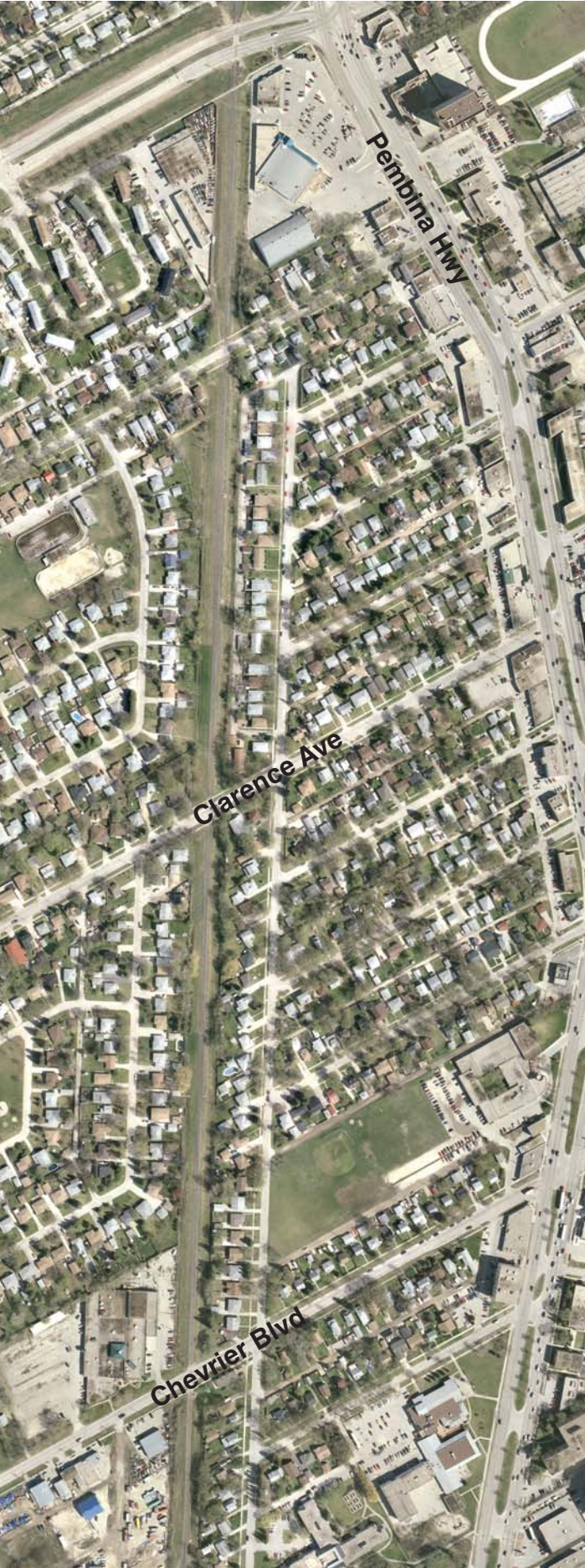
## 6.1 Potential Implications for the Southwest Rapid Transit Corridor

Interviews with individuals involved with the Euclid Corridor Transportation Project in Cleveland and the Central Corridor project in Minneapolis/St. Paul, along with a review of published materials on Arlington County's Rosslyn-Ballston Corridor, and Detroit's Woodward Avenue Line have found that rapid transit alignments, located on-street, tend to increase ridership and opportunities for transit-supportive development. Current literature also supports these findings. Rapid transit alignments that connect places where people live, are employed and/or otherwise need to go have strong transit-supportive development potential. They tend to attract high ridership when direct connectivity to existing and new meaningful destinations is accommodated (Wood, et al., 2009, pg 18).

The off-street alignment chosen for the SWRTC shows similarities with alignments in other cities, which are not as efficient as on-street alignments. The CN rail corridor, in most areas does not provide convenient access to Pembina Highway. South of McGillivray Avenue stations may be located in single-family neighbourhoods, hydro rights-of-way and multiple family neighbourhoods,

all of which represent difficulties for transit-supportive development. These areas represent a long walk from residential, commercial and institutional destinations, located on, and oriented to Pembina Highway.

Winnipeg's population growth is slow, as between 1991 and 2006 the City's population has grown from 616,795 to 633,451 or only by 2.6% (Statistics Canada, 2006). Also, residential development is predominately in the form of single-family homes, with much of the new development being located on the suburban fringes of the city. Current examples include the Sage Creek and Waverly West development projects, and some interest in growth on the northwestern fringe, while the draft document *Our Winnipeg* has outlined further expansion south of Charleswood and area. These trends make it highly unlikely that Winnipeg will be able to achieve development and density around stations of the planned SWRTC alignment. Developing the SWRTC on the CN rail line will create two corridors between downtown and the University of Manitoba. Mixing land uses and transportation modes along Pembina Highway would increase ridership and commercial activity along the line. Separating the bus corridor and the automobile corridor from development potential would decrease ridership of the transit line



and commercial activity. Creating two mixed-use corridors will diffuse development and population density, rather than creating the foundation for a dense, mixed-use transit-oriented corridor.

Development potential along the SWRTC, south of McGillivray Boulevard, is low (Figure 56). Potential stations in the Clarence Ave and Chevrier Blvd area will be located in single-family neighbourhoods that do not provide the opportunity for transit-supportive development, as there are limited sites available. Such neighbourhoods tend to resist land use changes and increases in residential density. Also, potential station locations are between 350 and 400 metres from Pembina Highway, which represents the outer threshold for the generally accepted five-minute travel distance, which transit users are willing to walk. The single-family character would limit the placemaking ability and commercial development, which might create pedestrian connections to Pembina Highway. New development along Pembina would likely remain automobile oriented, decreasing potential density and ridership for the SWRTC. An on-street alignment would take advantage of multiple-family housing and commercial uses.

Figure 56. Low development potential along the CN corridor south of McGillivray Blvd, Winnipeg.

Also, there are many redevelopment sites along Pembina that could incorporate transit-supportive development.

A station located near Plaza Drive would be located within a hydro ROW with overhead transmission lines. Existing neighbouring commercial buildings are oriented away from the corridor, toward Pembina Highway and would likely remain that way to maintain visibility and automobile access. Areas to the west of the station include the hydro corridor, industrial and former industrial lands. There is opportunity for redevelopment in these areas. However, the site would be bounded by hydro corridors on two sides and remaining industrial uses on another, while the final side

would have commercial development oriented away from it to Pembina Highway (Figure 57). This represents a less than ideal situation for residential and commercial development and great efforts will be required to make this a desirable place. There are many multiple family residential apartments and a seniors' apartment facilities located north of Plaza Drive along Pembina. For these residents, it could be 500 metres or more from a potential station, depending on its exact location. An on-street alignment would provide direct and immediate access. Potential riders living in this cluster will be poorly served by the SWRTC and it will be difficult to create a dense pedestrian oriented node.

Figure 57. CN rail corridor redevelopment site, north of Bishop Grandin Boulevard, Winnipeg.



After understanding the benefits of on-street alignments of the Central Corridor and Euclid Corridor Transportation Projects, similar placemaking will be difficult to achieve in most areas south of McGillivray, which have limited development potential. Just as development potential influences ridership, placemaking influences development potential. There is no initial foundation for development and no amenities on which to capitalize. In some areas, land is owned by many single-family homeowners and any kind of coordinated streetscaping program would be difficult to implement. As well, improvements would basically lead the limited number of users nowhere. There may be some opportunity to mix some park or plaza uses within the hydro corridor at Plaza Drive. However long distances to other destinations, noxious surrounding uses, and orientation of existing commercial development will make it difficult to create pedestrian oriented places. The Southwood Golf Course lands recently acquired by the University of Manitoba also represent high redevelopment and placemaking opportunities. Rapid transit could run through these lands, and amenities to attract development could be created. Adding transit to this area would generate commercial and residential development beyond what the University would be able

to influence on its own, and directly connect the rapid transit line to generate ridership.

The travel time of the SWRTC aligned within the CN corridor would be faster than a Pembina Highway alignment. However the difference would not be too disproportionate, especially when considering other benefits on-street rapid transit provides. On-street rapid transit maintains competitive travel time through the use of transit signal priority technology, dedicated lanes and minimal walking distance. With these considerations, rapid transit vehicles, for the most part only have to stop to service riders getting on and off. As discussed in chapter 5, research has found that people are willing to sacrifice some travel time if it means they are provided more convenient access between rapid transit stations and meaningful destinations.

On-street stations along Pembina Highway have the potential to be safer than the proposed off-street locations. There would be more passive surveillance by existing residential and commercial uses. This would increase as more development occurs. Also there would be other road users passing by, all of which would increase actual safety and the perception of safety along Pembina Highway.

## 6.2 Focus Group

### Discussion Results

The results of focus group discussions are presented in six sections; the first two discuss key barriers to an on-street system for phase two of the SWRTC. The following four discuss comments surrounding the five categories used to analyze benefits of on and off-street rapid transit (see section 5.3).

#### 6.2.1 Barrier to On-Street Rapid Transit – Southwest Rapid Transit Corridor Design

A significant barrier to an on-street alignment revealed by the respondents was the geographic catchment area and type of service the SWRTC is intended to provide. During the focus groups the discussion about the SWRTC was largely framed around commuting to downtown from south Winnipeg and back, with service that does not require a transfer.

A respondent commented that locating the SWRTC within the Pembina Highway ROW would not provide the indented connectivity and travel time the SWRTC and CN corridor alignment is designed to provide (R6TO). The respondent went on to explain the difference between

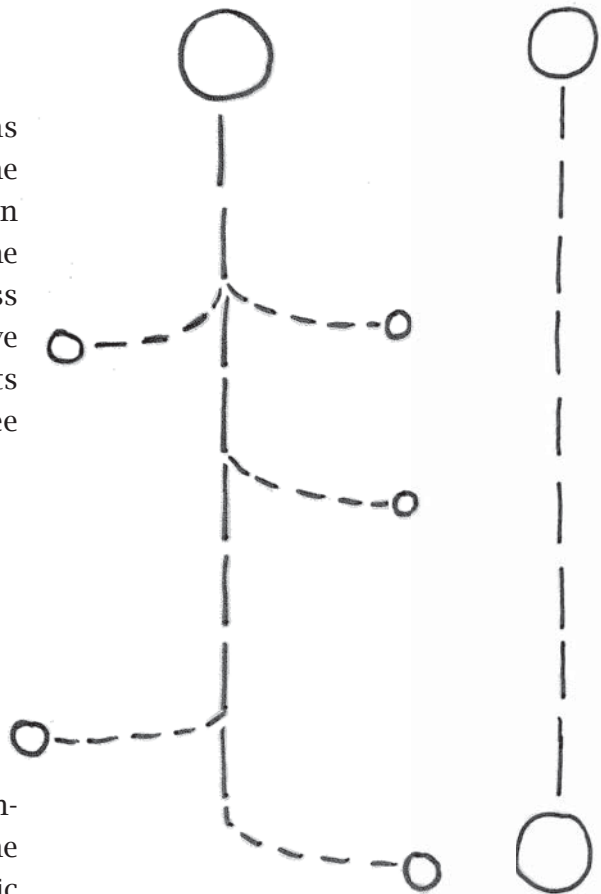


Figure 58. Left: flexible route network system. right: fixed route system.

a fixed route system running up and down a transit corridor (which the Central and Euclid Corridors are) and a flexible route network system (Figure 58) that allows mixed traffic, feeder bus routes to operate within the dedicated corridor (which is the intention of the SWRTC). The SWRTC plan allows mixed traffic, feeder bus routes to weave in and out of existing neighbourhoods, and on and off the busway. Respondents indicated this would increase the catchment



area of the SWRTC (R6TO; R9TA; R12TO). Another respondent agreed that the SWRTC plan intended on providing service to essentially all of south Winnipeg (R10P). Respondents also said this type of flexible route network service will provide the highest level of connectivity for this wide catchment area by eliminating the need for a transfer, which respondents agreed was a “Ridership Killer” (R11E; R6TO). For example, transit riders in Waverly West or Wildwood would be able to access a mixed traffic, feeder bus in their neighbourhood and utilize the unimpeded speed along the busway to access downtown. This service is intended to allow direct connectivity to existing and new neighbourhoods, while offering a high-speed busway to bypass congestion on Pembina Highway. A respondent concluded the SWRTC plan is intended to provide a “best of both worlds” scenario offering a high degree of connectivity and reduced travel time for a wide catchment area (R13P). Along with the wide catchment area, a respondent indicated that a 35-minute travel time threshold exists for transit commuters, with ridership drastically decreasing when travel time is above this threshold (R12TO). Two respondents concluded that the SWRTC could provide door-to-door service that decreases travel time under the 35-minute threshold for most of south Winnipeg. They went

on to say that this type of service would compete with the automobile offering similar and potentially faster travel time, enticing people out of their cars and on to buses (R12TO; R10P).

The researcher presented the advantages of a comprehensive transit-oriented corridor where people can service many daily needs along a single transit line (see end of section 2.1). In reply, a respondent commented people could use their travel time savings to access daily needs by other modes of transportation when they get home (R14E). Another respondent mentioned many Winnipeggers prefer single-family neighbourhoods and would not want to live in rental or condominium apartments along a dense urban corridor (R10P).

Respondents also discussed the advantages of the CN corridor for active transportation. Although on-street rapid transit improvements should include bike lanes, two respondents agreed that the CN corridor would provide better opportunities and more pleasant experiences for active transportation (R9TA; R13P). Along with benefits for active transportation, the off-street alignment along the CN corridor will not impede automobile traffic on Pembina Highway.

## **6.2.2 Barrier to On-Street Rapid Transit – Pembina Highway’s Traffic Capacity**

The focus groups revealed there would be enormous political ramifications in taking the space away from automobile traffic for rapid transit on Pembina Highway. A respondent commented the City of Winnipeg Council would not support a rapid transit plan that inconveniences automobiles and pointed out the few number of 24-hour diamond lanes in Winnipeg (R8TA). Another respondent agreed, mentioning that much of the general driving public dislike diamond lanes and there would be push back against a dedicated rapid transit lane (R13P). Two other respondents concurred that the public would pressure elected officials to remove the dedicated lane as many would feel the lane is underused and blame elected officials and rapid transit for traffic congestion on Pembina Highway (R7P; R8TA).

Respondents discussed another barrier to aligning the SWRTC within the Pembina Highway ROW, which echoed the reason for predicted public and political push back. Three respondents agreed that Pembina Highway experiences too much peak hour traffic to remove a lane for rapid transit. Previous research, which respondents were familiar with, showed Pembina Highway does not have the capacity to remove traffic lanes

(R6TO; R11E; R14E). A respondent asked about streets parallel to the Central Corridor and Euclid Corridor. A significant difference, between these contexts and Winnipeg, is that Pembina Highway does not have close parallel roads that can accommodate automobile traffic, while the example cities do. Respondents did not feel that Waverley St. and St. Mary’s Road would be reasonable parallel alternative automobile routes because of their distance from Pembina Highway and their existing traffic loads (R6TO; R11E; R14E).

According to the focus group respondents, the flexible route network system and travel time, along with traffic capacity issues on Pembina Highway, are the most significant barriers to on-street alignment for the SWRTC. The following discusses comments from focus group participants that pertain to the five categories used to study the benefits of rapid transit alignments.

## **6.2.3 Comparative Issue - Ridership**

Ridership was found to be a key consideration for the SWRTC. Much like the list of issues used to assess the benefits of on and off-street rapid transit, it was found that increasing ridership of the SWRTC would provide other spinoff benefits for development potential, placemaking,

travel time and safety. However, respondents felt the off-street plan would provide the highest ridership gains.

Respondents agreed that frequent transit service promotes ridership (R7P; R9TA; R6TO). A respondent discussed sensitivities of transit riders in Canada and Winnipeg compared to the United States. American riders are more sensitive to the price of transit. Although Canadians are concerned about price, they are more concerned about the quality of service including frequency, proximity to stations, connectivity of routes to meaningful destinations, and travel time (R6TO). Along with frequency of service, the respondent indicated information is also of great importance. The convenience of up-to-date wait times attracts riders (R7P). Another respondent indicated that having convenient access to a station near one's residence increases peoples' willingness to use rapid transit (R6TO; R12TO). Although proximity to transit stops and stations is significant, another respondent mentioned distance is less of a deterrent if the pedestrian environment is of high quality (R7P). Another respondent mentioned accessibility is more important than walking distance, and barriers like rail tracks or busy arterial streets discourage accessibility (R8TA).

The focus group revealed that one of the key considerations of the SWRTC plan is to provide a trip that does not require a transfer from neighbourhoods in south Winnipeg to downtown, or one-seat service. Respondents agreed that the act of transferring from vehicle to vehicle is a "Ridership Killer" for transit (R14E; R6TO; R12TO). Pembina Highway is also intended to be directly served by the corridor. Respondents mentioned that the system would provide direct access to destinations along Pembina Highway, including the Victoria Hospital and University of Manitoba via feeder, mixed traffic routes along Pembina or possibly through future redevelopment of the Southwood Golf Course lands (R6TO; R8TA; R7P).

The discussion was centred on the SWRTC's planned CN corridor alignment and on the concept of on-street rapid transit being inappropriate. However, some respondents' comments concurred with fundamental issues that promote ridership similar to findings from the study cities. Close proximity of transit to where people live and a strong pedestrian environment encourage ridership, while pedestrian hostile environments discourage it. Respondents also recognized the importance of connecting meaningful destinations with rapid transit. Although these findings revealed some basic similarities with interview

findings in terms of ridership, results for development potential and placemaking were not as similar.

## **6.2.4 Comparative Issues - Development Potential and Placemaking**

Development potential was not found to be the most important goal for the SWRTC. Respondents discussed various industrial areas west of the alignment and various parcels of open space as having the highest development potential along the CN corridor south of Jubilee (R6TO; R7P). Another respondent indicated development potential along Pembina Highway is not as high as it is along the CN corridor, by listing the proposed and potential redevelopment sites along the entire SWRTC corridor (R12TO). Another respondent was also skeptical with the development potential along Pembina Highway and indicated that from a developer's standpoint it would be easier and cheaper to consolidate and redevelop sites in single-family neighbourhoods than in the more valuable commercial sites along Pembina Highway (R13P).

Rapid transit can create benefits in single-family neighbourhoods that do not include development. A respondent discussed the impact of rapid transit to single-family neighbourhoods. Homes near rapid transit stations increase in value and

provide the opportunity for people to spend less of their overall income on transportation (R7P). However, this respondent did recognize that some residents adjacent to the Fort Rouge Yards redevelopment, along Phase One of the SWRTC, could be concerned about increases in density in their neighbourhood. The examples of on-street rapid transit lines, previously discussed, have been planned to accommodate a high degree of transit-supportive development. However the SWRTC, while not ignoring development potential, is more focused on serving a wide catchment area and providing fast service from south Winnipeg to downtown rather than creating a dense, mixed-use transit-oriented corridor. This contradicts the findings of this practicum and is discussed in section 6.3.

Placemaking was not discussed in great detail. However two respondents discussed the potential for the CN corridor to connect the community and be an aesthetically attractive space. When discussing how the connection would be made with Pembina Highway a respondent mentioned the walking distance is within the generally accepted distance (400 m) for transit riders, and people will simply use the side streets to access destinations along Pembina Highway (R10P; R7P). Also a respondent did mention that despite

the high volumes of traffic Pembina Highway is a good pedestrian street with wide sidewalks (R14E). Notwithstanding barriers to on-street rapid transit, this comment did recognize that Pembina has the foundation for a strong pedestrian realm required for rapid transit. However, along with traffic volume and capacity issues, the other barrier to an on-street alignment discussed by respondents was travel time.

### 6.2.5 Comparative Issue - Travel Time

Travel time was an issue that respondents concurred was of key importance for a successful rapid transit project. A respondent mentioned that ridership gains are achieved through speed of transit vehicles and reliability of travel time (R6TO). Another respondent indicated the only way this is possible in the SWRTC context is through the use of an off-street, dedicated busway with minimal impediments (R12TO).

Another respondent discussed personal experience in another city commuting to downtown via an off-street BRT line. When commuting downtown during peak hours the respondent found the service was faster than an automobile (R13P). Respondents discussed the 35-minute threshold for transit ridership (see section 6.2.1). They concurred once

travel time increases beyond this mark transit ridership drastically decreases. The respondent went on to indicate that the SWRTC is intended to provide service to downtown within this 35-minute threshold for many potential riders in south Winnipeg (R12TO; R10P). Recent development in many areas of south Winnipeg lies outside the 35-minute commute time by mixed traffic bus, but would be within the threshold if a dedicated corridor is used (R12TO). Another respondent mentioned the off-street BRT service will allow average speed for buses to be about 35 km/hr to 40 km/hr and speculated the Euclid Line in Cleveland could only attain about 25 km/hr (R12TO). In fact, the Euclid Corridor is designed to operate at about 20-25 km/hr (Mikelbank, 2009c, p.10). Earlier research results from the key informant interviews revealed benefits gained by directly connecting places where people go along an existing arterial street with high development and placemaking potential outweighed increased travel time (see section 5.3).

Discussing on-street BRT, other respondents made the argument that this type of system is similar to a diamond lane and is a form of mixed traffic transit, rather than being rapid transit (R12TO; R9TA; R8TA). Finally a respondent concluded that transit-supportive development is not the driving factor for the SWRTC. Rather,

the most important component is the door-to-door connectivity of bus service for many neighbourhoods in southern Winnipeg, rather than development potential, which was so crucial for the Euclid and Central Corridor projects (R12TO). The SWRTC is designed to provide the fastest service to downtown for all of south Winnipeg. Travel time is a key issue for this type of flexible route network system. Findings from study cities, however, show that travel time is less of an issue when compared to the additional benefits gained from on-street alignments (see section 6.3). It is unclear if travel time would have been more of an issue in the study cities if their systems were designed to accommodate flexible route network service. In turn, would travel time be less important for the SWRTC if it were a fixed route system? Along with the importance of travel time, focus group participants, for the most part, disagreed that on-street stations have the potential to be safer than off-street stations.

### **6.2.6 Comparative Issue - Safety**

Generally, focus group participants disagreed that stations located within the Pembina right-of-way have a higher potential to be safer or perceived to be safer than potential stations along the CN corridor. This contradiction is discussed in section

6.3. Two respondents mentioned that development would occur around stations, increasing the number of people in the area and “eyes on the street” (see section 5.3.5) (R6TO; R8TA). Other respondents mentioned there would be cyclists and other pedestrians at cross streets where stations would be located, all contributing to the perception of safety. Another respondent mentioned security cameras as a deterrent to crime and that the public must know that people are watching them and thus action would be taken (R12TO). However, disagreeing with the level of safety video cameras provide, one respondent argued that areas devoid of people, even if monitored by cameras, were places that were perceived to be, and many times are, unsafe. This respondent went on to mention people still felt unsafe after cameras were installed in downtown Winnipeg as it was found that cameras do not prevent crime and do not even deter it (R13P). Other respondents mentioned they would feel unsafe at night on the street in downtown Winnipeg or Toronto and they would rather be at an off-street transit station monitored by cameras (R9TA; R10P). Safety was the only time a focus group respondent agreed with research findings when relating to potential implications for the SWRTC.

## 6.3 Chapter Discussion

The focus groups demonstrated the difficulties involved in integrating rapid transit service in Winnipeg and other existing urban environments. The main problem is that North American cities have been designed, over the past 50 years, to accommodate the automobile. The resulting low-density built environment is inherently not transit-supportive.

Focus group respondents resisted the idea of an on-street rapid transit alignment within the Pembina Highway ROW. They generally disagreed with potential implications for the SWRTC based on findings from Cleveland and Minneapolis/St. Paul associated with ridership, development potential, placemaking, travel time, and safety. Respondents reported this was mainly due to the intended service area for the SWRTC. This system is designed to provide rapid transit service for all of south Winnipeg to downtown that will not require riders to transfer. For this to be successful, respondents indicated travel time is of key importance and the CN corridor alignment would offer the fastest trip. Other main barriers to an on-street alignment, mentioned by respondents, were restrictions involving traffic capacity on Pembina Highway and an envisaged lack of political support.

As a whole, during both focus groups, respondents did not agree an on-street alignment was appropriate for the SWRTC and did not feel that findings from the Euclid and Central Corridor projects were applicable to the SWRTC context. Through these discussions the focus group respondents revealed some key contradictions with the research findings. Along with contradictions, many responses revealed fundamental similarities with the findings from the study cities in terms of preferences of transit riders and basic issues important for the success of rapid transit projects.

Respondents agreed that directly connecting large institutions and meaningful destinations with transit service was crucial for generating ridership. They indicated the flexible route network design of the SWRTC would provide this direct service through mixed traffic, feeder bus routes. However, mixed traffic, feeder routes will not offer the convenience of rapid transit until buses enter the dedicated right-of-way. The level of service these feeder routes will be able to provide is unclear as they will be subject to traffic congestion. Operating in mixed traffic will decrease consistent predictability of travel time and increase perceived travel time (see section 5.3.4). Along with service issues, this type of system may not be perceived to be an attractive mode of transportation for

potential riders who have the option to drive a car (see section 1.7). These factors may affect ridership levels of the feeder routes, which could start a cycle of decreasing ridership and decreasing levels of service, affecting ridership gains and feasibility of the SWRTC as a flexible route network system (see section 6.4.1).

Respondents agreed that living and working in close proximity to stations increases people's willingness to use rapid transit. They did not agree that Pembina Highway provided a better opportunity for transit-supportive development and indicated that development potential was not the most important goal for the SWRTC (see sections 6.1 and 6.2.4). This contradicts key findings of this

practicum (5.3.2). The literature review revealed transit-oriented and supportive development sustains long-term ridership and is a more environmentally resilient alternative to highly consumptive, low-density, single use development (see chapter 2). The Federal Transportation Administration, the governing body that decides which rapid transit projects are awarded federal funding in the United States, considers development potential as a key factor when reviewing rapid transit projects (see section 2.6). Also, interview respondents discussing rapid transit projects in Cleveland and Minneapolis (see section 5.3.2), and the review of published materials describing other projects (see section

Figure 59. Mixing rapid transit riders with other road users and those living, working and shopping along Pembina Highway would promote a safer place with many more people present.



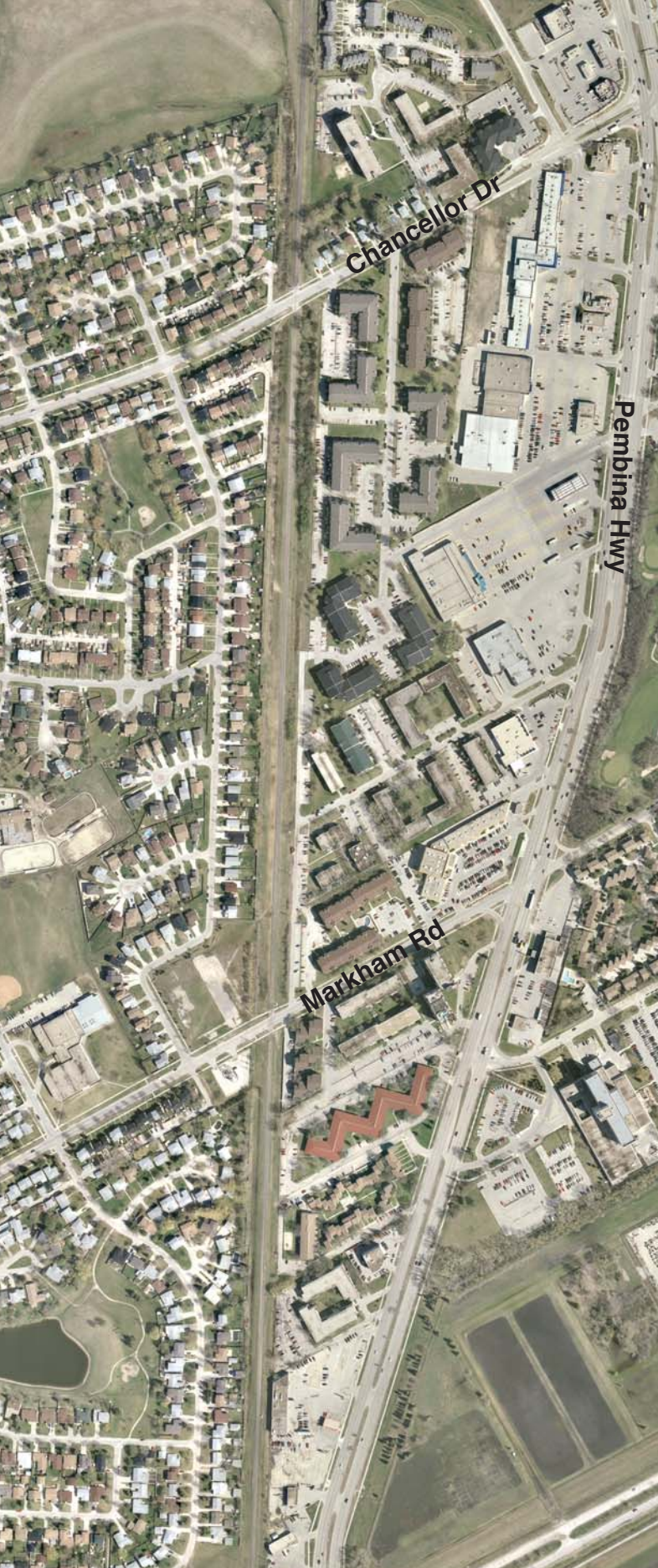


5.4.1 and 5.4.2), concur development potential is important for the success of rapid transit projects. On-street rapid transit alignments, for the most part, have the greatest development potential.

The importance of placemaking and comfortable pedestrian oriented spaces was not disputed, but rather it was indicated these places could be created along the CN corridor with connections to Pembina Highway. These connections and pedestrian oriented environments would be difficult to create between the CN corridor and Pembina Highway at stations located south of McGillivray Boulevard, as they are 350+ metres from Pembina Highway (see section 6.1). Also the built environment, of multiple single-family homes, makes it difficult to implement a coordinated streetscaping program and the development of commercial uses required to establish an environment that is interesting and comfortable for pedestrians. Although these stations would be within the generally accepted 400 metre distance people are willing to walk to transit (see chapter 2), the CN corridor does not represent the most convenient station locations for higher density residential, commercial and redevelopment sites along Pembina Highway.

Respondents agreed that passive surveillance by other people make

places safer, but for the most part disagreed with the assertion that Pembina Highway would best provide this (see section 6.1). Rather they mentioned that other transit riders, pedestrians and cyclists would be present along an off-street alignment. However, adding all these people with the drivers, residents, patrons and employees at commercial sites along Pembina Highway would clearly result in more people present and passing by (Figure 59). All existing buildings on Pembina Highway are oriented toward the street, with many areas having stretches of buildings with minimal setbacks, while this would not be the case for all stations along the CN corridor (Figure 59). Respondents indicated that new development around stations would promote additional passive surveillance by increasing the number of “eyes on the street” (see section 6.2.6), even though development potential was not a determining factor for the alignment (see section 6.2.4). New development, increasing safety along the CN corridor through passive surveillance, could be realized in some areas including stations located between Jubilee Avenue and McGillivray Boulevard and possibly north of Bishop Grandin Boulevard, as there are redevelopment sites directly adjacent to the CN line. However, areas between McGillivray Boulevard and Chevrier Avenue and south of Bishop Grandin Boulevard



do not have potential redevelopment sites directly adjacent to the corridor. Also, existing commercial, single-family and multiple-family residential buildings are oriented away from the CN line. (Figures 60 and 61)

Minimizing travel time for riders in all of south Winnipeg was reported as the key factor for success of the SWRTC plan. This requires the flexible route network design of the system, focusing on commute times from south Winnipeg to downtown in under 35 minutes (see section 6.2.5), rather than focusing on development potential with innovative and resilient forms of city building (see section 2.1). This raises a contradiction with the findings from Cleveland and Minneapolis/St. Paul as development potential is of key importance and people are willing to spend some extra time in transit if it means they can conveniently and directly access places they need to go (see section 5.3.4).

The discrepancy between findings from the study cities and focus group are related to disparate goals. The SWRTC focuses on minimizing travel time for suburban commuters, while the Euclid and Central Corridors

Figure 60. CN corridor south of Bishop Grandin Blvd, Winnipeg. There is limited development potential and buildings are oriented away from the rail line limiting 'eyes on the street.'



Figure 61. Example of potential SWRTC station area with development oriented away from the CN rail corridor. Markham Road, Winnipeg.

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strive to promote change in city building. Along with not aligning with other rapid transit projects goals the SWRTC does not align with the City of Winnipeg's development goals. The focus groups revealed this discrepancy between the City's goals for more sustainable forms of city building and rapid transit planning. Focus group respondents indicated that minimizing travel time for suburban commutes is the most important factor for the SWRTC, originally devised in the 1970's (see section 4.1.3). However, *Our Winnipeg*, released in 2010, promotes more sustainable development that is supported by rapid transit (see sections 4.1.10 and 4.1.11). This discrepancy is further emphasized with the *Transportation Master Plan* not coinciding with the release of *Our Winnipeg* (also section 4.1.10).

The SWRTC plan intends the use of rapid transit, a form of urban

transportation most ideal for medium and high-density residential and commercial development patterns, to provide service in a large, low-density context. By attempting to service a large low-density catchment area, the SWRTC is aligned along a route that maximizes travel time, rather than development potential. The CN alignment forges a long-term vision for a dense mixed-use corridor along Pembina Highway by focusing on commuters from suburban south Winnipeg. An on-street solution would create the foundation for a change in growth patterns in Winnipeg, while the off-street plan attempts to accommodate existing low-density development patterns, and by doing so, promotes the expansion of them (see section 7.1.2).

7

## Conclusion





This chapter reflects on the findings from the literature review, interviews and focus groups. Limitations, which arose as part of the process, are presented along with the significance

of this practicum to the planning profession. Finally, opportunities for further research conclude this document.

Figure 62. Pembina Hwy, south of Jubilee Ave, Winnipeg. Many redevelopment sites and wide right-of-way represent a foundation for a dense, mixed-use transit-oriented corridor.

## **7.1 Key Findings Summary Review**

The purpose of this practicum was to understand the relationship between rapid transit and development, the benefits of on-street and off-street rapid transit alignments, and implications for Winnipeg. This has been achieved through literature review and interviews, which analyzed the benefits of rapid transit through the following criteria: ridership, development potential, placemaking, travel time, and safety. These findings were presented to local professionals in Winnipeg, revealing the implications for the SWRTC.

### **7.1.1 Rapid Transit and Transit-supportive Development**

Transit-Oriented Development is prescriptive with somewhat formal guidelines for development. Cities do not always have the land available surrounding transit stations for comprehensive TOD. However, portions of TOD or transit-supportive development are adaptable to many places. The ultimate goal for transit-supportive development should be at the corridor scale, as a transit-oriented corridor, or string

of transit-oriented and supportive developments around stations (see section 2.1). This provides an environment where people can live, work, recreate and shop, essentially serve their daily needs along a single corridor, reducing automobile dependence, and thus reducing emissions.

A key component to any transit-supportive development is pedestrian comfort and connectivity between destinations and transit stations. Thoughtful urban design and placemaking are integral for creating pedestrian and transit-oriented neighbourhoods adjacent to rapid transit stations (see section 2.2). These should be designed with well-connected street networks, minimal building setbacks with active, permeable frontages, and overall a built environment that provides a sense of enclosure for streets and public spaces. If people can quickly and conveniently access transit from where they live, or where they need to go in an environment that includes these elements, people are more likely to walk and use rapid transit. Other benefits of transit-oriented and supportive development are increased and sustained property values, and they offer an alternative to low density, single-use development (see section 2.3).

Cities generally have few options for rapid transit alignments. Many large cities use grade-separated systems such as the “Sky Train” in Vancouver and subway in Toronto. Common, laterally separated, at-grade corridors used for transit alignments are off-street alignments, including highway, freeway and rail ROW, while others are aligned within arterial street ROW. Laterally separated corridors, along off-street alignments, can achieve higher speed with fewer impediments than laterally separated, on-street alignments. On-street alignments address this issue with transit signal priority technology and close connections to destinations. Grade separated alignments are the fastest, as they can achieve high speeds with little impediment (see section 2.5).

Development-oriented transit is a component of rapid transit corridor analysis. Rapid transit alignments must take into account surrounding land uses and the overall development potential of the transit line. Transit alignments that take these elements into account provide the best opportunity to implement transit-oriented and supportive development (see section 2.6). Adding rapid transit to existing arterial streets mixes transit riders with other road users, increasing the capacity for development.

## 7.1.2 Benefits of On-Street Rapid Transit Alignments

Every city’s built form, public transit needs and goals for rapid transit are different, with no one solution that is applicable everywhere. However, on-street rapid transit alignments provide benefits over off-street alignments. These were revealed through primary research in Cleveland and Minneapolis/St. Paul along with a review of published materials for other cities, which are more fully discussed in chapter 5.

On-street alignments are able to connect riders directly with meaningful destinations. Also, development potential along arterial streets is, in most cases, high. Placemaking initiatives are easily implemented as the streetscape and buildings provide a foundation for a strong pedestrian environment required to maximize development and ridership. On-street rapid transit can provide comparative travel time to off-street: walking distances are decreased; transit signal priority technology minimizes unnecessary stoppage of transit vehicles; and dedicated lanes eliminate traffic congestion. Although off-street rapid transit vehicles generally travel faster with fewer impediments than on-street, the research has revealed that people are willing to sacrifice

some travel time in lieu of other benefits. People are willing to spend more time in transit if they are able to conveniently access destinations, which service daily needs, directly along the line. On-street rapid transit lines and stations have the potential to be safer from crime than off-street lines. More people are around, which improves actual safety and the perception of safety. On-street rapid transit alignments have other road users and those living, working and shopping already present. Also, the built form is oriented to the street, allowing for a high degree of passive surveillance. Perhaps the most significant quality of on-street rapid transit alignments is they establish the foundation for long-term transit-supportive development and an alternative vision of city design. Dense, mixed-use, transit-oriented corridors where people can live, work, shop and recreate along a single transit line provides high levels of ridership and is a legitimate alternative to automobile dependence and automobile oriented design.

The advantage that off-street rapid transit provides (see section 5.5) is decreased travel time, decreased cost and minimal hindrance to automobile transportation. On-street rapid transit requires space in street ROW to be dedicated to rapid transit lines, stations, bikes, pedestrians

and streetscape improvements. This space is invariably taken from automobile-supporting infrastructure. Off-street rapid transit does provide travel time gains for longer commutes, but often neglects development potential at stations between suburban locations and downtown. However, some rail corridors do go through potential redevelopment sites, which are often vacant or underused industrial lands. Off-street alignments generally do not provide convenient access to existing destinations, as these are located on, and oriented to, streets.

Off-street, flexible route network transit systems, which are designed with priority to automobiles and serve low-density areas do not provide the best opportunity for long-term change in urban development patterns. In fact, by accommodating the automobile and associated low-density development, these types of rapid transit projects could promote the continued expansion of these environments. On-street rapid transit alignments have a greater potential to provide an avenue for a change in North American automobile dependence and urban built form.



### 7.1.3 Implications for Winnipeg and the Southwest Rapid Transit Corridor

Rapid transit has been studied in Winnipeg since 1959 through a variety of plans and studies. However, the City has failed to commit to rapid transit until 2010, as funding was always directed to other projects (see sections 4.1.1, 4.1.5, 4.1.9, 4.1.10). The lack of rapid transit corridors to influence compact development has contributed to low-density development patterns in Winnipeg. The built environment is the determining factor for the flexible route network system with a large catchment area, planned for the SWRTC. If the City had been investing in rapid transit since the 1960's, rapid transit needs in 2010 would be drastically different.

Although many stations along the corridor will have difficulty with redevelopment potential and access to Pembina Highway, all of the focus group participants concurred that an on-street rapid transit alignment was not appropriate for the SWRTC (see section 6.2). The main reasons are the intended flexibility of service, traffic volume constraints along Pembina Highway and perceived lack of citizen and political support. The

focus groups revealed the flexible route network system requires an off-street alignment to allow minimal travel time. This is important because the corridor is intended to serve all of south Winnipeg, with mixed traffic buses picking up riders in their neighbourhoods and utilizing the corridor to bypass north-south traffic congestion. Respondents indicated that automobile traffic along Pembina Highway is too great and the removal of a traffic lane for rapid transit was not an option. Respondents also agreed it is unlikely that a rapid transit system, which hinders automobile traffic in such a way, would be supported politically or by the general public in Winnipeg.

Respondents indicated the CN corridor has a reasonable amount of development potential in industrial and vacant sites. They also mentioned that the main goal of the SWRTC project is not maximizing development potential, but rather offering a fast, single seat ride into downtown from all of south Winnipeg. Travel time being the most important issue, respondents agreed the service intends on providing direct access to downtown in under the 35-minute threshold at which point transit ridership significantly decreases. Respondents were conflicted about safety, with most disagreeing on-street transit has the potential to be safer than off-street because of other

road users and buildings present along Pembina Highway.

A focus group respondent indicated Winnipeg in 2010, in terms of rapid transit and transit-supportive development, is where Portland, Oregon was in the 1970's (R7P). (Portland is widely cited as one of the best examples of a city with a comprehensive rapid transit system and associated transit-oriented development in North America.) Based on the intended service of the SWRTC plan, traffic pressures along Pembina Highway and the city's development patterns, it would require a strong political commitment and increased financial commitment (see section 5.5) to implement an on-street BRT system for phase two of the SWRTC. However, the SWRTC plan contradicts the lessons from new, award winning, innovative rapid transit projects in the United States. This contradiction is based on disparate goals between the SWRTC and these on-street projects. The SWRTC strives to provide minimal travel times to all of south Winnipeg while the Euclid and Central Corridors focus on placemaking, development potential and convenience. Focusing on travel time gains for suburban commuters rather than development potential provides little opportunity to change development patterns in Winnipeg to a more resilient model. Section 6.3 provides a more detailed discussion

about the contradictions between the SWRTC plan and findings from this research.

## **7.2 Biases and Limitations**

No additional biases, beyond what is listed in section 1.8, arose during the course of this practicum. An obvious limitation to this practicum research is lack of Canadian examples. Respondents agreed with this sentiment as it was brought up during the focus groups. Although Canada and the United States are very similar in many ways, there are differences in funding available through the Federal Transportation Administration and how it is released. American cities can access more money than Canadian cities for transit funding. However, to gain access to these funds, American cities must go through a more stringent review and approval program. Early in the research, the practicum researcher visited Toronto to understand on-street transit design and engineering concepts. The city has a comprehensive network of on-street rapid transit in various forms, however it is much larger than Winnipeg and may not be the most appropriate city for comparison. Ottawa has a comprehensive off-street BRT system. If research were to include formal research of cities with only off-street rapid transit lines, Ottawa would have been a logical choice.

A comment by a focus group participant, which others agreed with, was that the project could have benefited from more formal case studies from cities with off-street bus rapid transit lines (R13P). This project addressed on and off-street rapid transit in Cleveland and Minneapolis as these cities have both types of alignments. A formal case study of other cities with off-street rapid transit was beyond the scope of this research project. Even so, the research would have benefited from more casework in other cities, especially in Canada and this is a legitimate limitation of this practicum research.

### 7.3 Significance of Results to City Planners

Many cities in the United States are undertaking or planning to undertake transit projects. As of January 2010, the FTA lists 43 rapid transit projects at various phases of planning and design (FTA, 2010b, p. 3). In Canada, as well, many cities are investing in rapid transit, including Edmonton, Calgary, Winnipeg, Toronto, Ottawa and Kitchener/Waterloo (Gormick, 2010). As oil supply continues to be depleted and prices rise, at the same time urban population and traffic congestion increases, rapid transit will continue to be an important mode of cities' transportation systems. Understanding the benefits of rapid

transit projects, located on-street, will allow city officials and planners to make alignment choices that increase ridership, by maximizing convenience of use, connecting meaningful destinations, and taking advantage of high development potential.

City planners will find value in this research as it highlights how on-street rapid transit alignments can influence more resilient forms of city building. Focus group respondents believed on-street rapid transit was not an appropriate system for the SWRTC BRT system in Winnipeg, however others may disagree. This research will be informative when analyzing potential alignments for future rapid transit projects in Winnipeg, specifically the east and west corridors proposed in the *Sustainable Transportation Direction Strategy of Our Winnipeg*. Finally the research findings express the importance of valuing both quantitative and qualitative benefits, with an emphasis on increasing ridership. When planning and designing rapid transit alignments, conventional, immediately tangible benefits like travel time, cost and traffic capacity must be compared against long term development potential and placemaking opportunities. Transportation should no longer be designed to connect one area of a city to another as fast as

possible, but rather it must do so in a manner that integrates land uses along the way.

## **7.4 Future Research**

### **Directions**

Future research should attempt to understand flexible route network systems, rapid transit's effects on neighbourhood revitalization, the applicability of on-street rapid transit for the SWRTC, as City Council endorses LRT as the preferred transit mode (Kives, 2010c, para. 1), and how on-street rapid transit could benefit the east and west corridors in Winnipeg.

#### **7.4.1 Other Cities' Experiences with Flexible Route Network Systems**

During one of the focus groups, a respondent indicated that other cities have had success with flexible route network BRT systems (R6TO). A potential problem with this type of system is that the feeder routes may not achieve high enough ridership to provide frequent service, and they operate in mixed traffic for a portion of the trip, subject to traffic congestion (see section 6.3). Examples of flexible route network BRT systems mentioned by the respondent included

Brisbane, Pittsburg and Ottawa. Further research, to understand how well this type of rapid transit attracts riders from suburban neighbourhoods, would provide a better understanding of the potential success of the SWRTC in serving most of south Winnipeg. Studying subsequent development patterns would reveal significant nodes of transit-supportive development in neighbourhoods served by mixed traffic feeder bus routes. A focus group respondent indicated there is potential for this type of feeder route transit-supportive development in Winnipeg, along portions of Corydon Avenue, Taylor Avenue and in the area around the Grant Park Shopping Mall (R7P).

#### **7.4.2 Rapid Transit and Neighbourhood Revitalization**

The Euclid Corridor in Cleveland, the Central Corridor in Minneapolis/St. Paul and the Woodward Avenue LRT in Detroit all run through neglected areas of their respected cities. These projects are examples of on-street rapid transit alignments, which can promote neighbourhood revitalization through transit-supportive development. This commonality reveals an opportunity for further research. A direction

from this practicum could be to understand how on-street rapid transit can influence neighbourhood revitalization, and reveal what the long-term benefits are for the corridor and city.

### 7.4.3 Light Rail as Winnipeg's Preferred Mode and Traffic Analysis of Pembina Highway

On July 21, 2010, Winnipeg City Council voted 10 - 4 to approve light rail as the preferred mode of rapid transit (Kives, 2010c, para. 1). A mayoral candidate supports BRT and has committed to completing the SWRTC as planned (Kives, 2010b, para. 2). However, if the current administration remains after the October 2010 election, LRT could become a reality in Winnipeg.

A fixed route LRT line will not operate like the flexible route network BRT system, which allows mixed traffic buses to access neighbourhoods and avoid congestion along the off-street bus corridor. LRT tracks could be extended to neighbourhoods, however this would require more drastic planning for density and would be extremely expensive. One of the most important benefits of the off-street flexible route network system is the speed, congestion

reduction and one-seat service it could provide for a wide catchment area. Once this flexibility is lost, the travel time benefits of such a system are lost. Additional research is required to better understand the capacity of Pembina Highway, and if the local political will exists to align LRT with the Pembina Highway ROW.

Loss of street parking was one of the main issues the Euclid and Central Corridors had to overcome. However during the focus groups, the loss of street parking was not discussed in great detail and might not be as much of an issue if the SWRTC were aligned on Pembina Highway as it was in other cities. If this is the case and the loss of street parking could be overcome, the other two issues involving traffic capacity are the loss of a traffic lane, and closure of gaps in the centre median at cross streets, except at signalized intersections. It would be interesting to understand the traffic capacity of Pembina Highway, if the closure of gaps in the centre median and transit ridership were included in the traffic analysis. The flow of traffic improves the less traffic is able to turn left. It is unclear, but doubtful, this been included in previous traffic studies discussed by focus group respondents (see section 6.2.2). It is also unclear, and unlikely, any previous traffic analysis included ridership based on an on-street rapid transit alignment, as this was not the

focus of any previous transportation studies in Winnipeg (see section 4.1). These calculations could be compared to projected transit ridership and provide an understanding of how many transit riders would be required to maintain the current level of service for automobiles that Pembina Highway provides. It is interesting to note the street continues to function with only two lanes each way at the CN rail underpass at Jubilee Avenue. An on-street alignment for phase two of the SWRTC could avoid this bottleneck and link up with the off-street route of phase one.

While focus groups respondents felt an on-street alignment may not be the most appropriate solution for the SWRTC as a BRT system, more research is required to understand the implications for the SWRTC as a LRT system.

#### **7.4.4 Future Rapid Transit Corridors in Winnipeg**

When concluding the focus group discussions, respondents were asked if they felt on-street rapid transit was appropriate for the future east and west rapid transit corridors presented in the draft *Our Winnipeg, Sustainable Transportation Direction Strategy*. There were mixed feelings about this, as some respondents seemed to

be skeptical of on-street rapid transit altogether, while others indicated it could work for these corridors. There are no potential alignments defined in the Sustainable Transportation document for the west corridor, but respondents' comments gravitated to Portage Avenue. Two respondents disagreed that Portage Avenue was an appropriate alignment as it already has reasonable travel times with three different mixed traffic express bus routes. Also, these respondents mentioned that traffic lights are timed to allow a free flow of traffic (R12TO; R11E). When discussing other arterials like this in Winnipeg, a respondent mentioned that streets, providing this level of service for vehicles, sacrifice pedestrian access and do not support communities (R10P). On-street rapid transit would help reclaim these streets for pedestrians by making them more accessible through streetscape improvements and adding mixed-use development. A respondent indicated on-street rapid transit could work for the western corridor on Portage Avenue, however was skeptical it would be appropriate (R6TO). Another respondent indicated Portage Avenue might be the only sensible right-of-way available for a western corridor due to its width and the destinations it connects (R7P). This respondent along with another indicated the eastern corridor could also be appropriate for on-street rapid transit, possibly

from downtown through South Point Douglas and potentially on Regent Avenue (R7P; R6TO). A corridor analysis program should be defined to assess the benefits of future rapid transit alignments in Winnipeg. This practicum provides a starting point in assessing the benefits of on-street and off-street rapid transit alignments.

### **7.4.5 Maintenance Costs of On and Off-Street Rapid Transit Alignments**

During the practicum oral exam, a member of the advisory committee asked a question about maintenance costs of rapid transit alignments. Cost is listed as a limitation of this practicum (see section 1.7), however further research may reveal hidden costs of off-street alignments. Cities have to maintain road ROWs. Off-street rapid transit results in an additional ROW. Although off-street rapid transit alignments may cost less than on-street alignments during the construction phase (see section 5.5), operational costs of maintaining two ROWs may cancel out any initial cost benefit.

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# Appendix A

## Glossary of Terms

BRT - Bus Rapid Transit - "...is a type of limited-stop service. It provides high-speed bus service regardless of traffic conditions and frequently operates in a dedicated right-of-way. BRT combines the advantages of rail transit with the flexibility and lower capital cost of bus service. BRT systems often make use of transit signal priority systems to minimize delays at signalized intersections" (American Planning Association, 2006, p. 268).

DOT — Development-Oriented Transit - refers to a transit alignment's ROW and the potential for transit-supportive and oriented development that the ROW can accommodate.

Diamond Lane - a traffic lane denoted by a diamond symbol and signage. Generally used for buses, high-occupancy automobiles, or bicycles.

Dwelling Unit — refers to a one-family residence including apartments, townhomes, single-family homes etc.

Eminent Domain - is the American term for expropriation, when a government acquires a private parcel of land, giving owners market value for their property and buildings.

Eyes on the Street - "...there must be eyes upon the street, eyes belonging to those we might call the natural proprietors of the street. The buildings on a street equipped to handle strangers and to insure the safety of both residents and strangers, must be oriented to the street" (Jacobs, 1961, p. 35).

Fixed Route System - refers to a transit system that runs on a fixed route between two end points.

Flexible Route Network System - A rapid transit system, which allows for flexible service to multiple areas of a city via feeder routes that converge on a main dedicated transit corridor. The feeder routes allow for minimal transfers and the dedicated corridor maximizes speed.

GPS - Global Positioning System - technology that uses satellites to denote exact location on the planet.

Grade Separated Transit - a transit line separated from ground level and streets by either being above grade, such as a raised rail line or monorail, or below grade, such as a subway.

Headway - the time separation between (transit) vehicles measured at a particular point.

Laterally Separated Transit - at-grade transit line separated from automobile traffic in either a dedicated lane within a street right of way or on an exclusive transit line. These are either light rail or bus rapid transit systems.



LRT - Light Rail Transit - "...is an electric railway system characterized by its capability to operate single cars or short trains along exclusive rights-of-way at ground level, on aerial structures, in subways, or, occasionally, in streets. LRT systems board and discharge passengers at low-level platforms located either at track or car-floor level. They operate in medium to high-volume commuter corridors" (American Planning Association, 2006, p. 278).

Mixed Traffic Transit - transit that runs on streets within traffic, subjected to traffic congestion etc. Examples include conventional bus service and some streetcars.

Mountable Curb - a curb designed at an angle that allows vehicles, usually maintenance and emergency, but deters drivers from driving over it but also maintains water retention characteristics.

One Seat Service - a transit trip that does not require the rider to transfer from one vehicle to another or from one mode to another.

Peak Hour Traffic - the highest amount of traffic a road experiences during a unit of time. Peak hours are morning and evening commute times.

Pedestrian hostile environment - is the opposite of pedestrian friendly or pedestrian oriented design. These are places where pedestrians would feel uncomfortable or unsafe, such as narrow sidewalks along busy arterials, bridges, large parking lots, or areas devoid of other people.

Rumble Strip - a form of stamped or molded concrete or asphalt that makes an audible sound when driven over. Commonly used to alert drivers of an upcoming stop sign or announce a highway shoulder.

Signalized Intersection - an intersection of streets that uses stop lights to manage traffic.

Signalized Pedestrian Crossing - can be a crosswalk at a signalized intersection or an individual pedestrian crossing that uses lights and pavement treatments to denote a crossing.

SWRTC - Southwest Rapid Transit Corridor - Winnipeg's first rapid transit line that will ultimately connect downtown with the University of Manitoba. The project is being built in two phases.

Transit-oriented Corridor - "Corridors are natural sub regional travel sheds: six-to eight-mile axes along which significant shares of household trips occur. The aim is to enable many activities, such as for shopping, recreating, and perhaps even working, to occur within these somewhat self-contained travel sheds. People will make trips outside of local travel sheds for regional destinations, but TOC design would allow a bigger share of trips to be made within corridors-and by transit" (Cervero, 2007a, p. 136).

TOD - Transit-oriented Development - “A transit-oriented development (TOD) is a mixed-use community within an average 2,000 foot walking distance of a transit stop and core commercial area. TODs mix residential, retail, office, open space, and public uses in a walkable environment, making it convenient for residents and employees to travel by transit, bicycle, foot, or car” (Calthorpe, 1993, p. 56).

Transit-supportive Development - a broader term that refers to any development associated with rapid transit that is mindful of TOD principles. Transit-supportive development can refer to one infill site or an entire string of development along a transit line.

TSP - Transit Signal Priority - “...is an operational strategy that facilitates the movement of transit vehicles, usually buses and light rail vehicles, through traffic signal controlled intersections. TSP can be implemented in a variety of ways; priority treatments include passive priority, early green (red truncation), green extension, actuated transit phase, phase insertion, phase rotation and adaptive/real-time control” (Baltes, Cronin, Mortensen, & Thompson, 2008, p. 57).

## Appendix B

### **Semi-Structured Key Informant - Interview Guide Euclid Corridor Transportation Project, Cleveland and Central Corridor, Minneapolis/St. Paul**

#### **Interview Objectives**

1. To understand the benefits of on-street rapid transit based on the prioritized list of issues.
2. To understand design and engineering considerations required too integrate rapid transit within and existing street ROW and how it interacts with automobiles, cyclists and pedestrians.
3. To understand barriers to on-street rapid transit.

#### **Interview discussion guide**

##### **Benefits of on-street rapid transit based on the prioritized list**

1. Increasing ridership (affects intensity and level of benefit of the other issues)
2. Development Potential (residential and commercial)
3. Pollution mitigation and decreasing resource consumption
4. Travel time and traffic congestion reduction
5. Transportation diversity (multi-modal)
6. Alternate value of rail, hwy corridors etc.
7. Safety (from crime and crashes)

##### **Design and engineering considerations**

1. Automobile left turns
2. Dedicated rapid transit lane
3. Pedestrian access

##### **Barriers to on-street rapid transit**

1. Automobile traffic
2. Parking
3. Community opposition
4. Political opposition

# Appendix C

## Focus Group - Project Summary/Interview Guide

### 1. Practicum and Focus Group Background Information

This practicum compares the benefits of on-street versus off-street rapid transit alignments. This is achieved by analyzing the Euclid Corridor Transportation Project in Cleveland and the Central Corridor in Minneapolis/St. Paul, by examining five issues associated with rapid transit projects: Ridership, Development Potential, Placemaking, Travel Time and Safety.

Results are related to Winnipeg and the Southwest Rapid Transit Corridor (SWRTC), based on the findings from interviews with planners and engineers, and related research. The intention of this focus group is to act as a mechanism to test these findings and understand the implications for Winnipeg and the SWRTC.

### 2. Transit Projects Compared

#### 2.1 Cleveland

The Euclid Corridor, also known as the 'Health Line' runs 7.1 miles, mostly in a dedicated lane within the Euclid Avenue right-of-way. This Bus Rapid Transit Line (BRT) opened in October 2008, serving 58 stops with 36 stations. The final cost of the Euclid Corridor Transportation Project was \$168,400,000. It connects downtown Cleveland to Stokes-Windermere Station, which also happens to be the start and end points of the Red Line Light Rail Transit Line (LRT), which follows an off-street alignment. The Red Line is struggling. In general, it does not service areas where people need to go, or where people live or work.

#### 2.2 Minneapolis-St. Paul

The planned Central Corridor will connect downtown Minneapolis and downtown St. Paul, running within the University Avenue right-of-way. The Central Corridor is currently under construction and includes 18 stations along the 11-mile corridor with an over all project budget of \$957,000,000. The first rapid transit line in Minneapolis, the Hiawatha Line, connects downtown Minneapolis to the Mall of America, running on various off-street rights-of-way.

The main routes studied, before a final decision was made regarding alignment, were University Avenue and I-94, located four blocks south of University Avenue. Serious consideration was given to the I-94 alignment. It would have had trains running down the centre median of the highway. This alignment had travel time gains over University Avenue. However, stations would have to be located within desolate areas within the highway right-of-way (ROW), with riders having to cross bridges for access. This alignment would have provided little potential to create pedestrian friendly environments and had very poor development potential.

### 3. Key Findings

The following are excerpts from the working practicum document, based on the five issues used for comparison. These findings are primarily based on interviews with planners and engineers involved with the rapid transit projects in Cleveland and Minneapolis-St. Paul and are supplemented with published materials.

#### 3.1 Ridership

- Close, convenient access to major destinations, including large institutions, is a key component to increasing transit ridership.
- “Glitz” is literally a key factor in attracting ridership. Modern, high quality transit systems have a positive effect on the perceptions of public transit.
- A key advantage of the Central Corridor and Euclid Corridor alignments being located within a street ROW is their high visibility. Seeing how rapid transit works and people using it reminds discretionary riders of an alternative transportation option. This allows them to become comfortable with it and, therefore, more willing to use it.
- Well-traveled bus routes, where high ridership is attributed to surrounding land uses, highlight areas where rapid transit is most likely to succeed.
- Cleveland’s Red Line (off-street) serves the same two stations where the Euclid Corridor (on-street) begins and ends. Ridership of the Euclid corridor has been increasing even though it’s travel time is greater than the Red Line.
- Both the Euclid and Central Corridor alignments directly serve areas with high transit use, areas where people already live, work, access services, shop and recreate. Their counterparts, the Red Line and proposed I-94, do not. The Hiawatha Line has attained high ridership as it connects multiple large institutions and commercial destinations.

#### 3.2 Development Potential

- The on-street alignment of Euclid Avenue has advantages over the off-street Red Line, because it directly serves existing commercial, institutional and residential uses. Existing development and street patterns are already oriented to Euclid Avenue, creating the foundation for a

safe, convenient and interesting pedestrian environment.

- Visibility of on-street rapid transit allows riders to experience the built environment and see potential destinations, increasing patronage of local businesses.
- The Central and Euclid Corridor has high development and redevelopment potential. Research indicates development potential is generally high along on-street transit lines.
- If I-94 was chosen for the Central Corridor project, development potential would have been low. Existing surrounding development has been orientated away from the highway. Accessing stations across bridges would result in long and uncomfortable walks. It would have been difficult to create walkable environments and any sort of transit-supportive development along this alignment.
- Three stations along the off-street Hiawatha line in Minneapolis are directly adjacent to established single-family neighbourhoods. Development at these stations has been limited to small pockets. These stations were even omitted from formal station area planning processes while other station areas have formal master plans.
- Both the Euclid and Central Corridors have been planned and designed to be more than rapid transit projects. They are progressive examples of transit projects that have been and will be the driving force for city building and design, centered on redevelopment and resurgence of heavily used corridors.

### 3.3 Placemaking

- Rapid transit projects need to include a greater vision of city building and design, addressing the entire corridor. They should not simply be about connecting where people live to where they work.
- Transit investment should be more than infrastructure improvements. Investing in good urban design and streetscaping encourages development around transit.
- Adding amenities such as parks and plazas along the Central Corridor, together with strong urban design components and high development potential University Avenue offers, will create a solid foundation for transit-supportive development.

- Placemaking initiatives around stations along the Red Line were very poor and there has been almost no development. The line runs through predominately industrial and single-family residential areas.
- Streetscaping improvements along the Euclid Line included art installations, integrating stations with the character and history of the neighborhood. Urban design improvements benefited all corridor users, land and business owners.
- Representatives from Cleveland witnessed more people on the street last summer than in previous years, very shortly after the Euclid Line opened, hinting toward the resurgence of the downtown, especially Euclid Avenue, as a busy and desirable place.

### 3.4 Travel Time

- Off-street, laterally separated transit lines are generally faster than on-street, dedicated transit lines.
- Reducing travel time has traditionally been considered one of the most important benefits of rapid transit projects. Also, certainty of travel time is important. People must be able to consistently predict travel time.
- Balancing travel time and convenience is complicated and the tipping point is difficult to predict. Adding 3 stations for a total of 18 along the Central Corridor will increase ridership within the community, even though it will slow overall travel time. The Euclid Corridor has had a similar experience. It has 36 stations over a length of 7 miles, which is quite high for conventional rapid transit. However, the line has enjoyed steady increases in ridership since it opened.
- People are willing to sacrifice some time in transit, if it means they can easily access stations from residential, commercial and institutional destinations. In both study cities, sacrificing some travel time for increased development potential, placemaking potential and convenience of use has increased ridership.
- Increased walking distances between destinations and transit stations can deter discretionary riders who have the option to drive.

### 3.5 Safety from crime

- Danger from crime or personal security is largely a perception-based issue. Areas are deemed unsafe largely based on how safe people regard a place rather than how safe it actually is.
- On-street, at grade rapid transit stations have the potential to be safer and are perceived as being safer than off-street stations, because on-street transit alignments allow for increased passive surveillance from existing buildings oriented to the street and other street and road users.

## 4. Implications for Winnipeg and Southwest Rapid Transit Corridor

The five issues compared are imperative components to any successful rapid transit project. They cannot be assessed individually but rather are complementary to one another. That being said, the success of a transit system can be traced back to ridership. Development potential, placemaking, travel time and safety all contribute to ridership, acting as costs or benefits to it. More riders equates to increased benefits to all the other issues. Development potential is the most important issue for generating long-term ridership. Literature has demonstrated that those who live and work in close proximity to rapid transit tend to use it more than those who live elsewhere. My research has identified the most important transit project goal is increasing ridership through transit-supportive development. This is best accomplished by serving areas with high placemaking and development potential, where people already gather, I have also discovered that travel time is not as important as it is commonly believed.

After understanding the benefits of the on-street alignments of the Central and Euclid Corridors, the following implications for Winnipeg have been identified. My project focus and time constraints limit our discussion to focus on phase two of the SWRTC (downtown to Jubilee). However the following does apply to any potential rapid transit alignment in Winnipeg, including phase one:

**4.1** Five of seven stations in phase two of the SWRTC are located in areas similar to transit stations in other cities, where transit-supportive development has not positively affected ridership:

- The CN rail corridor will not provide convenient access local commercial activity and high-density residential apartments along Pembina Highway.
- Clarence and Chevrier stations will be located in single-family neighbourhoods with limited development potential. Also, single-family homeowners historically resist increases in density and land use changes. Stations



are located between 350 and 400 metres from Pembina Hwy. This is considered, by potential transit riders, to be an inconvenient walking distance.

- Without convenient access to transit stations, new and existing development along Pembina will likely remain automobile oriented, decreasing potential for higher density buildings and decreasing potential ridership for the SWRTC.
- Development around the Plaza Drive station, located within a hydro ROW, will likely be limited. Existing commercial uses are oriented toward Pembina Highway. There are many residential apartment buildings along Pembina. However, they are 500 metres away from the proposed station. Again, transit riders generally consider this an inconvenient walking distance.
- Stations south of Bishop Grandin Boulevard are located in areas with multiple family housing that may generate ridership. However redevelopment sites are limited. The CN alignment would forgo potential partnerships with the University of Manitoba in future re-development of the Southwood Golf Course lands. Also the SWRTC will not directly serve the University of Manitoba, the new stadium and Victoria Hospital, which all have significant ridership generating potential.

***Discussion Question: In what ways does the proposed alignment of the SWRTC promote transit-supportive development and choice riders?***

***Discussion Question: How well will the SWRTC serve Victoria Hospital, University of Manitoba and the new football stadium? Is there an opportunity for the University and City of Winnipeg to integrate rapid transit into the long-term redevelopment of the Southwood Golf Course lands?***

***Discussion Question: For the most part, Pembina will be inconvenient to access by SWRTC transit riders. Business owners will feel more comfortable on Pembina Highway than along the SWRTC. What will happen when we create two parallel transportation and mixed-use development corridors? What are the implications for placemaking, ridership, and development potential?***

4.2 Placemaking will be difficult to achieve at the five southerly stations:

- Most land is occupied by single-family homes whose owners will, most likely, resist increased density and a coordinated streetscaping program.
- Stations located closer to Pembina, including Windermere and McGillivray, would benefit from placemaking

initiatives. However, the other five stations would require drastic redevelopment to include commercial sites while incorporating a streetscaping improvement program along streets leading to stations.

- Pembina Highway provides greater opportunity for potential redevelopment sites and placemaking. Placemaking at stations along an on-street Pembina alignment would create opportunity for a more defined city-building vision.

***Discussion Question: How will high-density residential and commercial land uses along Pembina Highway be connected to the proposed SWRTC?***

***Discussion Question: What placemaking opportunities have been considered? How will these increase ridership and development potential?***

4.3 The travel time of an on-street alignment versus an off-street alignment in the case of Pembina Highway and SWRTC would be comparable:

- The travel time of the off-street alignment will invariably be faster. If the SWRTC were located in the Pembina Highway ROW, because the existing speed limit is 60 km/h it would be difficult to regulate speed limits to allow transit vehicles to move faster than automobiles, as is the case in Cleveland. However overall travel time of rapid transit, during peak travel times, would be less than automobiles due to lack of congestion, signal priority technology and decreased walking time between stations and meaningful destinations.

***Discussion Question: This practicum demonstrates that people are willing to sacrifice some travel time if it means they have more convenient access to rapid transit stations and meaningful destinations. What does this imply for the SWRTC?***

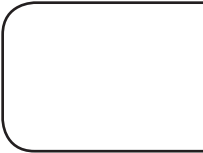
4.4 Station location, visibility and safety

- At stations along the SWRTC, there will be low levels of passive surveillance by neighbouring land uses and passers-by.
- Stations along a Pembina Highway alignment have more existing residential and commercial uses, other road users passing by and potentially more development around station areas.

***Discussion Question: Personal safety and perception of safety is an issue for rapid transit in most cities and will be an issue in Winnipeg. How well equipped is the SWRTC to deal with this?***

*Discussion Question: Why has Pembina Highway ROW not been selected for the SWRTC?*

*Discussion Question: Is there any opportunity for change with phase two (Jubilee to U of M) of the SWRTC? If so what are the next steps after today?*



## Appendix D

### Statement of Informed Consent Key Informant Interviews

(to be printed on University of Manitoba letterhead)

Research Project Title: *Testing Land Development Opportunities and the Viability of On Street and Off Street Rapid Transit alignments, Implications for Winnipeg's Southwest Rapid Transit Corridor.*

Researcher(s): Chris Baker

**This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.**

1. **Purpose of the Research:** This research is being undertaken to fulfill the major degree project requirement of the Master of City Planning Degree at the University of Manitoba, Faculty of Architecture. The purpose of the research is to explore transit oriented development in the context of on street and off street transit alignments and understand the implications for the City of Winnipeg's Southwest Rapid Transit Corridor.
2. **Procedures:** This research will include at least four and no more than eight semi-structured key informant interviews. Subjects will include planning professionals, engineers and/or city officials involved in various transit projects. Interviews are intended to supplement published materials when exploring precedent transit projects.
3. **Risk:** There is no risk beyond normal everyday risk associated with this project.
4. **Recording Devices:** This one-time interview will take approximately 1 to 1.5 hours of your time and, with your permission, I, Chris Baker, will record it with a tape recorder. During the research, tapes will be stored in a lockable filing cabinet in my home office. After the project is complete, the tapes will then be destroyed. If you do not wish for the conversation to be recorded, I will take hand-written notes. However, recording will ensure a more accurate response in the final document.
5. **Confidentiality:** I assume that confidentiality will not be an issue in this study, because I will be asking planning professionals and policy-makers about issues that are within their professional expertise. Only the general role of responsibility and city will be presented in the research, and your responses will be coded. Keep in mind that some people in planning and transportation circles may be able decipher who you are based on your general role of responsibility and city. If at any time you

wish to withdraw from the interview, while it is being conducted, your responses will not be used in the final document.

6. **Feedback:** This will be provided in the form of access to the completed research project. I will send a .pdf copy of the thesis document.
7. **Credit or Remuneration:** There is no credit, remuneration, or compensation for participant involvement in this study.

**Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.**

Contact Information:

My name is Chris Baker. I can be reached by email at \_\_\_\_\_  
 or by phone at \_\_\_\_\_ My advisor is Dr. Sheri Blake. She  
 can be reached by email at \_\_\_\_\_ or by phone at \_\_\_\_\_

**This research has been approved by the Joint Faculty Research Ethics Board (JFREB). If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122, or e-mail [margaret\\_bowman@umanitoba.ca](mailto:margaret_bowman@umanitoba.ca). A copy of this consent form has been given to you to keep for your records and reference.**

-----  
 Participant's Signature

-----  
 Date

-----  
 Researcher and/  
 or Delegate's  
 Signature  
 Date

## Appendix E

### Statement of Informed Consent Focus Group

(to be printed on University of Manitoba letterhead)

Research Project Title: *Testing Land Development Opportunities and the Viability of On Street and Off Street Rapid Transit alignments, Implications for Winnipeg's Southwest Rapid Transit Corridor.*

Researcher(s): Chris Baker

**This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.**

1. **Purpose of the Research:** This research is being undertaken to fulfill the major degree project requirement of the Master of City Planning Degree at the University of Manitoba, Faculty of Architecture. The purpose of the research is to explore transit oriented development in the context of on street and off street transit alignments and understand the implications for the City of Winnipeg's Southwest Rapid Transit Corridor.
2. **Procedures:** Stage 1 of this research included semi-structured key informant interviews with planners and engineers from Cleveland and Minneapolis/St. Paul. Stage 2 focus group subjects will include planning professionals, engineers, transit advocates and civil servants in Winnipeg. The focus group is intended to understand the implications for Winnipeg, based on the findings from other cities.
3. **Risk:** There is no risk beyond normal everyday risk associated with this project.
4. **Recording Devices:** This one-time focus group interview will take approximately 1.5 hours of your time and, with your permission, other Faculty of Architecture Graduate students will take notes. The note takers will not be permitted to keep notes they have taken and they will be deleted from computers if required. After the project is complete, the notes will be destroyed. They have signed a consent form to this effect.
5. **Confidentiality:** I assume that confidentiality will not be an issue in this study, because I will be asking planning professionals and policy-makers about issues that are within their professional expertise. Only the general role of responsibility and city will be presented in the research, and your responses will be coded. Keep in mind that some people in planning and transportation circles may be able decipher who you are based on your general role of responsibility and city. If at any time you

wish to withdraw from the interview, while it is being conducted, your responses will not be used in the final document.

By signing this consent form, you agree not to discuss particulars or mention any of those involved with this focus group interview with anyone who was not part of it.

6. **Feedback:** This will be provided in the form of access to the completed research project. I will send a .pdf copy of the thesis document.
7. **Credit or Remuneration:** There is no credit, remuneration, or compensation for participant involvement in this study.

**Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.**

Contact Information:

My name is Chris Baker. I can be reached by email at \_\_\_\_\_  
 or by phone at \_\_\_\_\_ My advisor is Dr. Sheri Blake. She  
 can be reached by email at \_\_\_\_\_ or by phone at \_\_\_\_\_

**This research has been approved by the Joint Faculty Research Ethics Board (JFREB). If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122, or e-mail: [margaret\\_bowman@umanitoba.ca](mailto:margaret_bowman@umanitoba.ca). A copy of this consent form has been given to you to keep for your records and reference.**

-----  
 Participant's Signature

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 Date

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 Researcher and/  
 or Delegate's  
 Signature  
 Date

# Appendix F

## Statement of Confidentiality for Discussion Note Recorders

Human Ethics Protocol # **Protocol #J2009:147**

I, \_\_\_\_\_ (name), am a discussion recorder on the project: *Testing Land Development Opportunities and the Viability of On Street and Off Street Rapid Transit alignments, Implications for Winnipeg's Southwest Rapid Transit Corridor*. Chris Baker is the researcher on this project. Chris Baker, as a student in the Master of City Planning program at the University of Manitoba, will retain full rights to the ownership, usage, distribution/ dissemination of notes recorded for this practicum project. Note takers will not be permitted to keep copies of the notes they record. Chris will ensure they are deleted from note takers computers if computers are used. The researcher will destroy notes once the practicum document is published.

I agree to keep confidential any and all information that I learn during the course of this project.

Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

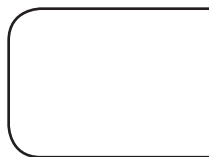
Tel/Fax \_\_\_\_\_

E-mail \_\_\_\_\_

Date: \_\_\_\_\_

Witness: \_\_\_\_\_





**Appendix G  
On-Street Rapid Transit Design and  
Engineering Considerations**





This chapter discusses key design and engineering considerations required to integrate rapid transit with existing street right-of-ways. Mixing rapid transit with cars, trucks, bicycles and pedestrians requires these design considerations to ensure the safe and efficient operation for all modes of transportation. Dedicated rapid transit lanes, pedestrian access and signalized intersections were

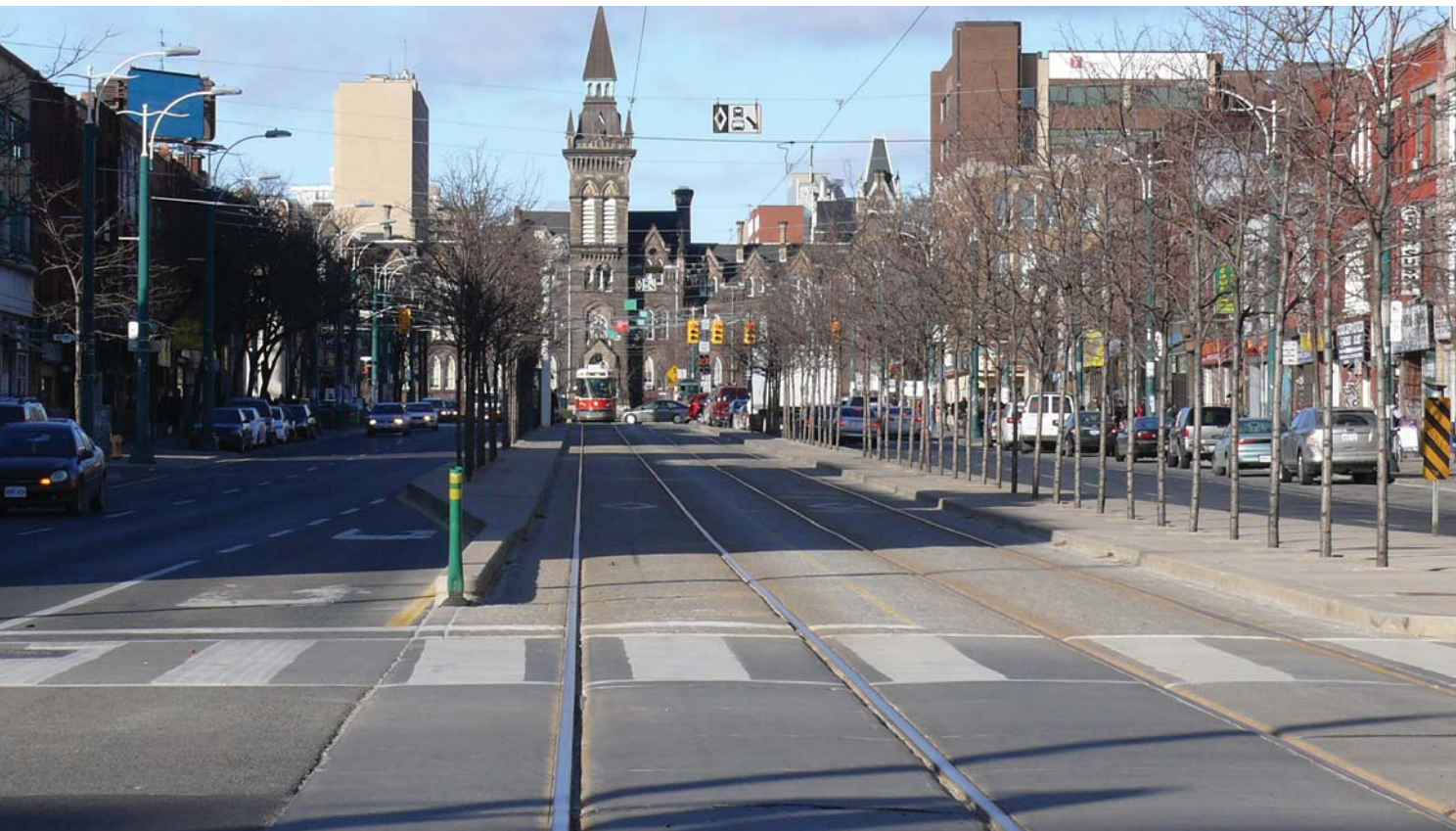
observed and recorded through photo elicitation from the Euclid Corridor in Cleveland, the Central Corridor in Minneapolis and the Spadina and St. Clair Streetcar Lines in Toronto. Design details were also discussed as part of key informant interviews. Maps outlining routes of the Euclid and Central Corridor projects can be found in section 5.2.

Figure 63. Euclid Corridor Transportation Project.



Figure 64. Spadina Road streetcar line, Toronto.

Figure 66. Spadina Road streetcar lane curb separation.



## Dedicated Rapid Transit Lanes

On-street rapid transit requires a laterally separated, dedicated lane to avoid traffic congestion and allow higher speeds to maximize travel time gains. Dedicated rapid transit lanes are located either in the centre or curb lane of the street. The Euclid, Central corridors, Spadina and St. Clair Streetcars are located in the centre lane (Figures 64).

The Euclid Corridor Transportation Project in Cleveland, aligned within the Euclid Avenue ROW runs in a laterally separated, dedicated lane that is divided from the mixed traffic lane by a rumble strip (Figure 65). Light reflectors are imbedded in the lane along with painted lines and text to designate the bus lane and increase visibility. The rumble strip is permeable by other vehicles, which allows for flexibility along Euclid Avenue as automobiles can pass obstructions such as stalled vehicles in the mixed traffic lane, helping to maintain traffic flow along Euclid Avenue. This also accommodates maintenance and emergency vehicles by providing seamless access. It is standard operating procedure for emergency vehicles to use the dedicated lane (R2P; R3E).

The Central Corridor, Spadina and St. Clair Streetcars are separated



Figure 67. Mountable curb. Osborne Street, Winnipeg.

from mixed traffic lanes by curbs to prevent other vehicles from entering the lane (Figure 66). LRT vehicles have different operating and stopping dynamics and it would be unsafe

Figure 65. Euclid Corridor rumble strip lane separation.



to mix them with automobile traffic. Streetcars often operate in mixed traffic, however, for safety reasons do not attain the same speeds as they can within a dedicated lane.

The Spadina and St. Clair lines use regular vertical curbs while the Central Corridor will employ mountable curbs to allow maintenance vehicles to access the lane (R1P) (Figure 67).

## Pedestrian Access

In these example cities, riders must cross lanes of automobile traffic in order to access stations or cross the street. Just like any street, crosswalks provide safe access for pedestrians accessing stations at signalized intersections (Figure 68). It is not always convenient for pedestrians to cross streets at intersections and there is a debate over who should get priority, the car or the pedestrian, with some promoting “J” walking as it is the most convenient for the majority of pedestrians. The generally accepted compromise is mid block crosswalks (Sucher, 1993, p. 149).

Figure 71. Stamped concrete, St. Clair streetcar Line, Toronto.



Figure 68. Signalized intersection Spadina Rd, Toronto.



Figure 70. Fenced track separation, Hiawatha Line, Minneapolis.



Figure 69. Hiawatha Line ballasted track.

The Central Corridor's surface treatment will be rock ballast, similar to the Hiawatha LRT Line also in Minneapolis (Figure 69). The east and west bound Central Corridor LRT lanes will be separated by a fence, also similar to the Hiawatha Line when it operates in downtown Minneapolis (R1P) (Figure 70). The fence and ballasted track will discourage pedestrians from crossing University Avenue, directing them to signalized crosswalks at stations or mid block.

The Euclid Corridor, Spadina and St. Clair Streetcar lanes are not

separated by a fence or other barrier. The Spadina and St. Clair lines use stamped concrete as surface treatments (Figure 71).

The lack of physical barriers and permeable surface treatment allows pedestrians to cross these streets mid block. Although "J" walking is legally discouraged it is important, as pedestrians tend to take straightest and shortest path to their destination (R1P). Pedestrian "J" walking was observed by the practicum researcher in both Toronto and Cleveland by people accessing stations and crossing the street (Figure 72 and 73).

Figure 72. Pedestrians tend to choose the most convenient path. Euclid Corridor, Cleveland.



Figure 73. Spadina Rd, Toronto, pedestrians tend to cross streets where it is most convenient.





Figure 74. Euclid Avenue, mid block crosswalk, “Z” pattern promotes visibility for drivers and safety for pedestrians.

Mid block crosswalks allow convenient access across streets in places where there may not be a street intersection. As these are located in areas where there is no station, the space in the median can be used as a pedestrian refuge, making crossing the entire street more accessible, especially if mobility is a concern (Figure 74).

Surface treatments are used to help denote crosswalks, which further alerts drivers of the pedestrian crossing. Cleveland uses a “Z” pattern surface treatment, as it is highly visible (Figure 74). Just as crosswalks at signalized intersections direct riders to transit stations, they also

serve disembarking riders. Transit stations are designed to corral riders to signalized crosswalks with fences, bollards, planter boxes and other elements of station design (Figures 75, 76 and 77).





Figure 75. Spadina station corals riders to signalized intersections.



Figure 76 Planters are used at St. Clair Ave stations to direct riders to signalized intersections.



Figure 77. Bollards at a Euclid Corridor station corral riders to signalized intersections.

## Signalized Intersections

Along with pedestrian crosswalks, on-street rapid transit also requires considerations regarding signalized intersections to ensure safe interaction between transit vehicles and automobiles.

Left turning automobiles represent a conflict with rapid transit. Signalized intersections provide the opportunity for safe and convenient left turns for mixed traffic. Traffic lights denote times when rapid transit vehicles must stop and other vehicles have the opportunity to turn left. The Toronto Streetcars use standard traffic signals, which are separate from mixed traffic signals (Figure 78). The Euclid Line uses light rail signals (Figure 79). LRT signals can be safer than standard traffic signals, as they are not easily confused with traffic signals (Figure 80).

Cross streets represent one main travel time hindrance for on-street rapid vehicles. The other is speed itself, as vehicles operating in off-street corridors can attain higher speeds (Figure 80). Cleveland addresses the speed issue by allowing rapid transit vehicles to travel at 35 mph while mixed traffic is restricted to 25 mph.

Transit Signal Priority (TSP) technology significantly reduces unnecessary stops for transit vehicles. TSP uses Global Positioning System (GPS), allowing transit signals to detect an approaching rapid transit vehicle and extend the go status. In Cleveland, Euclid Corridor stations are located at the far side of signalized intersections (i.e. eastbound stations are located on the east side of a signalized intersection), allowing efficient use of TSP technology (R2P).

Figure 81. Off-street Hiawatha Line, Minneapolis.



Figure 80. LRT signal system.

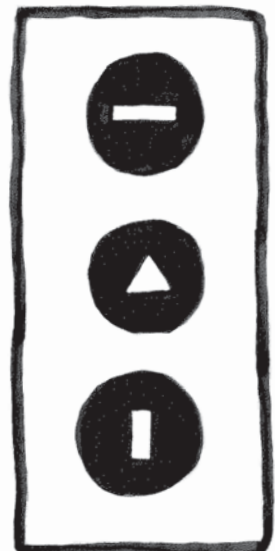




Figure 78. Spadina streetcar signals and mixed traffic lane signals.

Figure 79. The Euclid Corridor uses LRT signals to avoid confusion.

