PART 3: TRANSIT

Public transit is a major focus of the Growth Plan, given the important role that transit service plays in supporting and shaping the growth of any city. Residents have expressed a desire for Saskatoon to have an accessible and efficient transit system with an attractive customer experience. While people will still use cars, an efficient transit system with rapid transit priority lanes will provide options to alleviate and even bypass congestion ensuring that people can move around the city quickly and easily.

There is also a community desire to link transit with the development of major corridors. In this respect, frequent transit services and attractive transit facilities will act as a catalyst for growth and support investments in rapid transit along select major corridors. New transit-oriented community development would also support various strategic goals such as access to housing options and the development of attractive, mixed-use neighbourhoods where people can work, shop and play.

The Growth Plan includes the development of a long-term transit plan which examines the feasibility of rapid transit to better serve the residents of Saskatoon.

3.1 Existing Conditions

This section of the report examines the travel characteristics and needs of transit customers in Saskatoon, in addition to examining features and performance of the transit system itself with comparisons to other communities. Data used for this technical review includes transit ridership information as well as performance reviews and comparisons collected and provided by the City as well as through other industry sources such as the Canadian Urban Transit Association. Although much of this data was gathered and analyzed prior to and at the outset of the Growth Plan (2012 and 2013), the patterns are still considered relevant for this discussion.

3.1.1 The Transit Customer

The city's transit system continues to support a growing customer base that is made up of mostly people without other means of getting around, as well as those who may have access to an automobile but choose to use transit. Before deciding where to expand Saskatoon's transit system, it is important to understand both today's customer market and potential future customer markets that transit could serve. Considerations include the composition of the customer base, the frequency of their transit use, and the locations where they are traveling. The following discussion highlights some of the known attributes of the customer base currently using the transit system today.

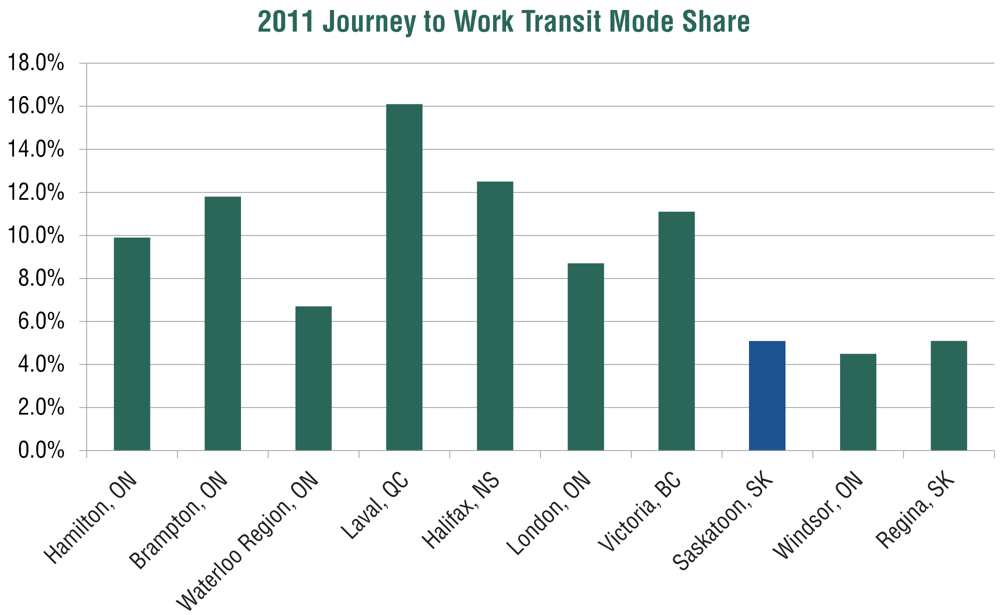


Figure 3.01 - 2011 Journey to Work Transit Mode Share

Source: 2011 Journey to Work Mode Share (National Household Survey, 2011)

- **Transit accommodates approximately 4.5% of all daily work trips.** In comparison to other Canadian communities with populations between 200,000 and 500,000 people, the proportion of people using transit in Saskatoon is relatively low, as illustrated in **Figure 3.01**. There are various factors that may contribute toward lower transit ridership. These factors include the transit customer experience, land use patterns, and other transportation system characteristics.

- **Transit serves over 9 million passengers a year**. **Figure 3.02** illustrates the growth in system ridership over a five year period. Between 2008 and 2012, transit ridership grew from slightly more than 8 million to over 9 million passengers – an increase of 15%, or about 4% per year. This increase in ridership exceeds growth in annual service hours during the same period (approximately 2% per year).

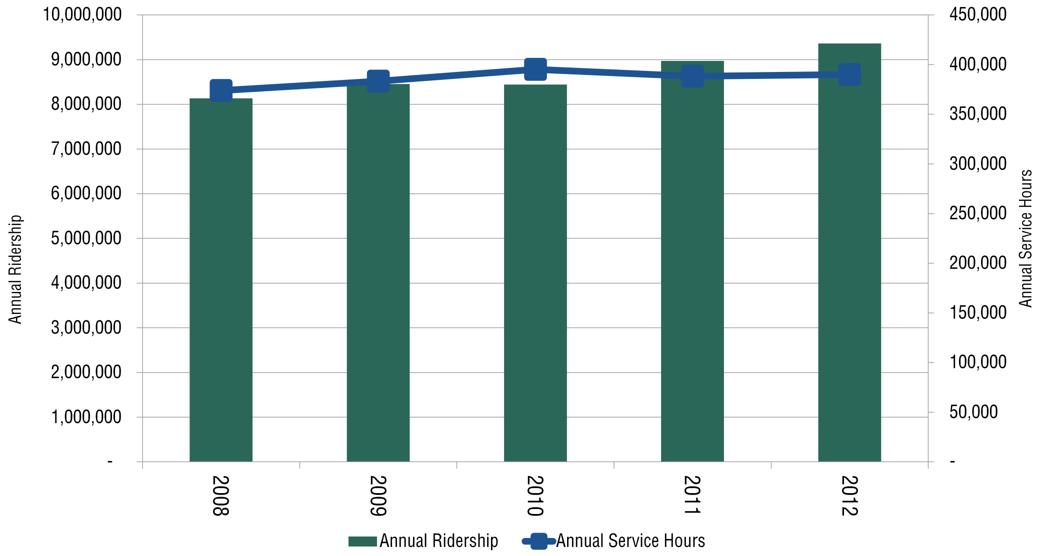


Figure 3.02 - Annual Ridership and Service Hours

Source: 2012 Saskatoon Transit Annual Service Report

- **The transit system serves approximately 25,000 customers every weekday. Figure 3.03** below illustrates daily boardings on transit for each day of the week. Transit ridership on Fridays is slightly lower than the Monday through Thursday periods. Additionally, weekend transit ridership levels are approximately 25% to 30% of typical weekday ridership levels. These daily patterns are typical of other cities in Canada.

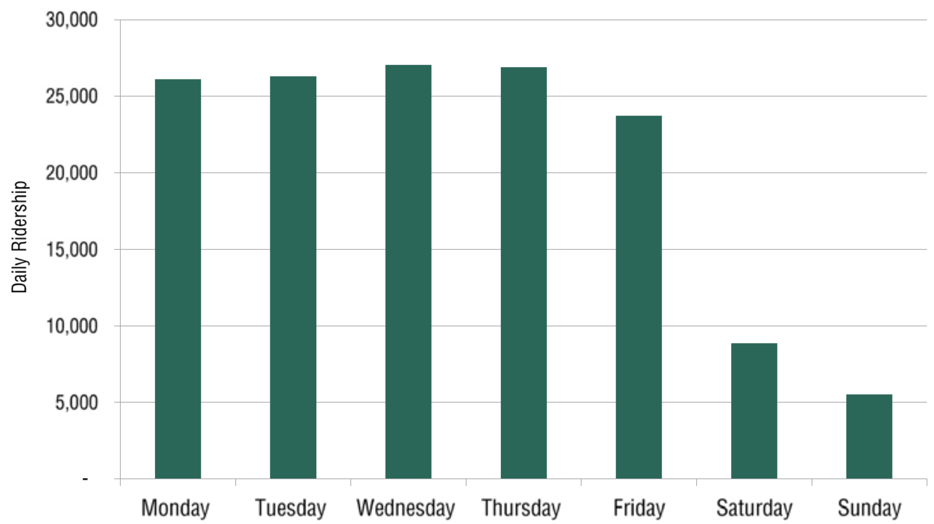


Figure 3.03 - 2012 Daily Transit Ridership

Source: Farebox Data (March 20 - 31, 2012)

- **On weekdays, over 55% of all transit trips occur during the morning and afternoon peak periods. Figure 3.04** illustrates the daily profile of customer boardings per hour across the entire system. On a typical weekday, over 14,000 customers board the transit system during the morning and afternoon peak periods (i.e. 7am to 9am and 3pm to 5pm). In the peak hour (3pm to 4pm), approximately 4,000 customers board the transit system. The peak periods generally capture daily travel to work and school, and typically influence the scale of fleet and number of operations in the system. As experienced in most communities, midday hourly ridership is much lower than the peak periods of a weekday. It is also noted that evening weekday transit ridership after 7pm is very low even though services operate until after midnight in some areas.

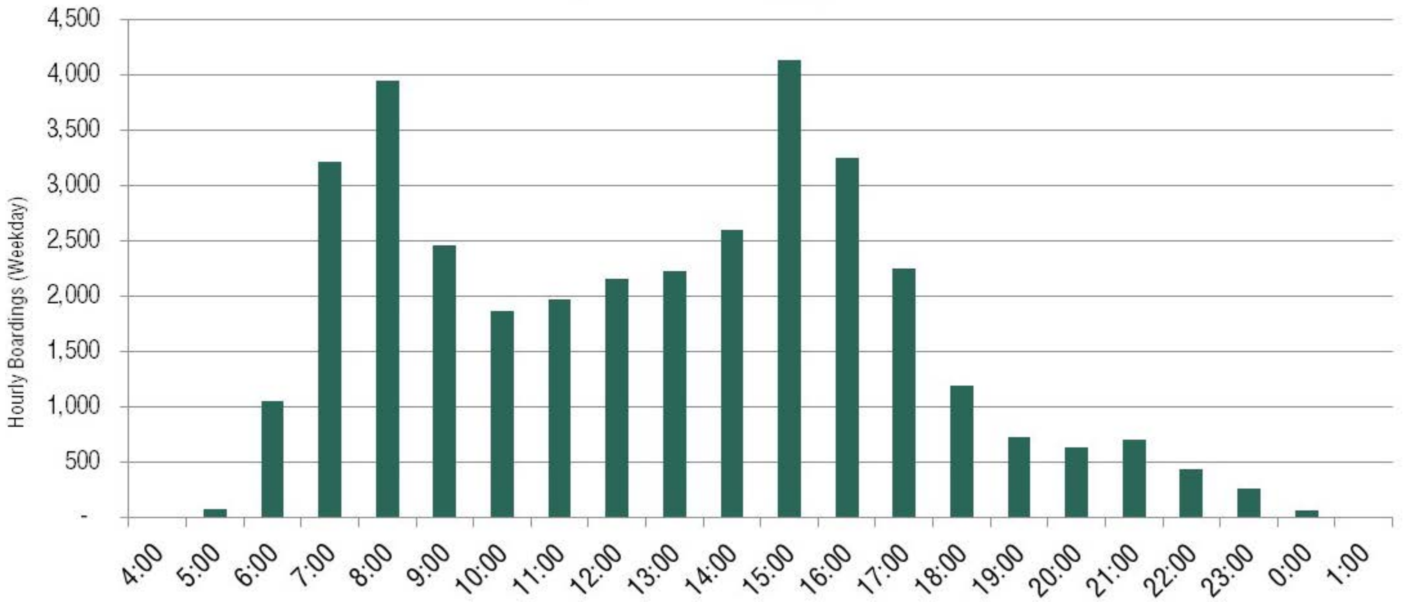


Figure 3.04 - Weekday Transit Boardings per Hour

Source: Farebox Data (March 20-31, 2012)

3.0 TRANSIT

- **Weekend ridership generally increases throughout the day toward the afternoon peak between 3pm and 4pm.** As illustrated below in **Figure 3.05**, transit ridership gradually increases to a peak of approximately 1,200 boardings per hour on a typical Saturday. Although the weekend peak transit ridership is approximately 30% of the weekday peak hours, evening transit ridership levels for a Saturday are generally consistent with weekday patterns. These ridership patterns suggest that peak weekend service levels and resources need only to be 30% of weekday services.

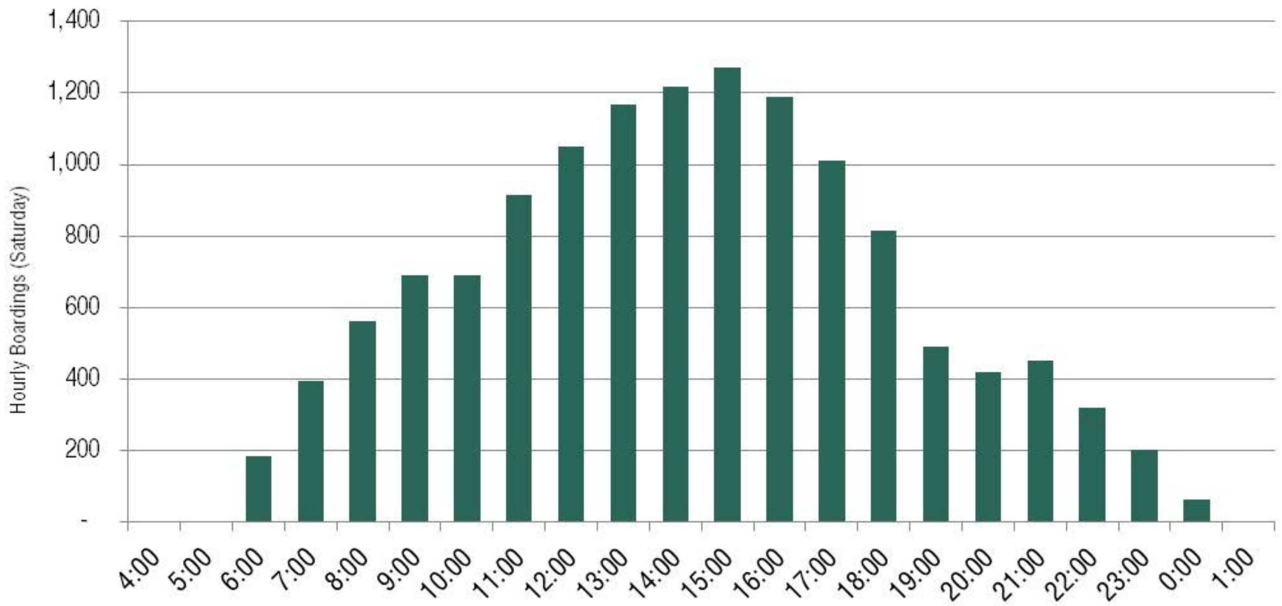


Figure 3.05 - Saturday Transit Boardings per Hour

Source: Farebox Data (March 20-31, 2012)

- **Almost 80% of all passengers are regular / daily transit customers.** Month/Day Pass, post secondary-UPass, and discounted pass holders make up the majority of the rider base. Seniors, cash and ticket fares make up less than 20% of all customers making use of transit today. As is the case in most communities, regular pass holders often use transit from a fixed origin to a fixed destination, five days a week.

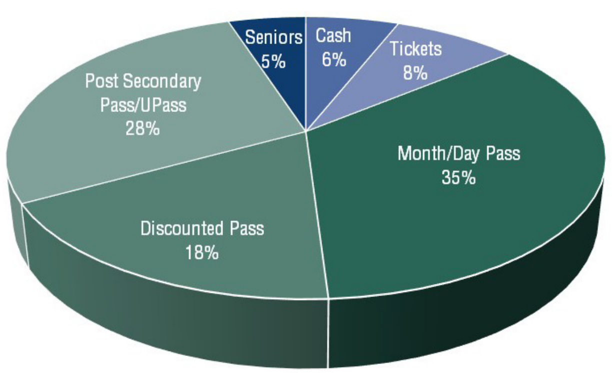


Figure 3.06 - Transit Ridership by Fare Type

Source: 2012 Saskatoon Transit Annual Report

- **Almost 30% of all transit customers are Post-Secondary Student Pass/UPass holders.** A large majority of these trips are to and from the University of Saskatchewan where the UPass has been available to all full and part time students since 2009. The UPass provides unlimited access to Saskatoon Transit buses at a deeply discounted rate.

- **Over 65% of all work trips (for all modes) begin in the suburban areas of Lakewood, Lawson Heights and Blairmore.** The remaining 35% of work based trips begin in the established communities largely inside the Circle Drive area. The distribution of work trip origins is generally consistent for both car and transit travel. In addition to post-secondary students, work based trips can be one of the strongest potential markets for transit customers, requiring highly attractive levels of service outside Circle Drive to connect passengers from suburban neighbourhoods to employment areas.

- **Over 85% of work trips by transit are destined to the Downtown and University areas**. In comparison, almost 60% of work trips by all modes are destined to the downtown, university and industrial areas. As of 2011, the Saskatoon region has over 110,000 jobs within the City boundaries, a majority of which are located in the Downtown, North Industrial and University of Saskatchewan areas. Despite the balance in the distribution of jobs, the core areas of the city are the primary transit customer markets. As experienced in other North American cities, suburb-to-suburb travel, even for work trips, can be more difficult to serve with transit, rendering these trips unattractive for people that have the option of driving.

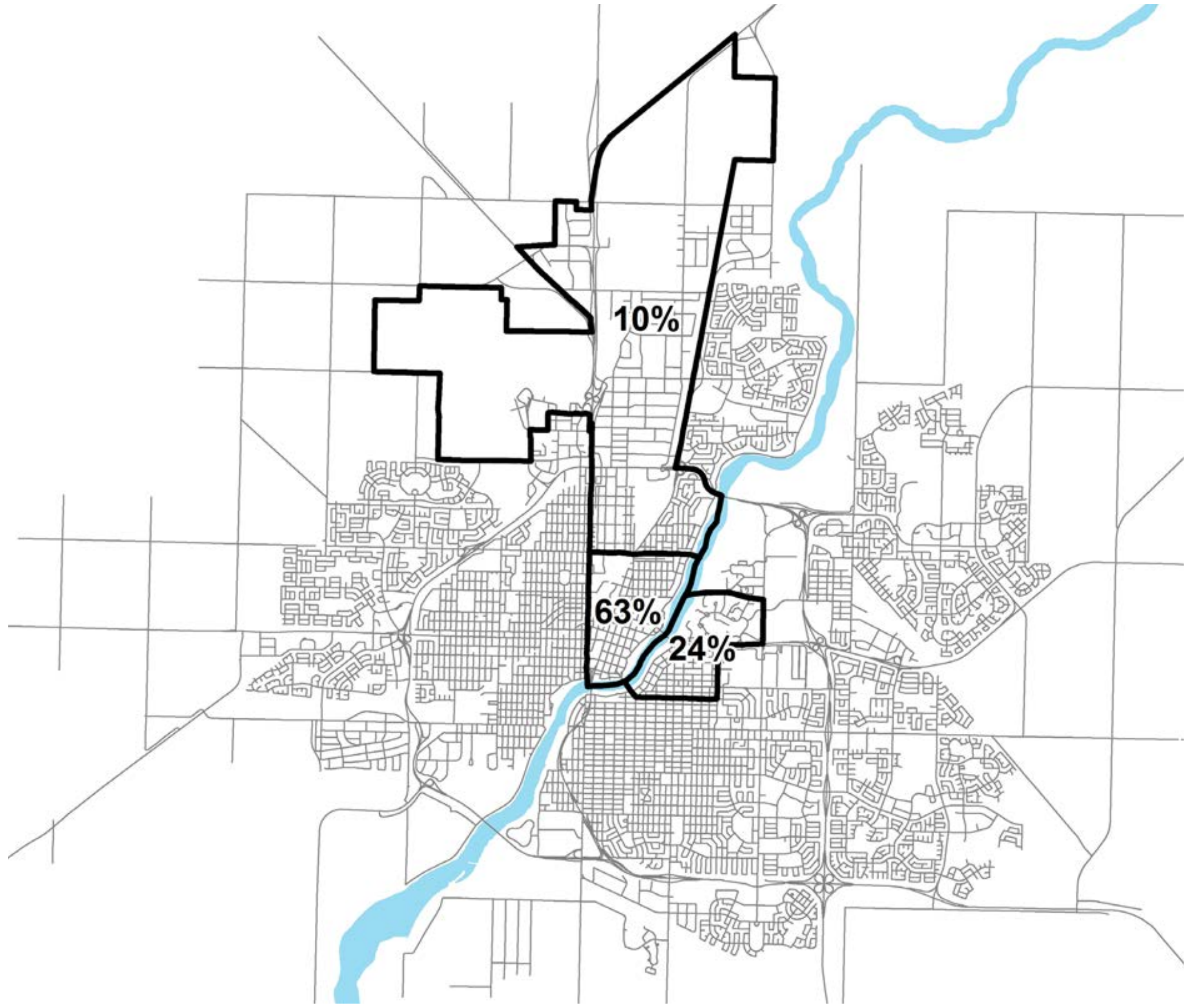


Figure 3.07 - Primary Work Trip Destinations by Transit

Source: Transportation Model

- **A majority of all weekday peak period transit trips start along a select number of key corridors and community terminals throughout the City.** As previously noted, a majority of the boardings on transit occur during the morning and afternoon peak periods. **Figures 3.08 and 3.09** below illustrate new boardings (excludes transfer trips) for the most active bus stop locations in the city, which account for approximately 45% and 75% of the total boardings in the morning and afternoon peak periods, respectively. These patterns suggest that a majority of transit customers start their trips in many of the primary land use terminals in the city such as the Downtown and the University, as well as several suburban centres such as in Lawson Heights, Confederation and University Heights. Additionally, several key corridors such as 22nd Street, 20th Street, Broadway Avenue, and 8th Street generate significant transit ridership during both the morning and afternoon peak periods. Concentrations of mixed-use areas represent the strongest two-way transit markets in the city today.

- **It is also noted that a portion of the busiest morning boarding activity occurs at stops outside key corridors and nodes.** Many transit trips begin in suburban residential areas in the morning. These boarding patterns highlight the importance of the suburban sections of the DART routes that extend beyond the primary corridors and mixed-use nodes of the city to serve residential areas.

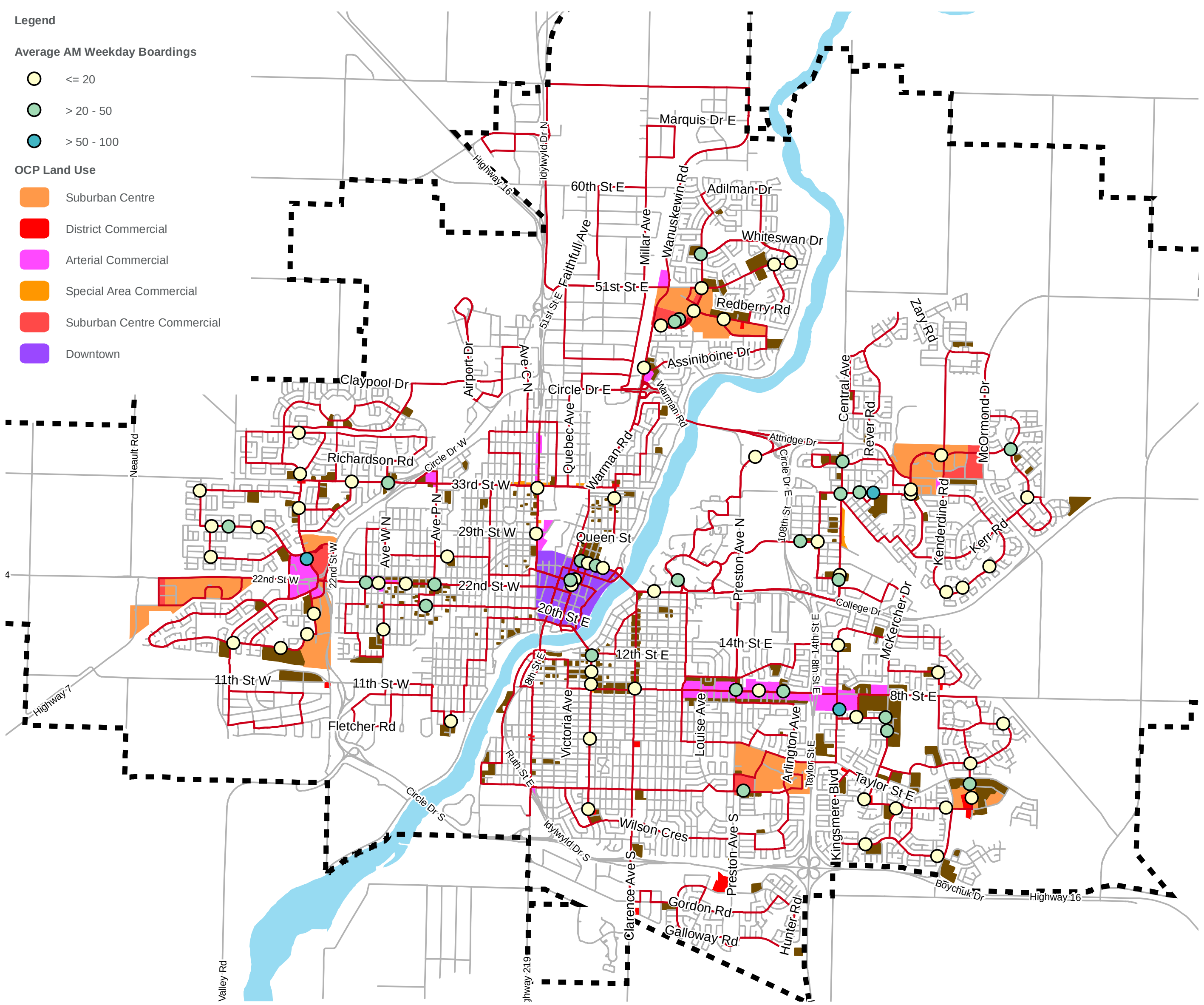


Figure 3.08 - Average AM Weekday Boarding Activity with Land Use

Source: Farebox (October 2013)

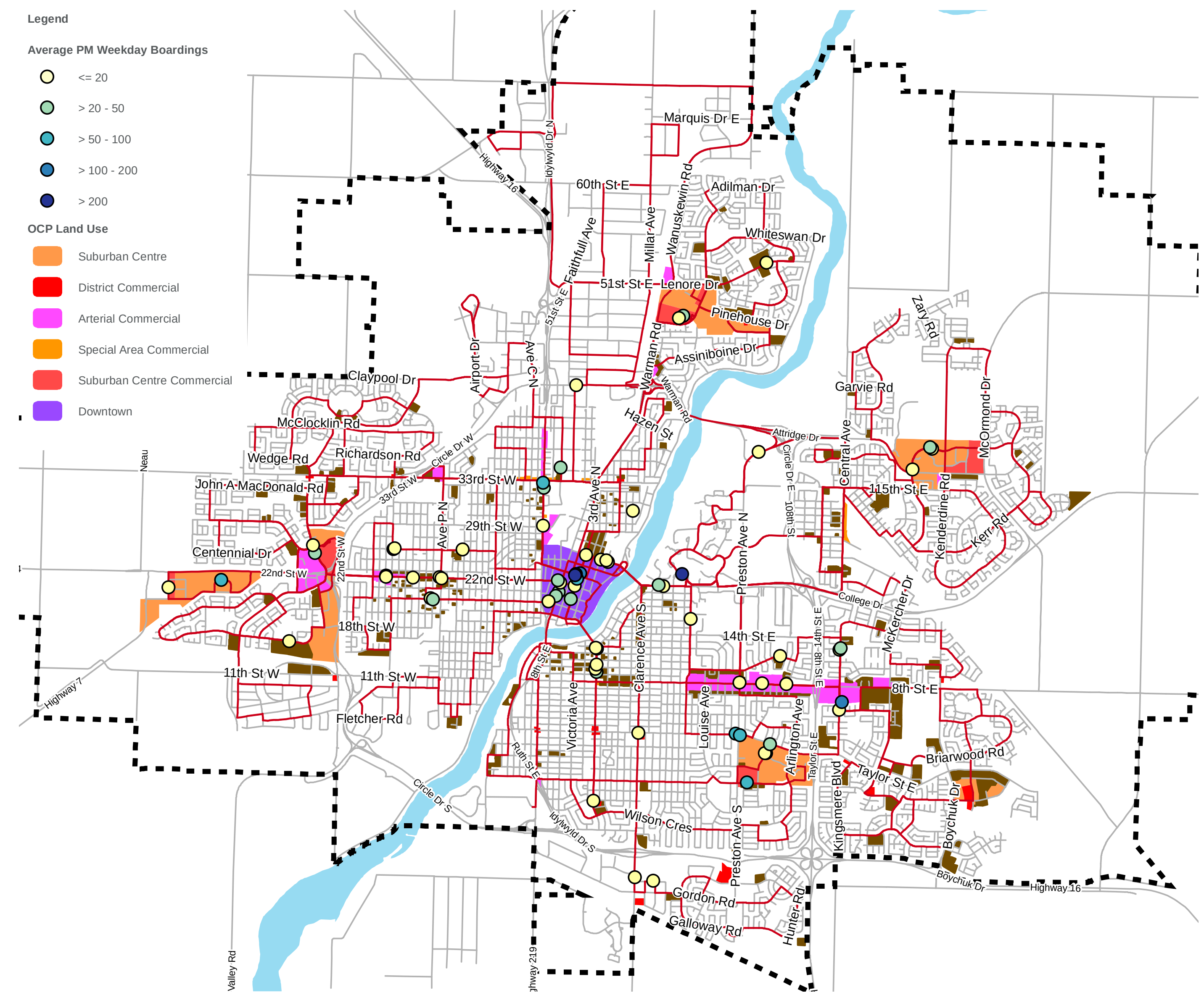


Figure 3.09 - Average PM Weekday Boarding Activity with Land Use

Source: Farebox (October 2013)

- **East-west transit ridership is generally higher than north-south ridership, and east-west ridership is significantly higher in the eastern areas of the city. Figure 3.10** below illustrates the transit ridership on all routes crossing major east-west and north-south screenlines in the city during the morning and afternoon peak hours. In general, the peak directional demands crossing each of the major screenlines range anywhere from 300 to over 1,100 passengers per hour during the morning and afternoon periods. Consistent with the boarding patterns previously described, east-west transit ridership is higher than north-south ridership. In particular, morning and afternoon transit ridership on east-west routes is highest on the east side of the river, with over 1,100 passengers entering and leaving the core area in the AM and PM peak directions respectively. Transit ridership across the river is generally balanced between both directions of travel in both the morning and afternoon peak periods.

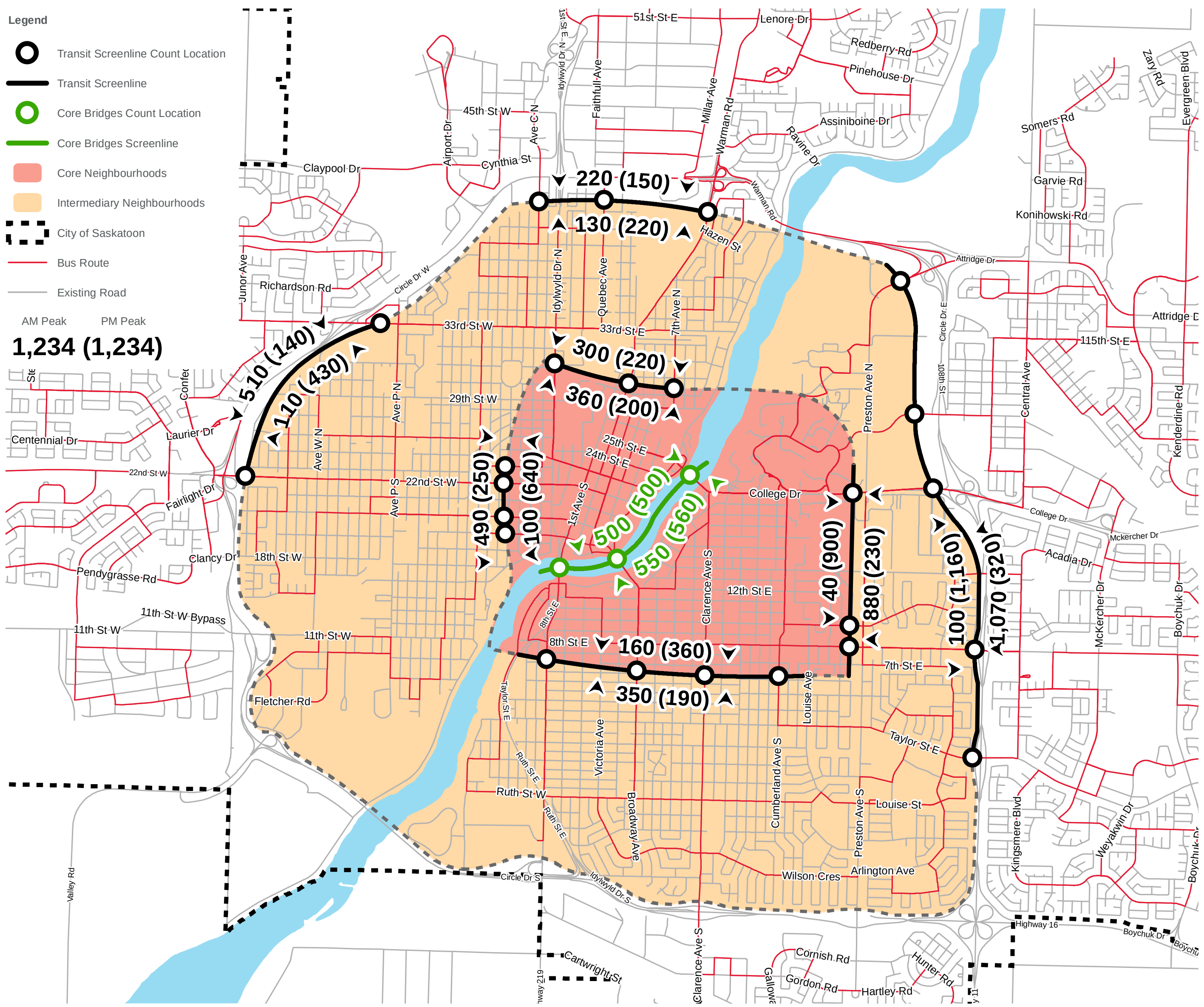


Figure 3.10 - Peak Hour Transit Screenline Counts (AM (PM) passengers per direction)
Source: City of Saskatoon (September 2013)

- **Approximately 7 to 10% of all the trips across the three core area bridges during the morning and afternoon peak hours are on transit. Figure 3.10** indicates that transit supports over 500 passengers in both directions across the South Saskatchewan River during the peak hours. For comparison purposes (prior to the opening of the Circle Drive South bridge), approximately 9,000 and 12,000 vehicles crossed these core area bridges in the morning and afternoon peak hours respectively. In general, the 7 to 10% transit mode share over the South Saskatchewan River in the core area is notably higher than the 4.5% city-wide travel to-work mode share noted in the 2011 National Household Survey. These patterns reinforce the importance of the downtown and university areas as the primary markets for transit today.

3.1.2 Existing Transit Services and Facilities

The parts of the transit system that most influence the customer experience include the amount, type and form of the services, as well as the facilities that accommodate passengers such as transit stops and terminals. This section of the Technical Report highlights the existing transit system within the city and provides comparisons with other communities of less than half a million people in Canada.

- **Saskatoon Transit provides approximately 395,000 hours of service to the community annually, of which 80% is delivered during the week and 20% on weekends**. This service level equates to slightly more than 1.6 service hours per capita, as illustrated in **Figure 3.11**. Communities of between 300,000 and 500,000 people appear to have service levels that range anywhere from 1.2 hours of service per capita to approximately 2.2 hours of service per capita. As the city grows, the number of service hours per capita will need to increase in order to make transit attractive and to increase transit mode share.

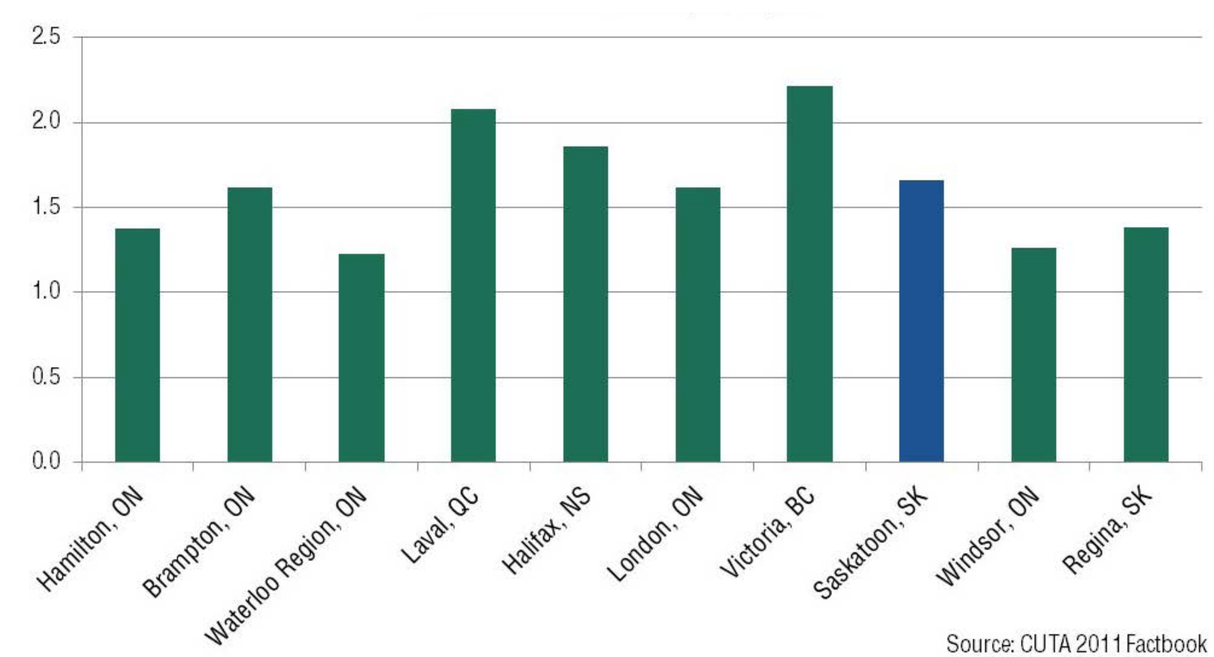


Figure 3.11 - Annual Service Hours per Capita

- **Saskatoon's transit system is designed as a hub-and-spoke service that is centered on the downtown and university areas of the city, as illustrated below in Figure 3.12.** Consistent with most cities, Saskatoon's transit system is designed to serve the major, two-way travel patterns that occur during peak periods. In this case, the system is designed to connect the suburban development areas with the Downtown and University. The 23rd Street Downtown terminal is the system's primary terminal, and is a transfer point in the system where most routes connect every 15 or 30 minutes.

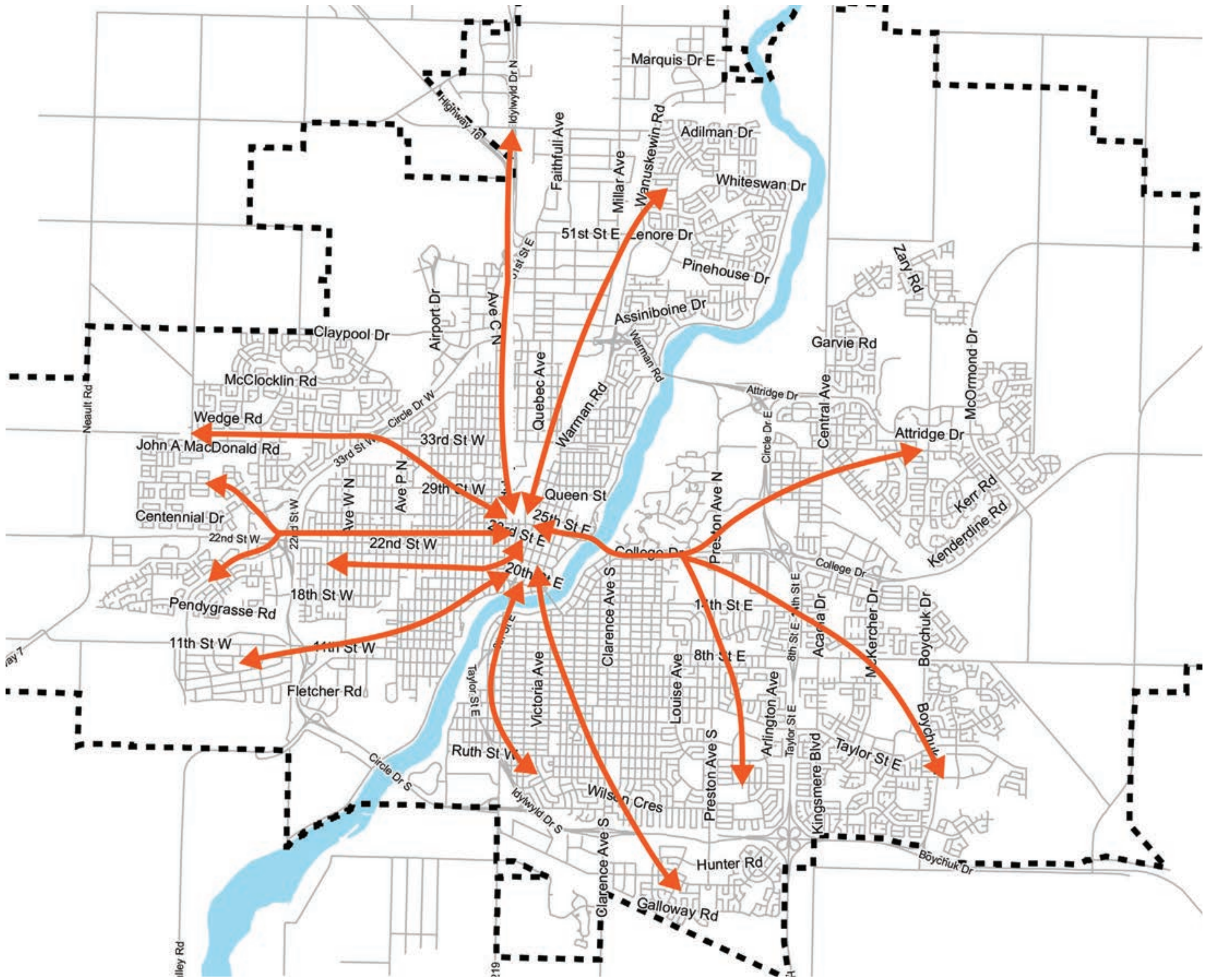


Figure 3.12 - Existing Transit System Structure (Hub-and-Spoke)

- **The system largely consists of conventional fixed-route, fixed-schedule transit serving urban and suburban areas of the city with 30 to 60 minute frequencies.** DART routes provide 30 minute service between suburban areas of the city through to the Downtown, while most other routes connect people to the Downtown at 30 minute peak, and 30 or 60 minute off-peak frequencies.

- **Most residents are within reasonable walking distance to transit (<400m). Figure 3.13** illustrates the 'coverage' of transit service in Saskatoon (<400 metre walking distance). Saskatoon's Official Community Plan (2013) states that wherever possible, transit routes should be provided within 450 metres of one-unit dwellings and townhouses, 250 metres of medium and high density multiple-unit dwellings, and 150 metres of special needs housing. Although there are some 'gaps' where transit is beyond a reasonable waking distance, transit service covers approximately 95% of the established areas of the City.

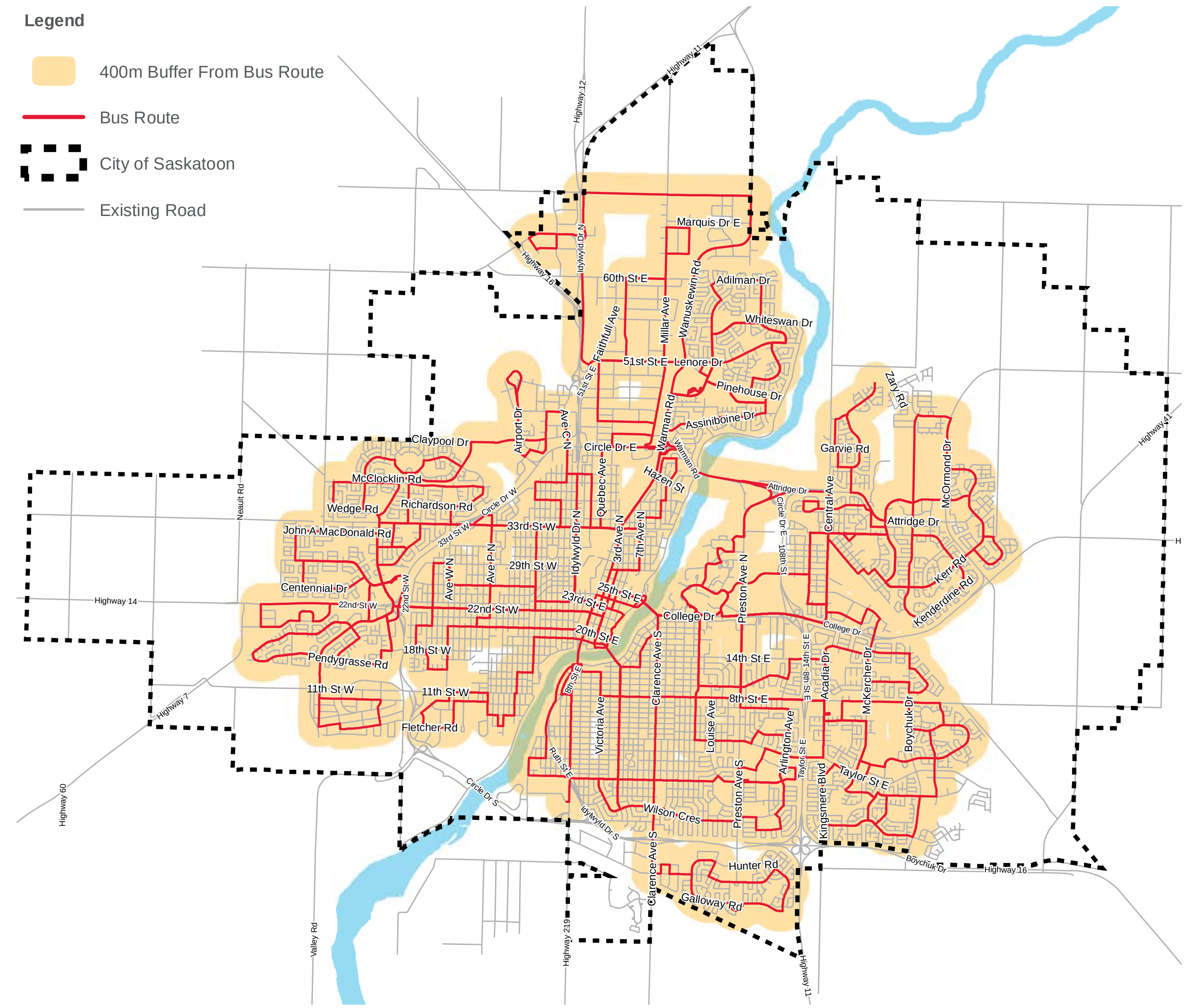


Figure 3.13 - Transit Coverage (400m Buffer)

- **Although transit service coverage is excellent, the road network layout of most suburban areas creates circuitous and indirect transit travel for many customers.** As experienced throughout North America over the past three decades, many suburban areas have shifted away from a grid roadway system such as the system that exists inside Circle Drive, and moved towards a curvilinear street system. This shift has created several transportation challenges that have extended to the transit system. Outside Circle Drive, the curvilinear road network results in indirect and circuitous transit routes that increase travel times for many customers. Although these areas represent the outer edges of the service area today, the effect of these areas will become more pronounced in the future as growth to the urban boundaries continues.

- **The most frequent transit services are focused on the core areas of the city and key roadways, such as College Drive, Preston Avenue, 22nd Street, Idylwyld Drive, Broadway Avenue, and Warman Road.** Transit services within the city generally operate at 30 minute frequencies during the peak periods, and every 30 to 60 minutes during the off-peak. **Figure 3.14** illustrates the cumulative morning and afternoon peak transit frequencies of all services operating along each corridor in the city. Despite the fact that many corridors, such as College Drive and 22nd Street, are served by 6 to 12 buses per hour, the maximum peak frequency on any corridor is limited to 15 minutes due to the hub-and-spoke nature of the system and the timed transfer downtown. In this regard, many core area corridors experience platoons or "bunching" of buses operating down the street at the same time.

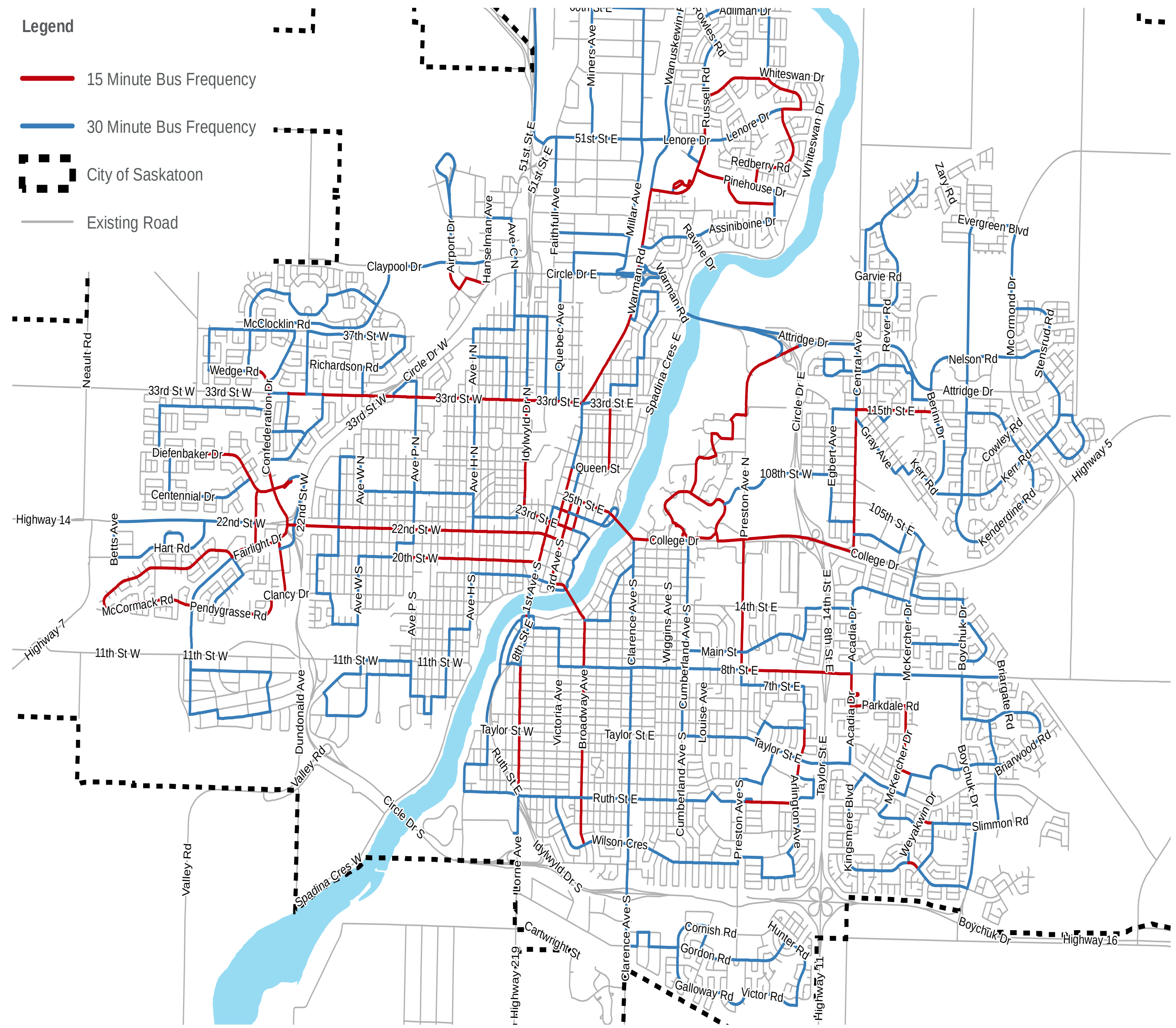


Figure 3.14 - Transit Frequencies (2013)

- **Transit travel times are most competitive to the car between the Downtown and suburban centres.** Transit travel between the Downtown and many of the key trip generators in the city is quite competitive with auto travel time. For example, a trip from Confederation Mall to Downtown takes approximately 11 minutes by car and 15 minutes by transit as illustrated below in **Figure 3.15**. For most transit customers, this small travel time differential would make transit a very attractive alternative. Conversely, suburb-to-suburb travel takes significantly longer on transit. Trips that take three or four times longer on the bus in comparison to driving are very unattractive, especially to choice riders that have access to a car. These markets are much more difficult to serve by transit and are typically higher proportions of vehicle travel than other areas of the city.

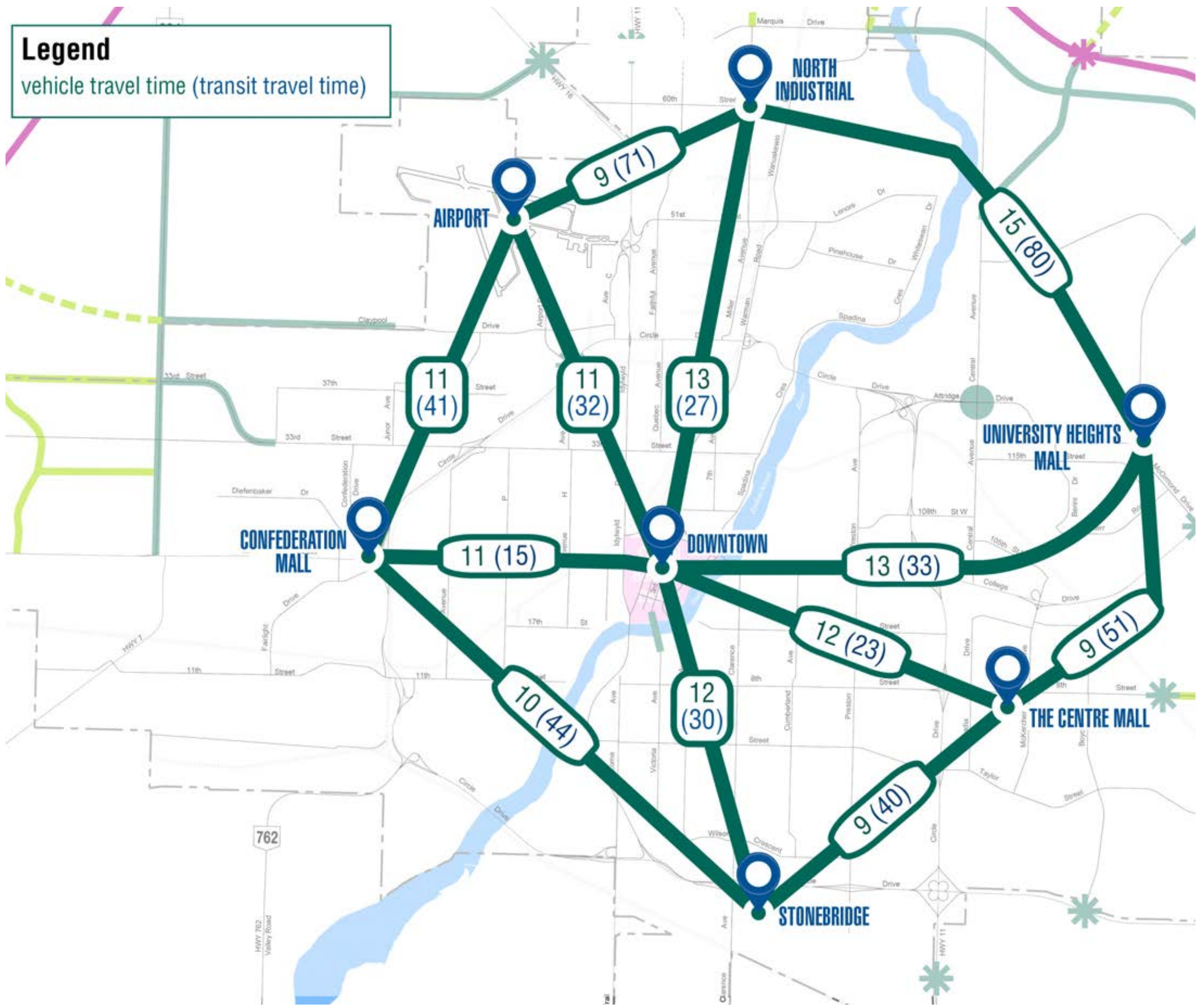


Figure 3.15 - Existing Car & Transit Travel Time Comparisons
Source: Google Travel Times

Monthly Pass		Fee
Transit Pass		$50 (child) $83 (adult)
University Parking		$30.38* (students) $60 (faculty)
Downtown Parking	Parkade 1 Av/20 St	$145.00
	Impark - YMCA	$120.00
	Impark 2 Av/24 St	$175.00
North West Industrial Area Parking		$0

**$234/Fall and Winter Semester (8 months)*

Table 3.01 - Monthly Transit Fares & Sample Parking Rates
Source: Saskatoon Transit, USask Parking Services, Parkopedia, 2016

- **Fleet comfort and accessibility can impact the customer experience.** Providing an accessible fleet and facilities surrounding the stops means more people can ride conventional services and reduce demands on custom transit. Provision of an accessible fleet is often quite costly. **Table 3.02** compares Saskatoon's fleet size, age and accessibility with that of other communities. Although the City has wisely managed financial resources by purchasing buses from other transit agencies, this approach has reduced accessibility and comfort for passengers. As of 2015, the average age of buses within Saskatoon was 11.9 years (with an age ranging from 1990 to 2015). In 2015, a fleet replacement strategy was adopted that will see ten (10) new buses annually, with the goal to have an accessible fleet by 2018.

- **Monthly parking is generally free outside the core area of the city and a very low cost at the University (see Table 3.01).** Abundant supplies of free or low cost parking encourage people to drive their car for frequent and routine trips, such as those to work and school. Within the core area of the city, monthly parking rates tend to be more expensive than a transit pass at approximately $150/month, while staff/faculty parking rates at the University are below the price of a monthly transit pass at $60/month. When parking rates are lower or comparable to transit fares, many people will choose to drive rather than take transit.

- **Over 70% of stops do not have a shelter and a greater percentage do not have seating. Just 33% of stops are considered to be well lit**. Saskatoon has over 1,688 transit stops throughout the city, including those located in transit terminals. As is the case in many cities, a large majority of transit facilities consist of a transit sign identifying the transit stop and the bus route number(s). In many areas of the city, transit stops do not provide adequate facilities in terms of seating and lighting to make the customer experience comfortable.

City	# Buses	Average Age	Percent Accessible
Saskatoon, SK	161	13	59%
Regina, SK	109	9.4	77%
Victoria, BC	280	7.5	100%
Waterloo Region, ON	235	8.2	92%
Winnipeg, MB	545	8.9	84%

Table 3.02 - Summary of Transit Fleet Age & Accessibility
Source: CUTA 2011 Factbook

3.1.3 Transit Fares and Funding

This section examines current fares for operating transit in Saskatoon and highlights the funding sources for operating and capital improvements relative to other communities in Canada.

- **Saskatoon's transit fares are generally in line with other similarly-sized municipalities. Table 3.03** below compares 2014 fares for the City of Saskatoon with other larger cities in Canada. Saskatoon's fare-pricing structure is targeted towards resident university students and seniors. Saskatoon, like Regina, offers significant discounts to seniors purchasing monthly passes to support mobility for an aging population. Similar to Victoria and Waterloo Region, a deeply discounted UPass is compulsory for full time students at the University of Saskatchewan.

		Saskatoon	Regina	Victoria	Waterloo Region	Winnipeg
CASH	Adult	$3.00	$2.50	$2.50	$3.00	$2.55
	Senior	$3.00	$2.50	$2.50	$3.00	$2.05
	Post Secondary	$3.00	$2.50	$2.50	$3.00	-
	High School	$2.50	$2.00	$2.50	$3.00	$2.05
	Youth	$2.00	$2.00	$2.50	$3.00	$2.00
MONTHLY	Adult	$78.00	$62.00	$85.00	$72.00	$84.70
	Senior	$26.00	$16.83	$45.00	$60.00	$42.35
	Post Secondary	$78.00	$53.00	$77.00	$60.00	-
	High School	$56.00	$47.00	$35.00	$60.00	$58.90
	Child	$47.00	$47.00	$35.00	$60.00	$58.90
UPass (Semester)		$76.00	None	$81.00	$72.23	None
Farebox Cost Recovery (%)		38%	33%	47%	39%	60%

Source: Saskatoon Transit, Regina Transit, BC Transit, Grand River Transit, Winnipeg Transit, University of Saskatchewan, University of Regina, University of Victoria, University of Waterloo, University of Manitoba websites (retrieved January, 2014); CUTA Factbook (2011)

Table 3.03 - Summary of Transit Fares & Cost Recovery

Unlike investments in roads and other municipal infrastructure, cost recovery from the farebox has become a measure of effectiveness for most transit systems. Although there should be no expectation that the farebox revenues recover the costs for the service, a farebox recovery percentage provides a means of assessing how effective the service is relative to other systems in the country. As indicated in **Table 3.03**, a 38% farebox recovery in Saskatoon is generally consistent with most other similar sized and slightly larger systems.

- **On average, Saskatoon taxpayers invest about $93 per capita per year to operate the City's transit system.** As shown in **Figure 3.16**, this places Saskatoon near the average level of municipal investment per person for the cities shown.

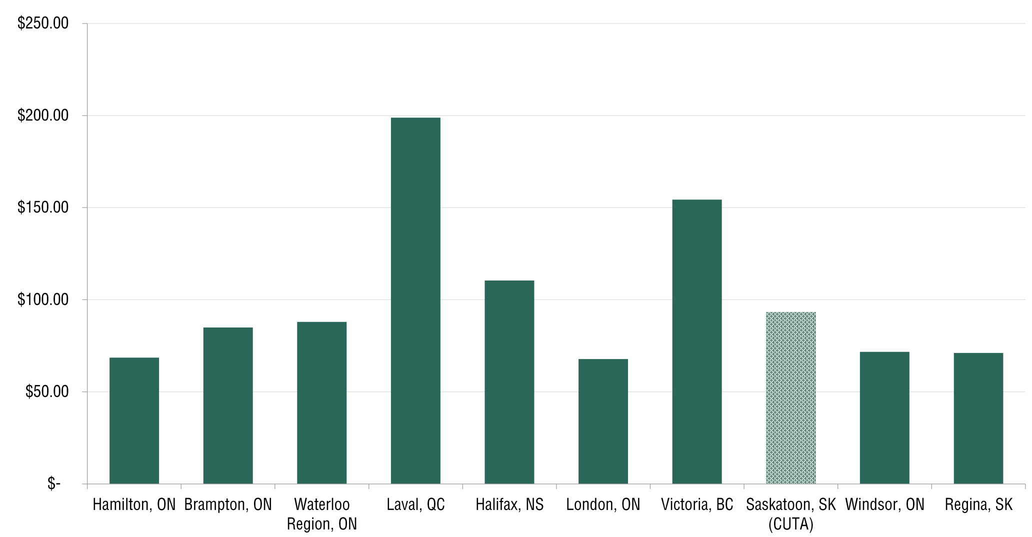


Figure 3.16 - Municipal Operating Contributions per Person

3.2 Future 'Business-as-Usual' Transit

Projected population growth to half a million people will increase demands on the transit system. This section explores the 'base' level investments to expand the transit system and identifies the projected increases in travel demand in order to examine potential improvements to be considered in the Plan.

3.2.1 Base Service Increases

Since 2007, annual transit service hours have grown at a compound rate of approximately 1.8% per year despite higher rates of population growth during that time. Over the next 30 years, it is assumed that the City will continue to invest in transit services and facilities at a higher level than the past in order to provide more attractive travel choices and to increase overall ridership. As a starting point however, a 'base' level of investment to increase transit services by 1.8% is assumed for the purpose of serving planned growth areas of the city as previously described. The Transit Plan and rapid transit review will determine whether additional investments would be worthwhile to capture key transit markets and foster growth along major corridors.

The following discussion highlights the 'base' level investments and service changes anticipated for the transit system over the next 30 years.

- **Although the population is expected to more than double over the next 30 years, current rates of transit investment mean that service levels in the system would only increase by 70%.** As previously described, the population is projected to grow at approximately 2.5% per year, resulting in a more than doubling of the city's population over the next 30 years. If current rates of transit investment, i.e. 1.8% annually, were maintained over this time frame, service hours would increase from slightly less than 400,000 hours annually to approximately 675,000 hours. Despite this increase in total service hours, it would actually result in a decline in service hours per capita, going from slightly more than 1.6 to less than 1.4. **Figure 3.17** illustrates and compares the base level investments in transit service hours over the next 30 years with the population growth rates projected.

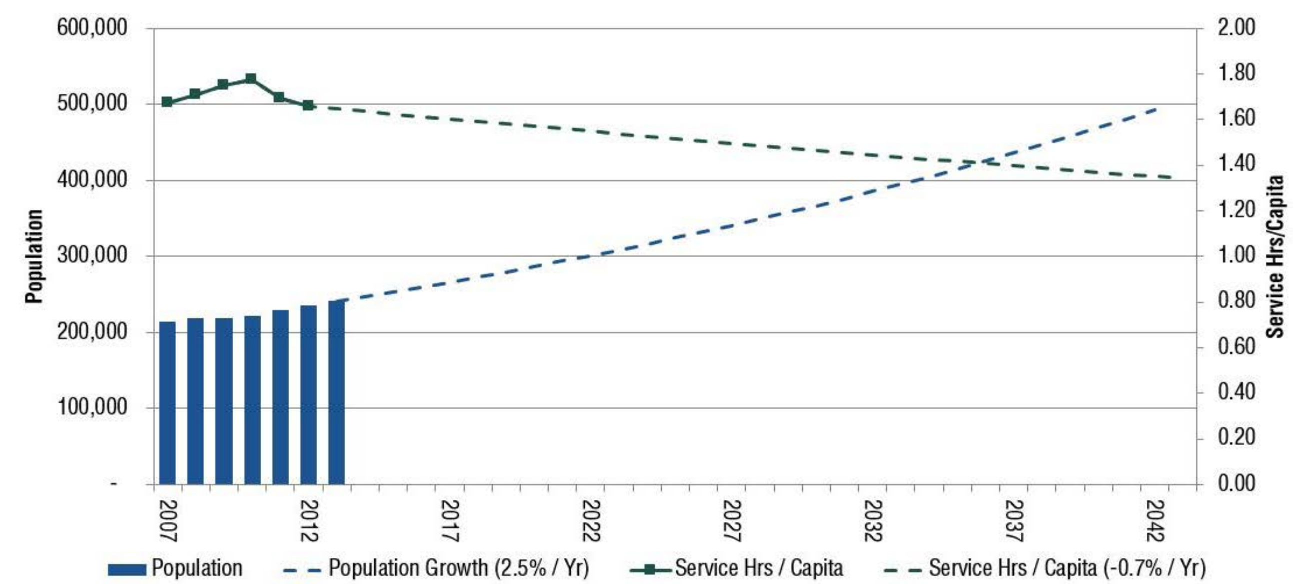


Figure 3.17 - Projected Population and Base Transit Service Hour Growth to 2043

- **This 'base' level of investment will make it impossible to increase transit mode share and provide reasonable transportation choice.** Service hours are a measure of how much service is on the street serving customers, which in turn influences ridership and mode share. **Figure 3.18** illustrates the relationship between today's service hours and mode share in systems across the country. In very broad terms, communities with more than 2.0 annual service hours per capita experience transit mode shares of 11 to 16%. Communities with 1.0 to 2.0 annual service hours per capita experience transit mode shares of 4% to 15%. And, communities with less than 1.0 service hours per capita experience transit mode shares of less than 3%. In this regard, transit service hours need to be increased beyond current rates of growth in order to realistically increase transit mode share. For Saskatoon, service levels per capita must be above 2.0 in order to increase ridership and manage congestion.

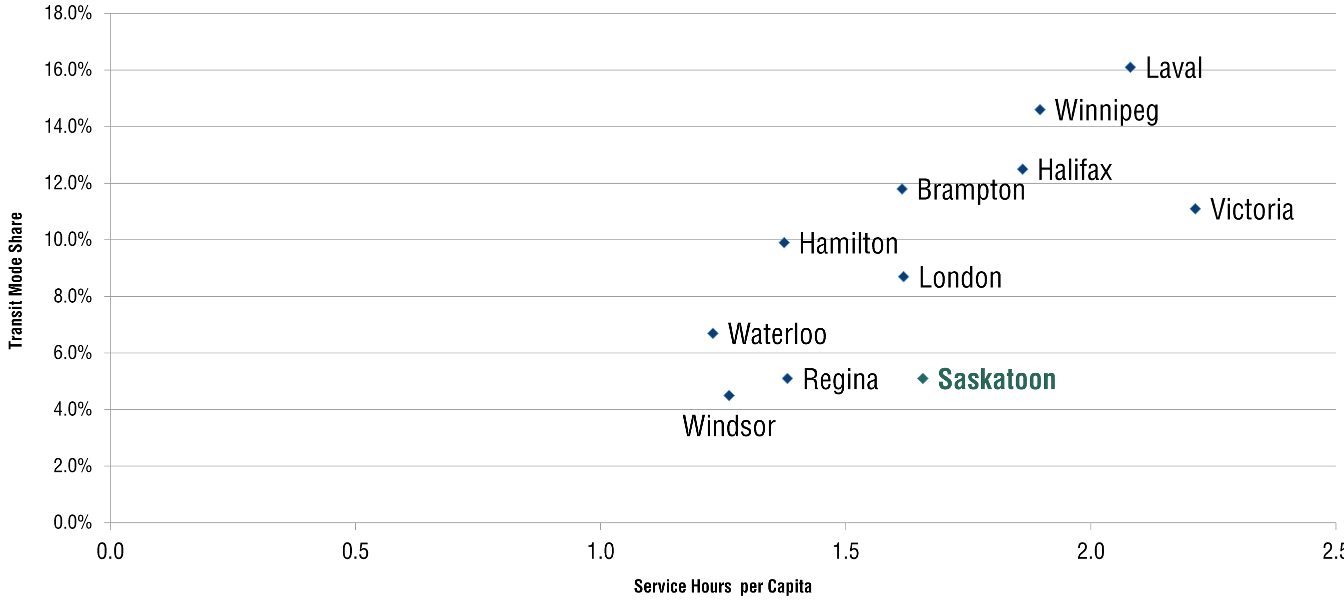


Figure 3.18 - Annual Service Hours per Capita and Transit Mode Share

Source: 2011 CUTA Factbook

- **Along some key corridors, a 'business-as-usual' investment could be designed to improve the frequencies of buses to 10 minutes or less.** The increase in annual service hours would be allocated across the system to serve the suburban development areas and to improve frequencies on the most productive routes as a base level of investment in expanding service hours. The specific allocation of service hours are assumed to be distributed as follows:
  - 30 minute service levels to the three suburban development areas that include the introduction of three new routes to Blairmore, three new routes to Holmwood, and two new routes to University Heights. Consistent with the current services, these routes are designed to connect local areas to the core areas and transit markets of the city.
  - Increases in bus frequencies on the most successful routes including changes to DART routes 50, 60, 70, and 80 from 30 to 20 minutes headways (for a combined DART corridor frequency of 10 minutes); Route 2 headways from 30 to 10 minutes; and, Route 4 headways from 30 to 15 minutes.

Figure 3.19 illustrates the future base peak period corridor frequencies. Several key corridors develop as primary transit spines with peak frequencies of 10 minutes or better. Corridor frequencies of 10 minutes or better provide greater flexibility to customers boarding transit on these corridors as they will not need to consult a schedule and will never have a significant wait time.

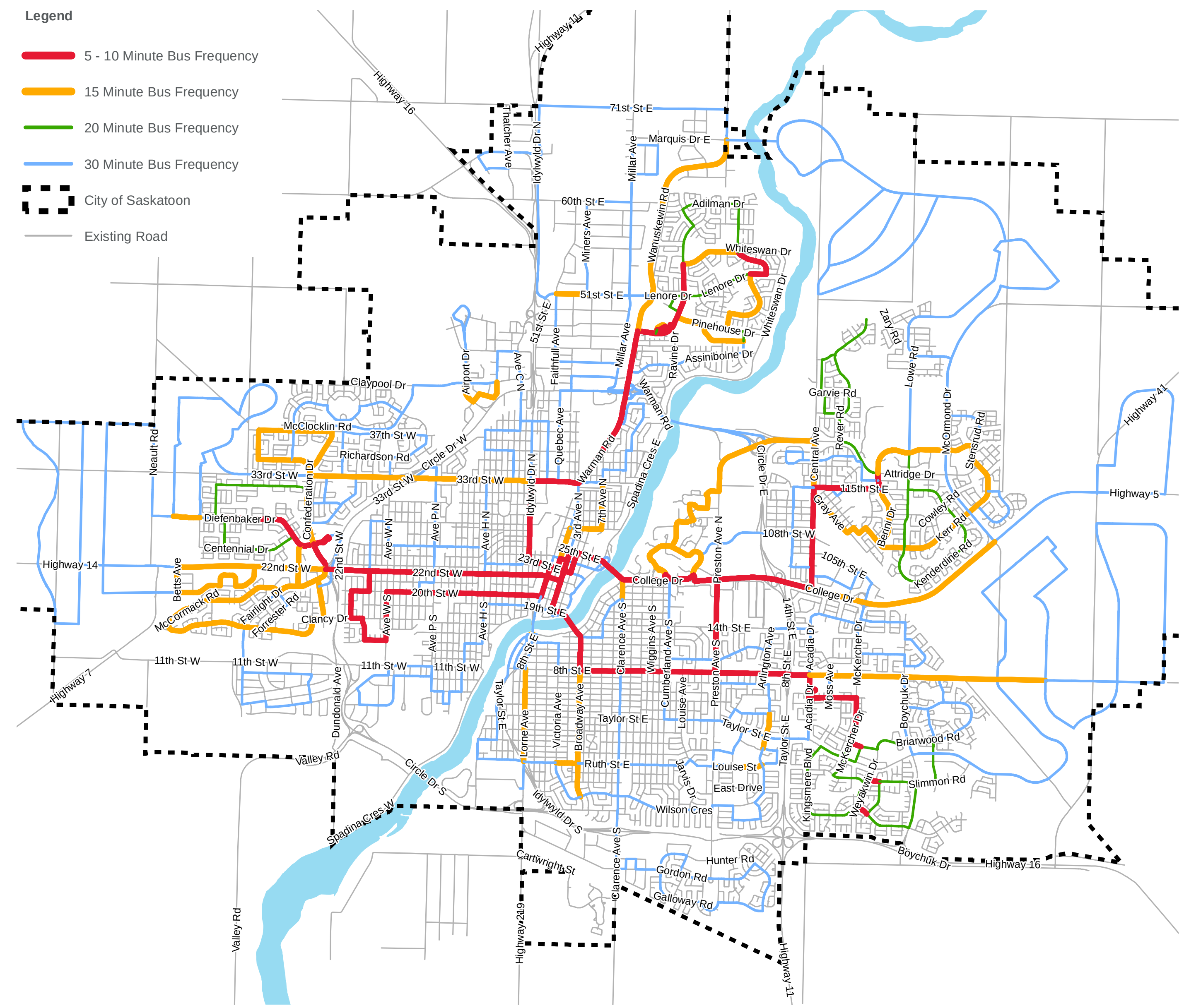


Figure 3.19 - Future Transit Frequencies (Base)

3.2.2 Forecast Ridership Changes

The 2011 transportation model was used to assign forecast PM peak hour trips to the 'base' transit network to confirm overall shifts in ridership and the volume of transit passengers projected along each corridor in 30 years. The following discussion highlights the overall patterns and transit passenger volumes along key corridors in the core areas of the city.

- **Consistent with today's patterns, east-west transit ridership across the city is higher than the ridership on north-south services.** Over the next 30 years, College Drive, University Bridge, 8th Street and 22nd Street through to the downtown are projected to accommodate the highest transit ridership in the PM peak hour as illustrated in **Figure 3.20.** Much of the ridership is generated by existing nodes and planned growth along these corridors inside Circle Drive as well as from suburban services outside Circle Drive. Consistent with today's transit travel patterns, these areas are projected to continue to be the strongest markets for transit in the long-term.

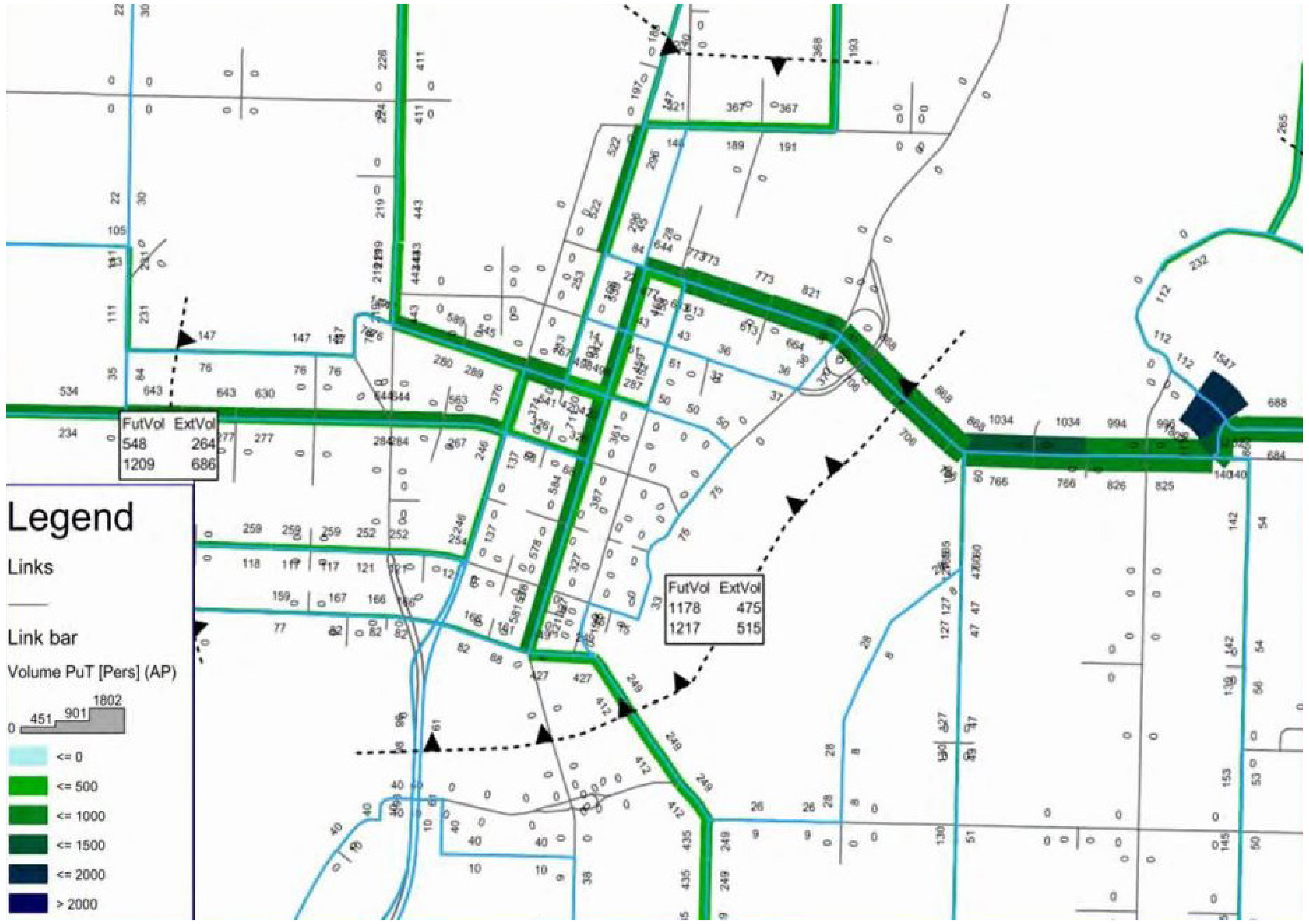


Figure 3.20 - Forecast PM Peak Hour Transit ridership (Business-as-Usual)

Source: Traffic Model

- **The secondary markets for transit travel include other east-west corridors such as 33rd Street, 20th Street, and parts of 8th Street.** North-south corridors such as Idylwyld Drive, Warman Road, Preston Avenue, and Broadway Avenue are also projected to accommodate moderate passenger loads during the PM peak hour.

- **Over the next 30 years, PM peak hour east-west transit passenger loads are projected to increase to as much as 1,100 passengers in the peak direction along College Drive near the University, and to approximately 650 passengers on 22nd Street west of downtown.** Additionally, the PM peak directional ridership southbound across the Broadway Bridge and on services to the north of the Downtown (on Idylwyld Drive and 2nd Avenue) are generally in the range of approximately 400 passengers. These patterns are illustrated below in **Figure 3.21.**

Figure 3.21 - Forecast PM Peak Hour Screenline Ridership (Business-as-Usual)

Source: Traffic Model

3.3 Problem Definition

The transit system in Saskatoon is typical of many small to mid-size communities across Canada in terms of the level of investment, amount and design of services (as well as facilities) and the subsequent ridership or transit mode share (currently at 5% of all daily travel). Beyond the transit system itself, land use patterns and other transportation systems have a tremendous impact on the success of transit regardless of the service quality. This section highlights some of these and other challenges facing transit today, and what this means for the future of Saskatoon with half a million people as previously described.

Today, Saskatoon's transit system provides service levels that are comparable to other mid-size cities with approximately 400,000 hours of service per year (or approximately 1.6 hours per capita). The overall quality of the current transit system is affected by the following factors:

- Transit is designed as a hub-and-spoke system that is centred on the downtown to support 85% of all transit passengers today. For those going to other areas of the city however, passengers must travel to the downtown transit terminal before transferring to another bus before getting to their destination. This reduces the directness of travel and adds significant travel time for trips other than to the downtown and University areas.
- Most residents are within a 400 m walking distance of transit across the city, and as a result services can be indirect for many customers (i.e. the system uses a coverage model).
- Land use patterns within many suburban neighbourhoods in the city are single-use, low density areas with circuitous street patterns that are difficult to support with attractive and cost effective transit service. However, the city is challenged with the expectations and trade-offs of providing a basic level of transit service to new suburban areas that are generally low transit generators rather than providing more attractive services to larger transit market areas and corridors.
- The frequency of transit services along many corridors in the city are modest with services generally operating every 15 to 30 minutes or more during the peak periods of the day.
- Transit is 'one-size fits all' type of service with conventional routes trying to serve multiple travel needs – local trip making, travel between neighbourhoods and cross-city trip making.
- The transit system is not very accessible compared to other cities in Canada. On one hand, the aging fleet has limited accessibility for boarding and leaving the bus for people with mobility challenges. Beyond the vehicle itself, many transit stops and pedestrian facilities are also not accessible, especially during winter months.
- The overall customer needs are variable and the experience with transit for some has become a barrier to making regular use of transit. Barriers have been identified at every step of the journey, from planning a trip on transit through to leaving the bus to an individual's destination.
- As the primary alternative to transit, drivers generally experience modest levels of congestion and abundant supplies of free or low cost parking in most areas of the city. Investments in the roadway network to address congestion and the provision of excessive parking through development will continue to make driving more attractive for most trips.

The City of Saskatoon is expected to double in population and support approximately half a million people and nearly 250,000 jobs by 2045. Current plans with see growth accomomdated in New Suburban Areas (e.g. Blairmore, Holmwood, University Heights), Neighbourhood Infill Areas (e.g. existing residential neighbourhoods primarily within Circle Drive), and Strategic Infill Areas (e.g. Downtown, North Downtown, University of Saskatchewan). Overall, 50% of the growth is planned for the core area inside Circle Drive, and the remaining 50% in New Suburban Areas.

With planned growth to half a million people, the limited choices that exist today within the transportation system will impact mobility of residents. Over the next thirty years, the city roadway network could be expected to support 100,000 additional vehicle trips during the peak hours alone. With planned land use patterns and the network improvements, average trip distances will increase from 6 km to 10 km with travel times growing by 300%. In short, the planned roadway network with modest changes inside Circle Drive means that more roadways in the city's core area will be at capacity. Since most roadways in the established areas of Saskatoon cannot and should not be widened, the City must look for ways of increasing the people-carrying capacity for existing road space through transit.

Recognizing the changes in travel demands and patterns across the city, the challenges ahead for transit are being exacerbated by the modest increases in transit investments as well as mounting pressures for roadway space and congestion. With a 'business-as-usual' approach to transit, there are several critical challenges ahead for mobility throughout a city with half a million people as briefly highlighted below.

- Continuing the trend of smaller increases in transit services over the next 30 years will result in 70% more transit service levels with a 100% increase in population. On a per person basis, this means that service levels with half a million people would be worse than the experience of many customers today.
- The challenges of serving expanding areas of the city with modest levels of transit service at the expense of stronger transit markets in the urbanized areas of the city will become even greater in the long-term.
- The capacity of the transit system will undoubtedly be exceeded during peak periods of the day on some of the most attractive corridors without significant increases to service levels. In other words, the number of buses with full passenger loads.

- Even with significant increases in vehicle travel times, transit would be stuck in the same congested street system as traffic without any advantage for the customer. At the same time, the people-carrying capacity of the street system would remain unchanged with a 'business-as-usual' approach.
- Without enhanced transit customer support, service and facilities, the city will be unable to respond to the needs of an aging population and variation in mobility levels of a growing city. As experienced elsewhere, this typically means that more people will rely on specialized transit services that are more costly rather than the conventional system.
- The city-wide transit mode share will likely decline without corresponding increases to transit service levels that exceed population growth.

In the end, a 'business-as-usual' approach affects more than the transportation system. Transit is at the centre of enabling and supporting sustainable growth patterns across the city. Without attractive transit services and facilities, the city's plan to support 50% of all growth within the core area inside Circle Drive will be compromised. Further, Corridor Growth patterns envisioned within the Growth Plan rely on transforming the street environment with attractive transportation alternatives such as rapid transit in addition to walking and cycling facilities. At best, these areas may remain auto-oriented without significant investments in transit. At worst, the city may be unable to grow upward in a sustainable manner and will face continued pressure for outward growth.

3.4 Vision and Possibilities for Transit

This section describes the long-term vision for transit in Saskatoon, and describes the possible improvements that were explored as part of the Growth Plan to enhance the transit system. The transit vision mirrors the Saskatoon Speaks and Strategic Plan directions for Moving Around, and it is supported by transit specific goals and objectives that guide the long-term plan needed to achieve the long-term vision.

3.4.1 Vision and Goals for Transit

Through the Saskatoon Speaks process, City residents acknowledged the need for viable alternatives to the car, recognizing that more and more people are seeking other ways to get around. During the process, residents recognized that traveling by car or truck through the city should be easy, but also expressed a desire to make public transit more efficient and attractive. This vision was further articulated in the City's Strategic Plan, as noted below.

Saskatoon's Vision for Moving Around (from the 2013-2023 Strategic Plan)

Our investments in infrastructure and new modes of transportation have shifted attitudes about the best ways to get around. Our transportation network includes an accessible and efficient transit system and a comprehensive network of bike routes. People still use cars, and also rely on options such as public transit, walking and cycling.

Growth has brought new roads and bridges that improve connectivity for all travel modes. Improved streetscapes, interconnected streets and well-planned neighbourhoods encourage walking and cycling. Attractive options to the car alleviate congestion and ensure people and goods can move around the city quickly and easily.

Goal for Transit (developed for the Growth Plan)

The transit system in Saskatoon will strive toward providing exceptional experience for customers and be attractive. The long-term Transit Plan will include a broader range of service to support a variety of trips. Rapid transit will complement the overall transit system, and serve as the spine to the transit network. Rapid transit corridors and stations will be planned to support and connect higher density, mixed-use areas of the City in order to enhance mobility for residents and visitors.

Transit Objectives

- To support and shape opportunities for growth and development beyond current plans.
- To provide frequent, direct and reliable transit services for the most significant travel markets.
- To provide neighbourhood services that support local area travel and connections to primary corridors.
- To provide transit supportive facilities that enhance safety and comfort for customers.

3.4.2 Possibilities for Transit

This section describes the possibilities that were considered and incorporated in the Growth Plan to alter the 'business-as-usual' approach to delivering transit services. These possibilities focus on improving the customer experience, increasing the amount and range of services, providing transit priority treatments, and providing transit supportive infrastructure and programs.

A) Improving the Customer Experience

The customer experience is central to the success of transit in Saskatoon. The community has clearly stated the experience on transit is essential as a foundation of the transit business and improvements to the customer experience should be implemented NOW! Whether it's planning a trip or getting to the destination, there are many things that can be done to improve the experience for customers of all ages and abilities. Some of the potential improvements considered and developed in the Growth Plan are designed for each step of the travel journey as illustrated in **Figure 3.22**.

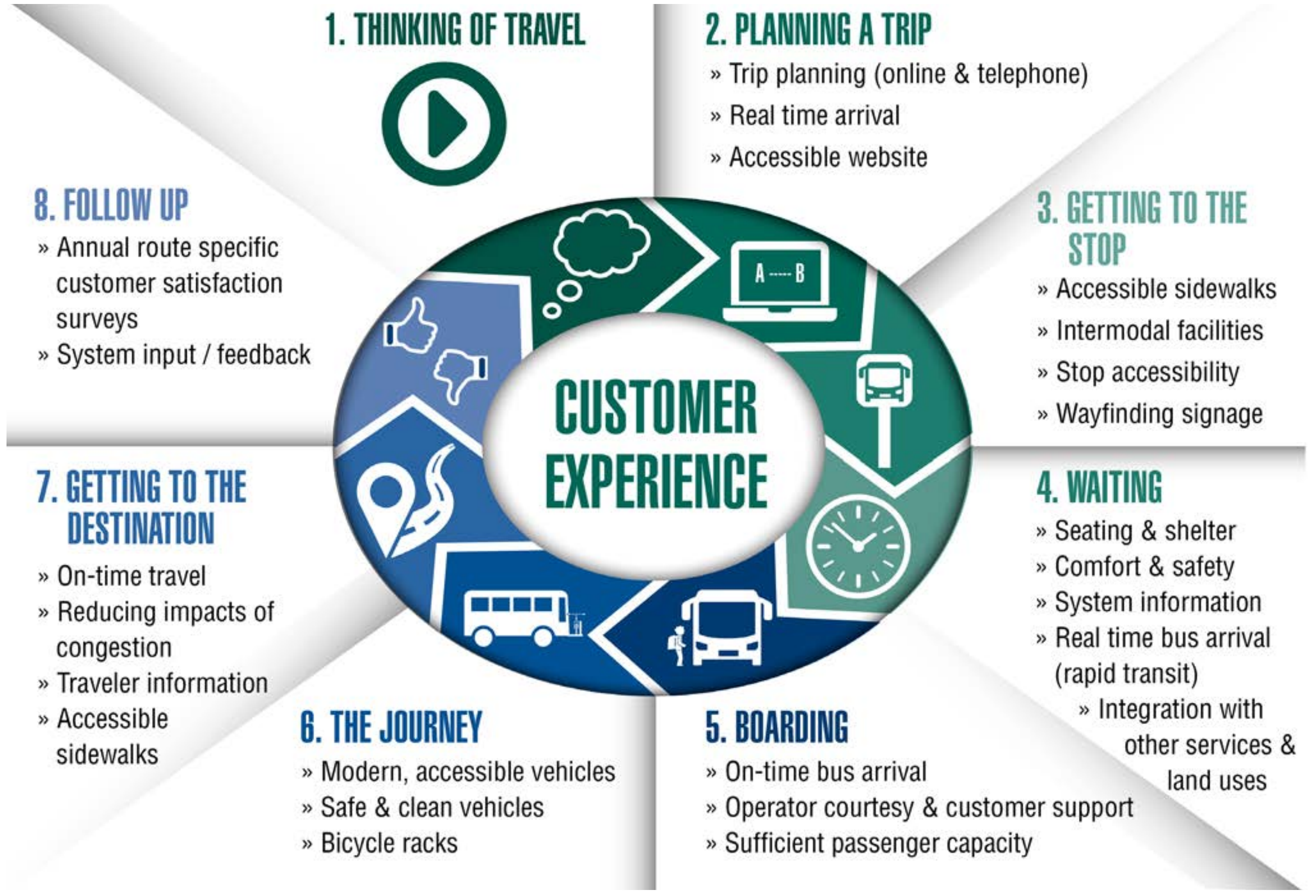


Figure 3.22 - Improving the Customer Experience

B) Improving Service Levels and Quality

In order to increase the attractiveness of transit in Saskatoon, the amount, type and quality of services must be dramatically improved. The following possibilities will allow the City to achieve its overall vision and goals for moving around and supporting sustainable growth.

- **Grow the amount of services available in Saskatoon faster than population growth in order to truly enhance weekday and weekend service levels.** The long-term Transit Plan is framed around thirty-year service levels ultimately being anywhere from 900,000 to 1,000,000 service hours per year, or between 1.8 and 2.0 service hours per capita. To accomplish this level of growth, annual service hours would need to increase by as much as 2.5 to 3.0% per year over the next thirty years. This investment would not only maintain, but increase the levels of service per capita from today in order to make transit attractive for a city of half a million people. This level of service is in line with other peer Canadian cities at or nearing the half million population horizon such as Victoria, Winnipeg and Halifax where transit mode shares are higher than Saskatoon.

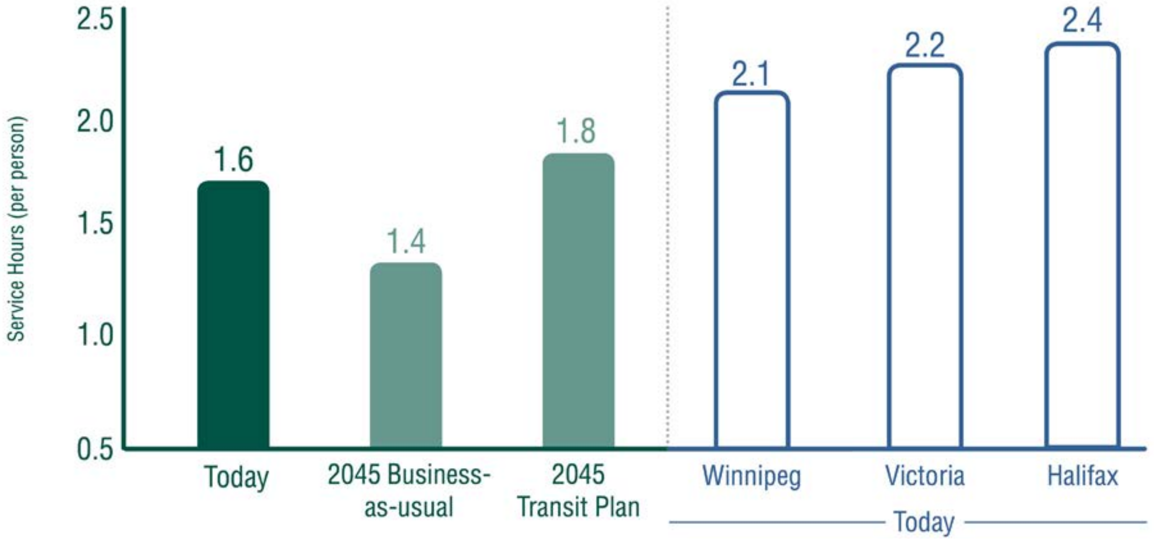


Figure 3.23 - Comparison of Annual Service Hours
Source: CUTA 2013 Factbook

3.0 TRANSIT

- **Increase the range of services to better suit varying needs.** An attractive transit system in Saskatoon begins with the concept of a broader range of services—designed to support different travel and customer needs. Some services must be direct and fast in order to meet customer needs—particularly longer distance trips. Other services are needed to provide frequent and reliable transit service along major corridors in the city and to connect to key areas. Some services are needed to support everyday and infrequent travel such as shopping and appointments, while other services are needed to support longer distance travel between communities in the city.

  For these differing customer needs, a broader range of services are required, as described in **Table 3.04**. Recognizing the relationship between travel and land use, the more frequent and direct services typically require a higher scale and density of development, as well as a greater mixture of land uses to make them economically possible.

SERVICE OR CORRIDOR TYPE	WHAT DOES IT DO?	VEHICLE TYPE	FREQUENT	DIRECT	FAST	RELIABLE	COVERAGE
Rapid Transit Corridors	Dedicated Bus Lanes & Stations. Supports Frequent & Conventional Transit Services		✔	✔	✔	✔	
Frequent Transit	Connects higher demand areas.		✔	✔	✔	✔	✔
Conventional Transit	Connects neighbourhoods.					✔	✔
Community Shuttle	Connects low demand outer areas to main corridors.					✔	✔
Commuter Service	Connects with surrounding communities.			✔		✔	✔

Table 3.04 - Broader Range of Transit Serving Different Customer Needs

- **Shift the structure of the transit system from a hub-and-spoke system designed to only serve University and Downtown travel to a grid system where other destinations can also be made convenient by transit.** Consistent with most cities, Saskatoon's transit system is designed to connect the suburban development areas with the Downtown and University. The 23rd Street Downtown terminal is the system's primary terminal, and is a transfer point in the system where most routes connect every 15 or 30 minutes. The existing structure of service will evolve toward a grid system of services along streets where more areas are served with attractive transit and services can be more direct for the majority of passengers.

- **Direct most services to the largest transit markets.** Providing higher quality service for larger potential transit markets, and managing the amount of service in lower demand areas is essential for transit to be successful. Instead of providing equal transit service everywhere, it is recommended that steps be taken now to adjust service frequency, directness and hours of operation during both weekdays and weekends so more resources can be invested where they have more impact. This will result in some areas of the city seeing more attractive service while other areas with limited ridership may see less service (see **Figure 3.24** below).

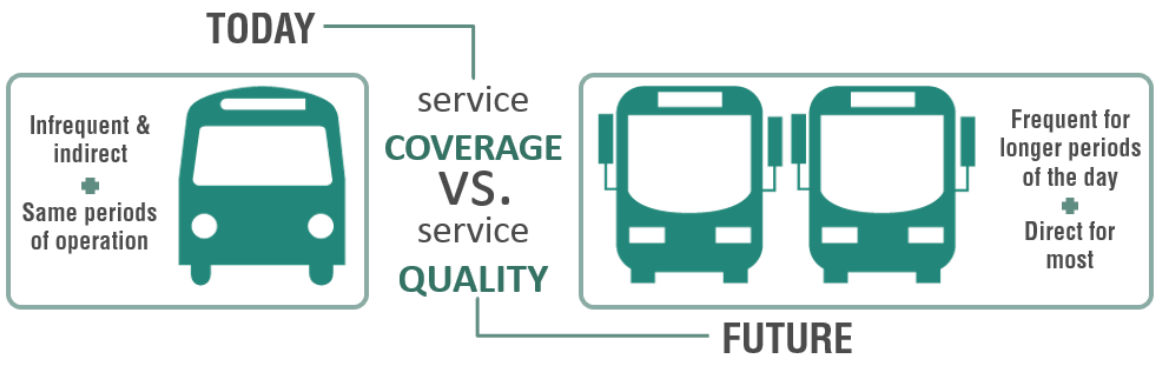


Figure 3.24 - Service Coverage vs Service Quality Design

C) Transit Priority Treatments

Improved speed and reliability can make transit travel more competitive with automobile travel and attract more passengers. Through the implementation of transit priority treatments (See **Figure 3.25**, below), passengers are likely to move faster than cars during periods of congestion. Additionally, buses will arrive and depart at scheduled times. This means that passengers will arrive at their destinations on time. For the operator, transit priority measures to bypass areas of congestion can improve operating speeds and increase reliability, thus reducing 'bunching' of buses and imbalanced headways. As a result, fewer buses are required to provide the same frequency of service on a given route. Alternatively, the same number of buses could be used to provide more frequent service along major corridors.

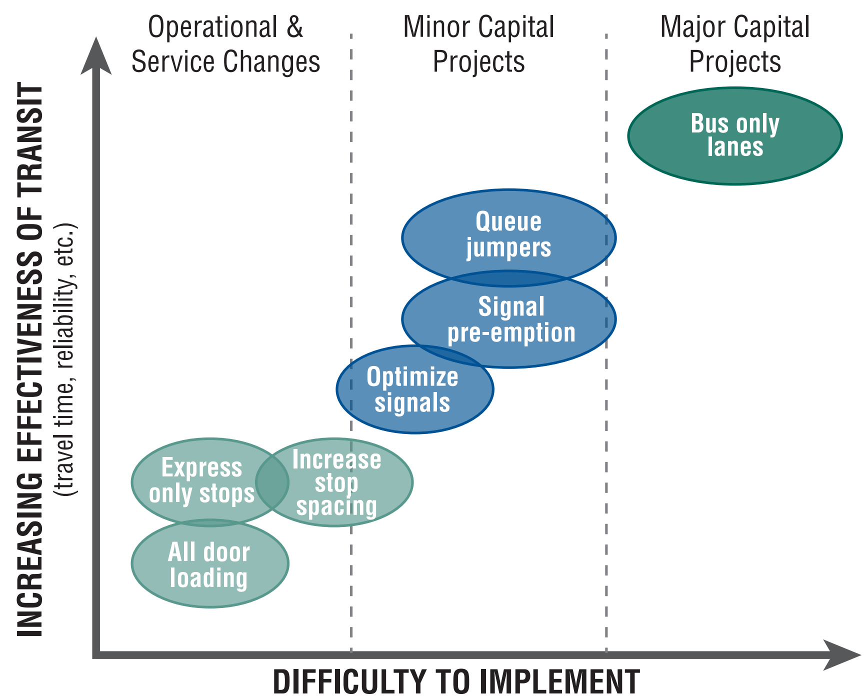


Figure 3.25 - Example Transit Priority Measures

The benefits of reallocating or providing additional space for buses must be weighed against the impacts and with community engagement to build awareness of the trade-offs to keep transit moving.

Through service planning and design, ongoing improvements to the customer experience and efficiency of the system can be made through operational changes such as by simply increasing stop distance and managing boarding and alighting activities. In some cases where sufficient ridership and services are provided, more active measures that include a wide range of traffic signal based measures can be used (e.g. transit biased signal progression, provision of transit specific signal phases, and traffic signal phase modification based on transit needs (TSP)). In other corridors, where service and ridership is significant and rapid transit services are envisioned, passive measures may be considered, such as: enhancements targeted at all modes and that also result in transit improvements (e.g. widening of roadways); provision of intersection queue jumpers; and, regulatory exemptions (e.g. exemption from turn restrictions or other prohibitions). Work to review such opportunities should be undertaken in partnership with transportation, public works, and roadways groups at the City.

D) Transit Supportive Infrastructure and Programs

A number of critical transit supportive features are required to achieve Saskatoon's goals for Moving Around. These features include park-and-ride lots, transit stations, conversion of bus terminals for rapid transit, bus fleet replacement, improvements to transit stop accessibility and comfort, and community outreach along with staff/customer training.

3.5 Transit Plan

This section of the report describes the primary features of the long-term Transit Plan that includes an enhanced customer experience, improved transit services and facilities as well as the provision of Bus Rapid Transit.

3.5.1 Improving the Customer Experience

Community input and feedback on the directions for the Growth Plan highlight the need for a holistic approach to improving the transit customer experience – from the point that customers are considering and planning a trip to the time they arrive at their destination, and also including any follow-up that may be required. Consistent with other service-based industries, transit must be a more customer focused service where the experience at each stage of the journey progresses with relative ease and comfort for people of all ages and levels of mobility. When considering or planning a trip, customers not familiar with the transit system must be able to easily access information on which bus to take, and the scheduled departure and arrival times. During the journey, customers should be able to comfortably walk, bike or drive to accessible bus stops and terminals that offer attractive and safe facilities at the busiest locations. Once the bus arrives, customers of all mobility levels must be able to easily board the bus and the vehicle should be clean, comfortable and safe. In all cases, information should be available on-board for customers, and drivers should be trained to deal with the many needs of passengers.

A) Real Time Bus Arrivals

Saskatoon Transit has recently equipped their fleet with internet-enabled GPS units, which enhance the rider experience by allowing transit users to monitor the location of buses in real-time. As shown in **Figure 3.26,** customers now have the information to monitor the precise location of their bus, which empowers them to choose when best to venture to the bus stop. Minimizing uncertainty and wait-times at stops can be particularly helpful during the winter. In addition, GPS units power the updated web-based trip planning application, ensuring customers are routed in the most efficient manner possible.

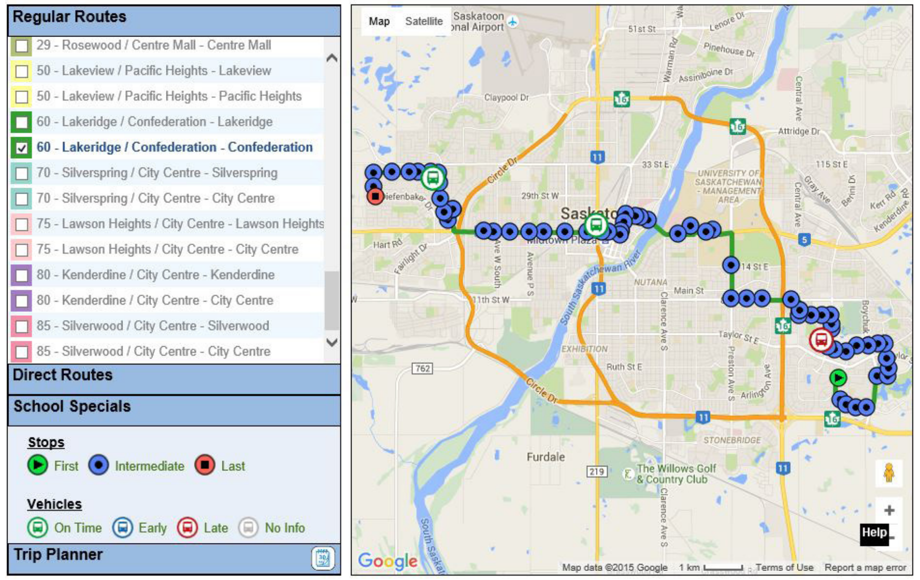


Figure 3.26 - Saskatoon Transit's New Real Time Bus Map

Real-time scheduling and bus arrivals are now also available on Google Maps, which provides a multi-modal, globally standardized platform for trip directions at the stroke of a mouse or swipe of a finger.

Recommended Actions:

- To best leverage the efficiency of real time bus arrivals for customers, new fleet should be outfitted with GPS units.
- Additionally, it is recommended that all future rapid transit stations and other busy stops in the system be equipped with digital displays notifying customers of real-time arrivals for the next bus.

These customer enhancements will require ongoing maintenance and upgrades once installed throughout the system.

B) Mobile App

Mobile apps complement the City's Real Time Bus Arrivals by providing much of the same information in an easy to interpret format suitable for Smart Phones. While an official Saskatoon Transit mobile app has not yet been created, several free third party mobile apps are available for download that provide real time scheduling and bus location information on the go for customers. Third party mobile apps use routing and real-time GPS information provided by Saskatoon Transit to map the precise location of vehicles on a route-by-route basis. This information is valuable for trip making decisions such as routing choices, when to leave the house, and how long one can expect to wait at a stop.

Recommended Action:

- That the City continue to provide routing, stop, and GPS location data to third party developers on a go-forward basis.

C) Ongoing Website Upgrades

The City's website has increasingly become the primary method by which existing and potential customers obtain most of their information. As the City's population grows, so too will the number of people with mobility and cognitive challenges that make use of the transit system. As such, Saskatoon Transit's website will need to adapt to be accessible to all customers.

Recommended Actions:

- Pursue ongoing website development and expansion using Web Accessibility Guidelines based on internationally accepted practices to support people with a range of disabilities.
- Consider other opportunities to enhance accessibility of the website for all transit customers include further enhancements to the trip planner, additional accessibility information, video clips of key transit nodes (such as at planned BRT stations and terminals), and the provision of new functions such as the use of speech-enabled web content software.
- As the city grows and more languages are needed, an on-line translator as well as specific instructions to call Customer Information for those needing further assistance in other languages may be required.

As much as possible, these and other changes to the website should be done with the input and feedback of customers through various forms of market research.

D) Universally Accessible Bus Stops

In recent years, the accessibility of Saskatoon's transit system has been vastly improved through the provision of low-floor accessible buses and specialized transit service. However, while some bus stops are designed to accommodate passengers using mobility aids, such as wheelchairs and scooters, the current system is not truly universally accessible, as transit users with other disabilities are not fully accommodated. Universal accessibility implies that services are designed to accommodate persons with various degrees of mobility, visual, hearing, and cognitive impairments. This includes passengers who, though not using any mobility aids, may not be able to walk long distances or stand for long periods of time without difficulty.

In the future, there will be increasing demand for universally accessible bus stops. Our population is aging and, because the disability rate increases with age (over 40% of Canadians 65 and over have some form of disability), it is anticipated that the proportion of our population with disabilities will grow over time. Ultimately, universally accessible transit facilities will accommodate the needs of all customers better.

Recommended Action:

- That the City of Saskatoon engage in a process of updating its bus stop standards to promote universal accessibility. These standards would be intended for use by engineers and other professionals and parties involved in the design and building of bus stops and other accessible infrastructure throughout Saskatoon.

E) Access to Transit

Access to and from transit was noted by the public as one of the most significant areas that requires more attention moving forward. In winter conditions, access to transit becomes even more difficult. Snow and ice obstruct bus stops and sidewalks, making them at times impassable for all but the most able.

Due to the nature of Saskatoon's climate, choppy ice and compact snow can remain on city sidewalks through the winter, making many sidewalks impassable for those with mobility impairments and generally difficult for all customers for several months a year. This situation is exacerbated by a policy that requires landowners and tenants to clear snow and ice from sidewalks adjacent to their properties, resulting in an inconsistent quality of sidewalk clearance. Saskatoon's winter conditions also increase the discomfort of waiting for buses on dark and cold days.

Recommended Action:

- Ensure all frequent transit corridors have wide accessible sidewalks on both sides of the street within 400 metres of a future rapid transit bus stop. Sidewalks along main corridors should be well-lit. Where possible, separated sidewalks may be preferred along high volume/fast moving arterial corridors to improve pedestrian comfort (safer spacing and reduced incidence of splashing from vehicles during rains / snow melts).
- Ensure all sidewalks along frequent transit corridors have curb cuts that can facilitate wheelchair access.
- Ensure safe and frequent road crossing opportunities across major transit corridors.

- **Shift the responsibility for snow and ice clearing from private landowners and tenants to the City, specifically within the Urban Core and University District and along Rapid Transit and frequent transit corridors. This will allow for a consistent level of snow and ice clearance along all City sidewalks in heavy-use transit areas, putting sidewalk snow clearance on-par with roadway snow clearance.**
- **Work towards universal accessibility at all bus stops (as per above) with a focus on Rapid Transit and Frequent Transit Corridors as well as stops within the Downtown core.**
- **Implement heated and well-lit shelters at all stations along Rapid Transit corridors; consider installing heated shelters at primary bus stops along frequent transit routes.**
- **Ensure new commercial and higher density residential developments are oriented to rapid transit stops (not parking lots), making transit the most convenient mode to access these new developments.**
- **Ensure easy penetration into neighbourhoods from transit stops, with preference for grid or modified grid street networks in newly developing areas.**
- **Build a parallel cycling network that connects neighbourhoods and rapid transit stops to each other; ensure the provision of bike racks or other cycling facilities at rapid transit stations to facilitate intermodal travel.**

F) Community Outreach

The needs of existing and potential customers vary from simply getting the right information through to assistance boarding and leaving the transit vehicle. For many people, limited assistance or even poor customer service can be a barrier to using transit. This is particularly true for people with cognitive or physical disabilities and it can place added pressures on specialized service (i.e. Access Transit).

Training for customers and staff that work with people of varying needs are essential to increase comfort and accessibility of transit for everyone. Community outreach programs will serve to increase awareness of system accessibility and the customer support that is available, and will be used to address individual circumstances. This form of customer outreach and support is considered a "high touch" approach and requires trained staff resources. As such, outreach programs may be targeted toward specific groups that work with youth, seniors as well as people with disabilities.

Recommended Action:

- **In most cases, the City will want to provide hands-on training (i.e. train-the-trainer) so that community leaders can assist potential customers on a routine basis—school programs, seniors groups and organizations that work with people with disabilities. To be effective, most customer training and community outreach initiatives should be piloted, evaluated and modified as necessary to increase accessibility of the conventional transit system.**

G) Customer Service Staff & Training

To increase accessibility of the transit system, the volume and complexity of customer needs must be accommodated and supported by staff through enhanced customer service. Beyond having full time staff to provide customer services, planning for and working with customers with disabilities requires individuals with special training and guidance.

Recommended Actions:

- **Provide basic level training for all staff. This training could emphasize that individuals with disabilities are a diverse group of customers using the transit system. Training could address how fears and prejudices can result in misinformed assumptions, and may alter attitudes and perceptions that shape behaviours.**
- **Provide expanded opportunities for passenger assistance training and refresher courses for those working with disabled customers on a day-to-day basis. This form of training could essentially involve more details about various disabilities and how to provide direct assistance.**

H) Customer Satisfaction Surveys

Customers riding the bus today are perhaps the most informed about the transit experience and can become detractors for others to use transit when their experience is poor. Customer satisfaction surveys should be done for the entire system or on a route-by-route basis in order to get a broad understanding of all people using the system.

Recommended Action:

- **Implement customer satisfaction surveys to generally monitor and maintain a positive experience for existing transit customers and to make changes where customer satisfaction is below reasonable levels**

Based on experience of other transit systems, there are various sample customer experience metrics that may be monitored, including:

- Safety & Security (safety at stops, stations and on board vehicles);
- Reliability & Frequency (ability to meet departure times, frequency of services and reliability of card readers);
- Comfort (cleanliness, availability of seats, temperature on board, and facilities at stops and stations);
- Ease of Use (using and understanding ticketing including transferring between routes, ease of finding stops);
- Proximity (convenience of available routes, distances from stops and stations);
- Efficiency (door-to-door travel time, connections with other services and avoidance of congestion).
- Information (ability to understand on board and at-station information, timetables, maps and journey planning information);
- Accessibility (ease of getting on and off the platform, and on and off the vehicles);Staff (knowledge, conduct, presentation and helpfulness of staff);
- Affordability (cost of tickets and benefits of not having to pay for parking); and,
- Service Reliability / Adherence.

3.5.2 Service Plan

A) Increase Service Hours

If Saskatoon maintains the current rates of investment, transit service will not keep pace with the City's rapid population growth. Today, almost 400,000 transit service hours are provided in Saskatoon, resulting in about 1.6 service hours per capita. But with lagging investment in transit, overall service hours per capita will decline over the next thirty years to 1.4 service hours per capita. Although the overall travel demand is expected to grow, the proportion of people using transit will decline without a corresponding increase in service levels.

The Transit Plan requires additional service hours beyond the recent annual increases of 1.8% per year. The Transit Plan is framed around thirty-year service levels ultimately being anywhere from 900,000 to 1,000,000 service hours per year, or between 1.8 and 2.0 service hours per capita. This investment would not only maintain, but also increase the levels of service per capita from today in order to make transit attractive for a city of half a million people. This level of service is in line with other peer Canadian cities at or nearing the half million population horizon (e.g. Victoria, Winnipeg and Halifax), where transit mode shares are higher than Saskatoon.

Recommended Action:

- **To accomplish this level of growth, annual service hours would need to increase by as much as 2.5 to 3.0% per year over the next thirty years, up from today's 1.8% per year rate of growth, which does not keep pace with Saskatoon's population growth rate of 2.5% as illustrated below in Figure 3.27.**

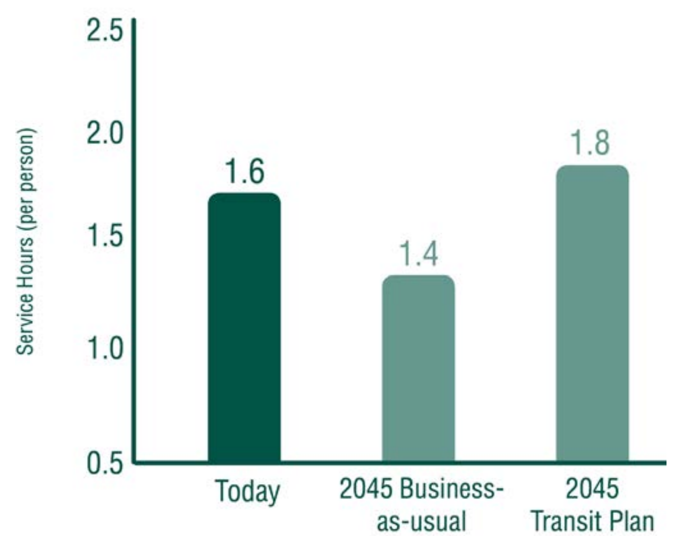


Figure 3.27 - Plan for Annual Service Hours Changes and Comparisons

The increase in transit services must be directed toward the largest customer markets today and for the future travel patterns in Saskatoon. Considering the planned growth within the city and projected ridership patterns, the strongest markets for attractive transit services are illustrated in **Figure 3.28.**

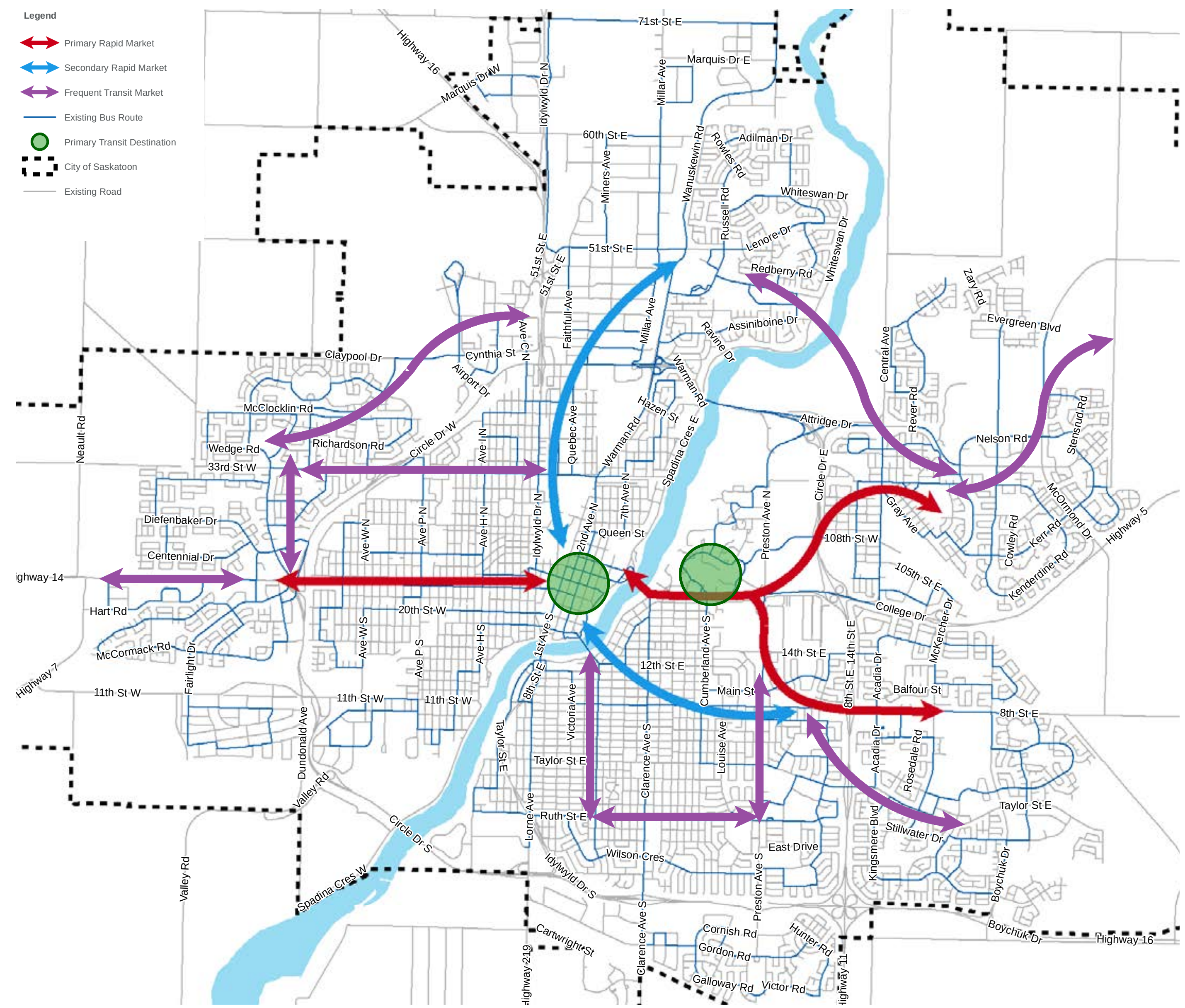


Figure 3.28 - Potential Transit Markets

B) Rapid Transit Corridors

Ultimately, rapid transit is intended to shape and support growth in addition to providing an attractive transportation choice. Rapid transit stations and corridors are more than a ‘transportation utility.’ They should be designed with the intent to create vibrant urban environments that are attractive and comfortable for people. Rapid transit systems are also unique from the rest of the transit system in that they are identifiable corridors with mostly or entirely separate travel lanes, enhanced transit stations for the comfort of passengers and real time information. These integrated investments will enhance the customer experience and system operation.

With half a million people, the projected east-west and north-south ridership for the rapid transit corridors can be accommodated using buses in dedicated lanes. Although higher capacity systems such as Light Rail Transit (LRT) may be required to support transit ridership beyond 30 or 40 years, a Bus Rapid Transit (BRT) system allows the city to significantly expand transit services and the system as ridership grows.

Similar to the BRT system in operation in Ottawa as well as what’s being planned for Winnipeg, the rapid transit service will be made up of the combined services from different areas of the city that are directed to specific corridors with dedicated bus lanes or priority treatments for buses at intersections. For Saskatoon, this means increasing the frequency and directness of the DART services and introducing additional east-west and north-south express bus services across the city. With the cumulative frequencies of these interconnected routes, customers could expect a bus at least every 5 to 10 minutes along the BRT corridors during peak periods.

In the long-term, BRT corridors will form the ‘spine’ of the transit system for Saskatoon as illustrated in **Figure 3.29.** Ultimately, the east-west corridors (Red BRT Line) will include approximately 22 kilometres of dedicated bus lanes with 26 stations between Blairmore, University Heights and Holmwood. The Red BRT Line will eventually operate along established corridors where existing and forecast transit customer markets are significant such as along 22nd Street, 3rd Avenue, 25th Street, College Drive, Preston Avenue, and 8th Street. As dedicated lanes are implemented, nearby transit terminals such as the Downtown, University and Confederation terminals will be replaced with on-street stations. In fact, most routes will operate through the downtown area, providing customers with a transferless trip across the city and no wait times in the middle of their journey.

The north-south corridors (Blue BRT Line) will include approximately 12 kilometres between Nutana Suburban Centre and Lawson Heights. The projected ridership and service levels would support transit priority treatments in order to bypass areas of recurring congestion such as signalized intersections as described later in the Plan. The Blue BRT Line includes corridors such as 8th Street, Broadway Avenue, 3rd Avenue, 25th Street, Idylwyld Drive, 33rd Street, and Warman Road.

Recommended Actions:

- **Increase the frequency and directness of the DART services and as demand grows, introduce additional east-west and north-south express bus services across the city**
- **Add service incrementally to establish cumulative frequencies on these interconnected routes, where customers could expect a bus at least every 5 to 10 minutes along the corridors during peak periods.**

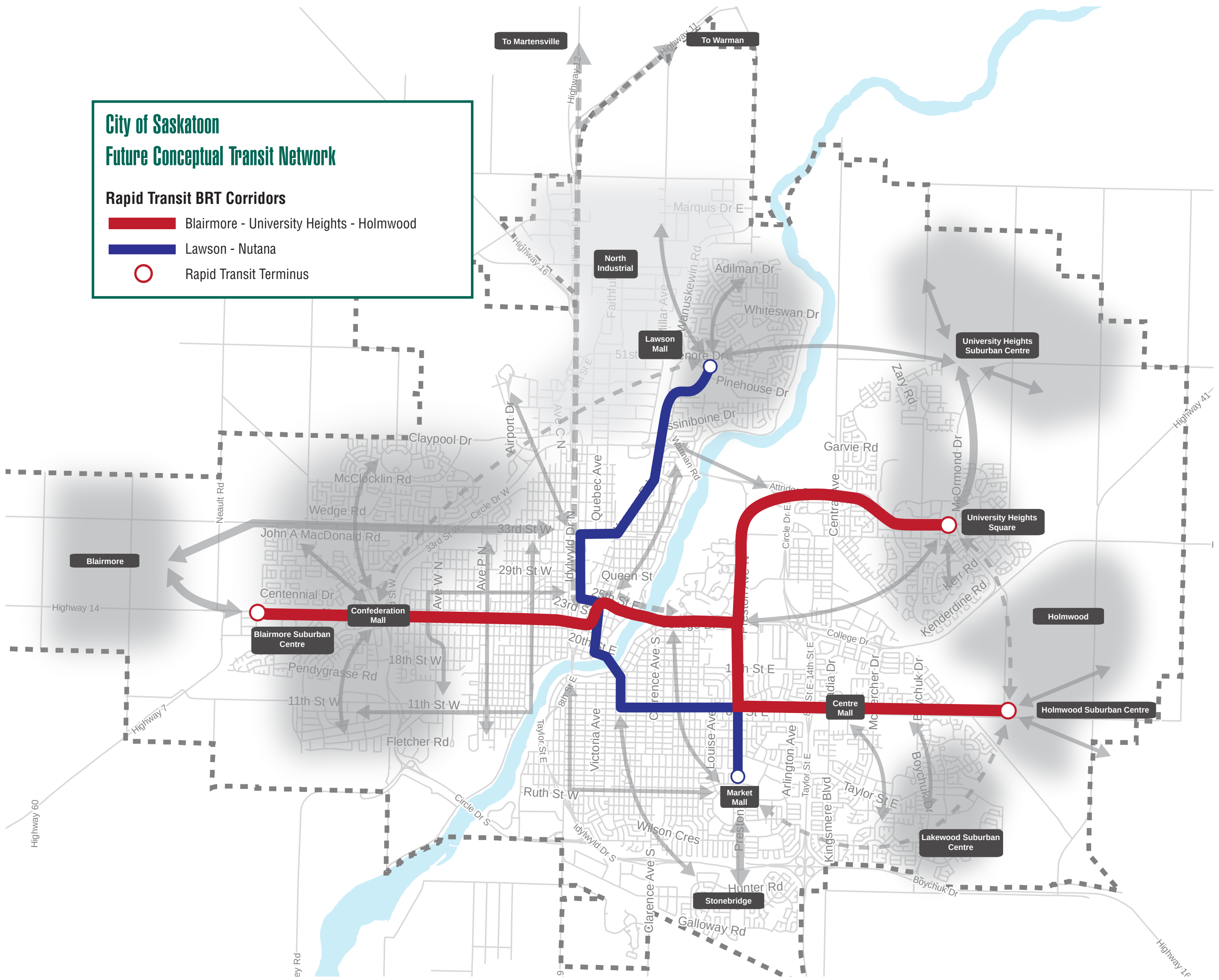


Figure 3.29 - Recommended Red & Blue BRT Lines

C) Frequent Transit Corridors

Beyond the BRT corridors, Frequent Transit Corridors (FTC) will also serve as identifiable parts of the city's transit system. **Figure 3.30** conceptually illustrates the FTCs planned for the city in the long-term. Ultimately, buses will operate at least every 15 minutes along FTCs, for 15 hours per day, 7 days a week. With greater awareness of the system and corridors, customers boarding transit along the FTCs can rely on an attractive bus service. With growing north-south travel from Stonebridge and planned growth in Blairmore, University Heights and Holmwood, FTCs can be created along corridors such as 22nd Street, 33rd Street, Preston Avenue and McOrmond Drive. Similar to BRT corridors, transit services will be directed to FTCs in order to create the minimum desired frequencies and to shape land use patterns along the corridors. FTCs should be equipped with comfortable stops with shelters and passenger information where transit ridership and boardings are highest.

Recommended Actions:

- **Build service along corridors to create minimum desired frequencies. Ultimately, buses will operate at least every 15 minutes along FTCs, for 15 hours per day, 7 days a week.**
- **Equip FTCs with passenger amenities where transit ridership and boardings are highest.**

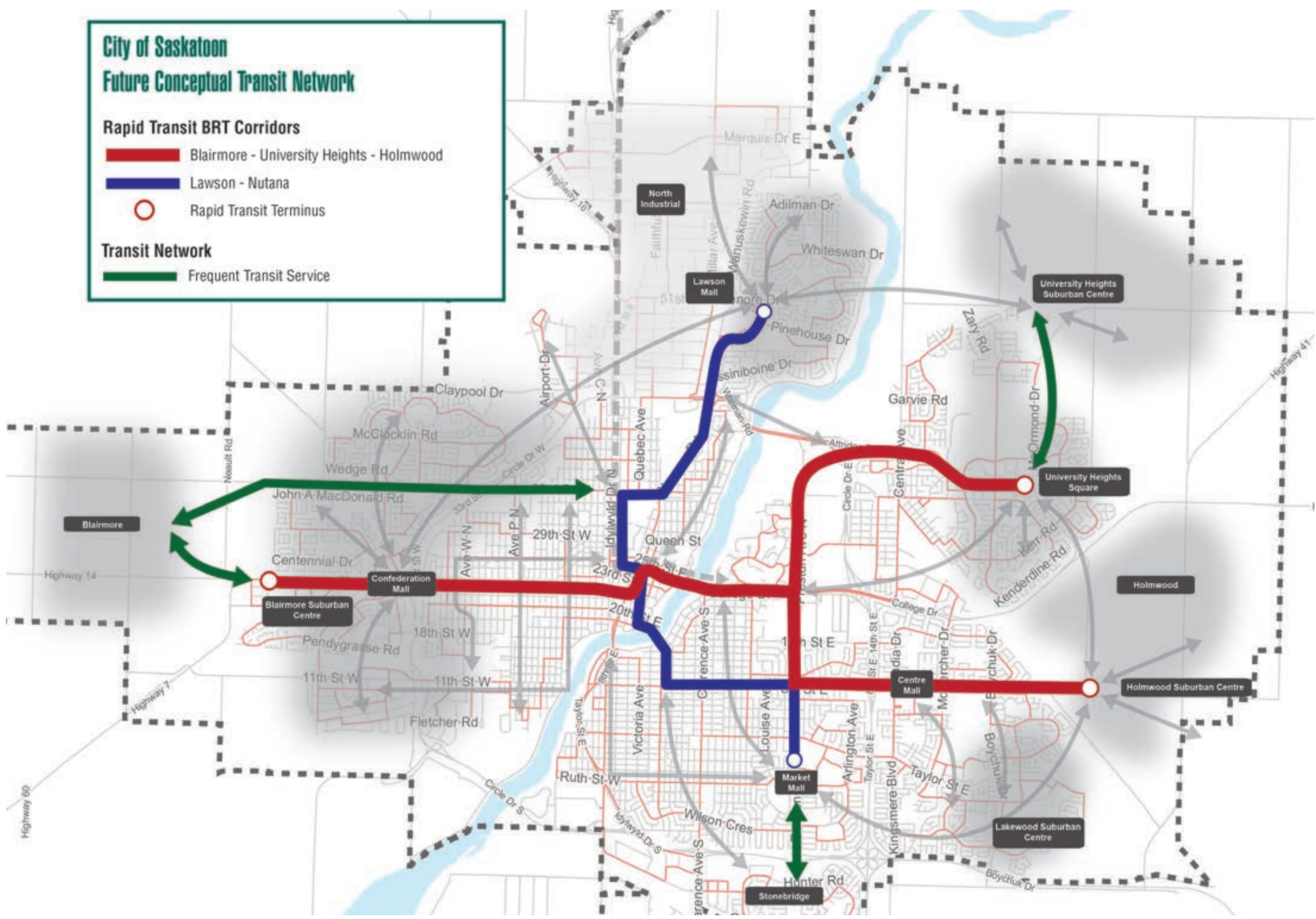


Figure 3.30 - Recommended Frequent Transit Corridor Structure

D) Conventional Transit Services (including Suburban Centre Services)

Conventional transit services will form the largest part of the transit network in the city. Within the core areas of the city, the 'grid structure' of conventional services along several major roadways will enhance access to BRT Lines and FTCs where customers can transfer at stations and comfortable stops. Conventional services will also be designed to support local trip making with more direct and frequent access to other areas of the city not well served by transit today, as well as providing direct connections between suburban centres and the North Industrial Area. With these new transit connections inside the core and between suburban areas, transit travel times will become much more reasonable and attractive to enhance the customer experience. In order to be attractive, peak and off-peak services should be at least every 15 minutes and 30 minutes respectively. **Figure 3.31** illustrates the conceptual network of conventional transit services proposed for Saskatoon.

Recommended Action:

- **Transition to a 'grid-like structure' of conventional services along frequent transit corridor along several major roadways within the core area of the city, to enhance access to BRT Lines and FTCs where customers can transfer at stations and comfortable stops.**
- **In order to be attractive, peak and off- peak services should be at least every 15 minutes and 30 minutes respectively.**

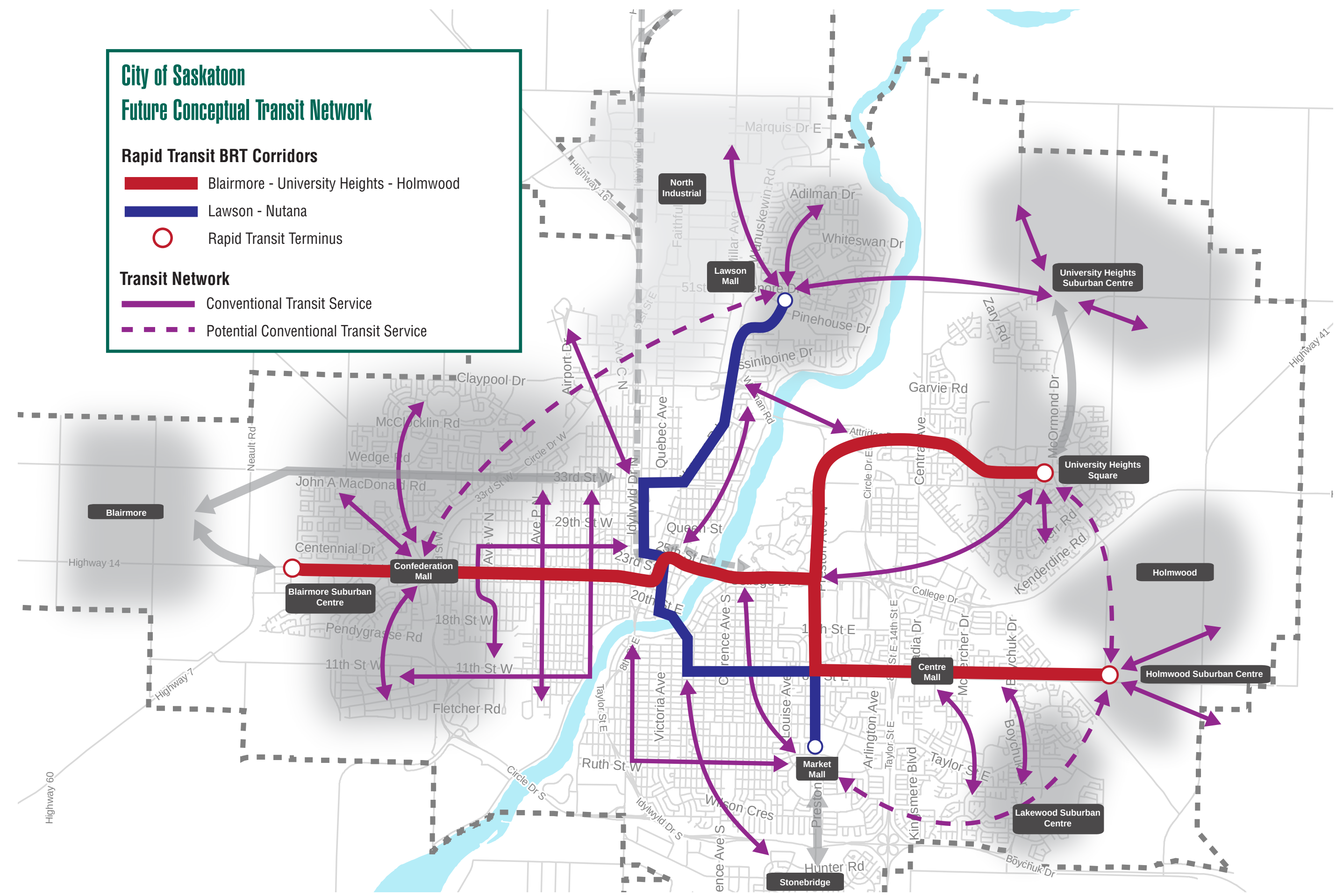


Figure 3.31 - Recommended Conventional Transit Service Structure

E) Community Shuttle / Flexible Service Areas

Travel to, from, and within expanding areas such as Holmwood, University Heights and even the North Industrial Area is expected to grow significantly in the long-term. Rapid transit, FTCs and conventional services will be designed to provide more direct and frequent services between the established and growing areas of the city. Within the lower density suburban areas of the city, however, it can be difficult to make transit attractive to serve local trip making.

In order to maintain reasonable coverage and access to transit, community shuttle or flexible transit services may provide access for local area travel and to other parts of the transit system. Smaller buses can operate on neighbourhood streets to provide greater coverage and easier access to transit, with minimal impact on the community. In some areas—such as the North Industrial Area—flexible community shuttle services may be required to provide easy connections to the Lawson Heights BRT station during much of the day. **Figure 3.32** illustrates the community shuttle service areas where rapid transit, FTCs and conventional services may not provide sufficient coverage and where customers may benefit from additional transit coverage.

Recommended Action:

- **Identify form of community shuttle and flexible service solutions to better serve lower density areas with lower travel demand, while providing local access and access to more frequent services.**

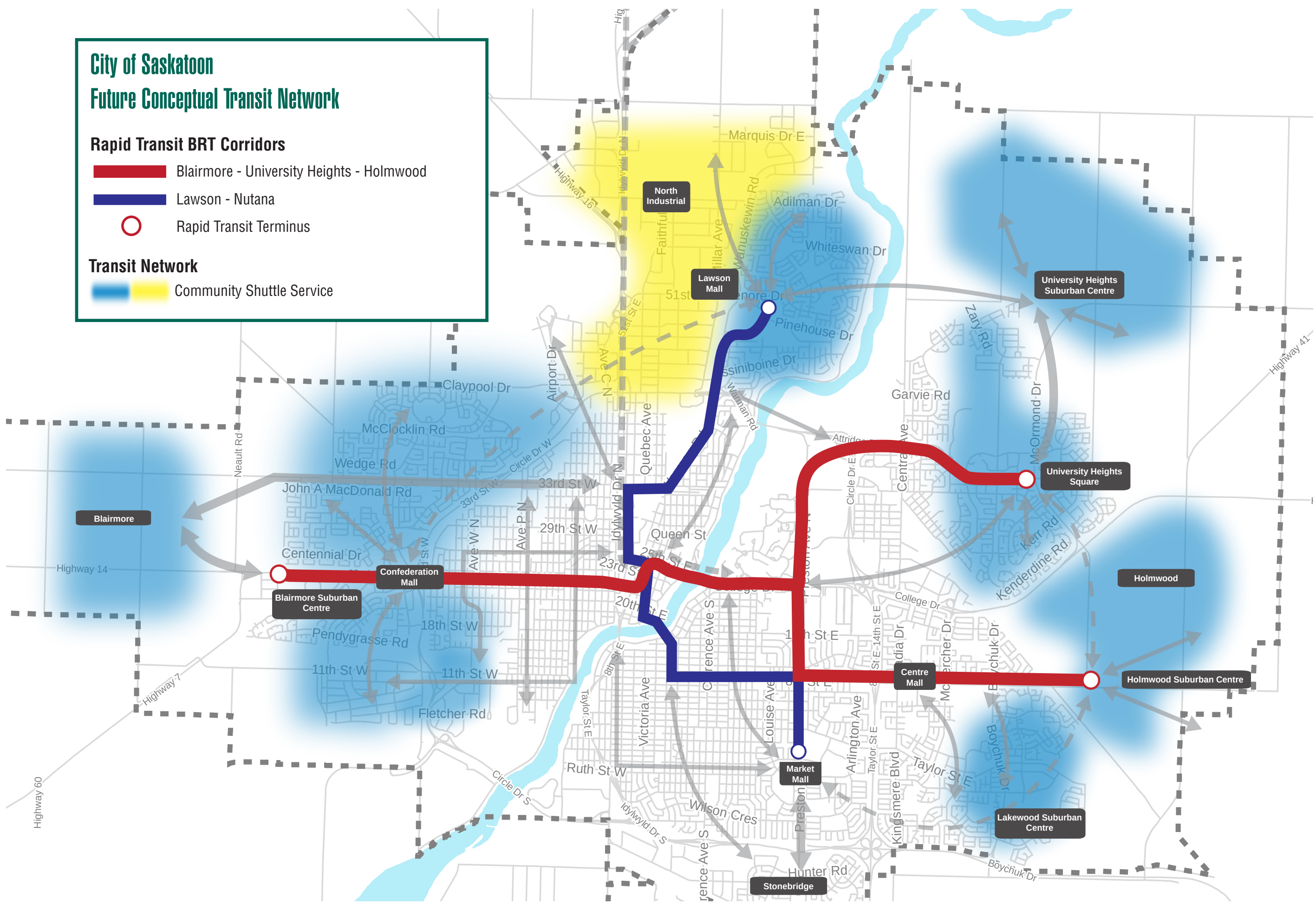


Figure 3.32 - Recommended Community Shuttle Areas

F) Commuter Services

As the city and surrounding communities continue to grow, so too will regional travel. Commuter Services in Saskatoon can provide connections between surrounding areas such as Warman / Martensville and primary destinations in the city such as the North Industrial area, Downtown and the University. Although Commuter Services are included in the long-term Transit Plan, they would be financially supported by surrounding municipalities and possibly contracted to Saskatoon Transit or alternatively a private operator. These services should be supported with strategically located park-and-ride facilities inside the outlying communities in order to intercept driving trips closer to where they begin. **Figure 3.33** illustrates the conceptual connections for commuter services entering the city from Martensville and Warman.

There is no recommendation at this time.

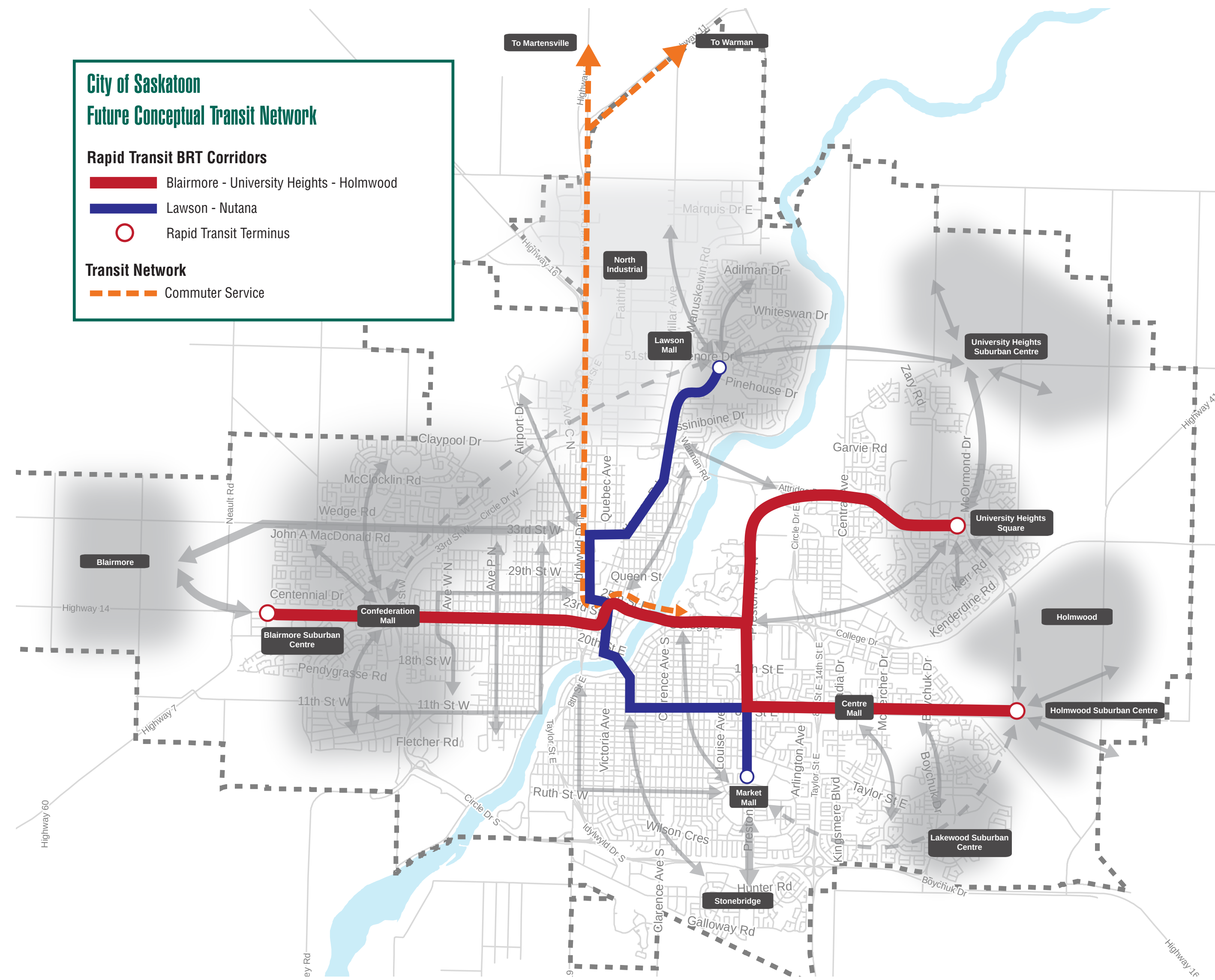


Figure 3.33 - Recommended Commuter Services (Martensville & Warman)

The long-term Transit Plan for Saskatoon is illustrated in **Figure 3.34.**

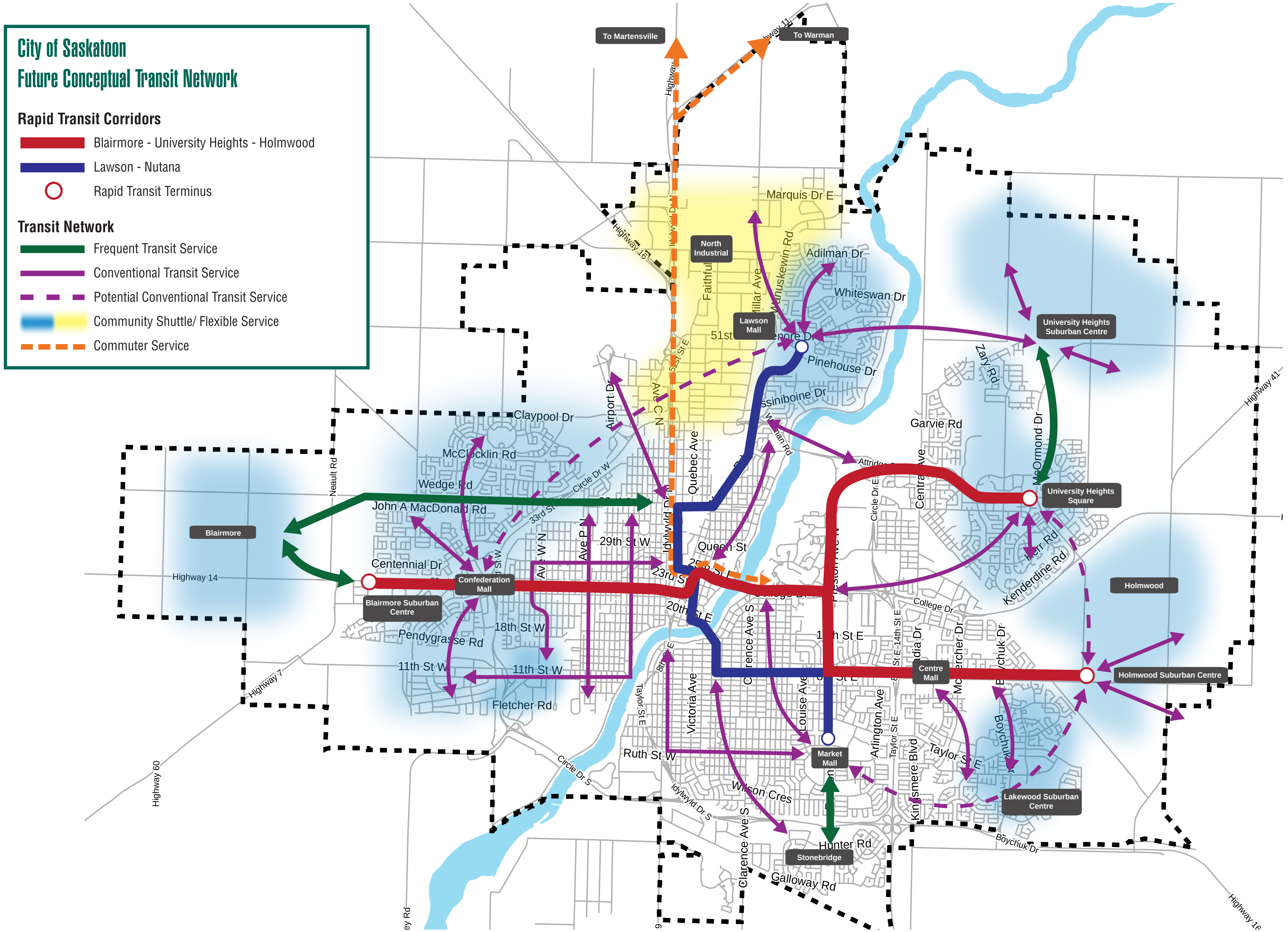


Figure 3.34 - Conceptual Long-term Transit Plan

3.0 TRANSIT

3.5.3 Support Facilities

A) Bus Fleet Replacement

Over the past number of years, the City has purchased used buses from other transit agencies. This has allowed the City to put more buses into the system at reduced capital costs. This has also resulted in Saskatoon having a comparatively much older fleet than other peer communities in the country. Comfortable and fully accessible vehicles are essential to improving the attractiveness of transit going forward. A Fleet Renewal Strategy was adopted by the City in 2015.

Recommended Action:

- **Continue to implement the Fleet Renewal Strategy to maintain a safe and reliable fleet, with an average fleet age meeting the industry average.**

B) Bus Fleet Expansion

The ten year implementation plan requires approximately 126,000 additional service hours beyond current levels. If the current fleet usage ratio is maintained, 52 additional buses will be required to support the ten year service expansion, or about five new buses each year. The City should pursue partnerships with senior levels of government to achieve this goal. It should be noted that these costs are estimates only and should not be used for budgeting purposes. Additionally, these costs do not account for additional operating and maintenance costs.

Implementation Timing and Cost

Actions:	Purchase 5 additional buses every year ($600,000 per bus assumed)	**Annual Cost** $3.0 M
Timing:	Annual fleet purchases	
Estimated Cost:	**$30 M ($ 2015)** in capital costs over 10 years	

Table 3.05 - Bus Fleet Expansion Implementation Timing & Cost

Recommended Action:

- **Pursue a fleet expansion strategy to meet the needs of growth and provide additional service hours.**

C) Transit Priority Treatments

Through service planning and design, ongoing improvements to the customer experience and efficiency of the system can be made through operational changes such as by simply increasing stop distance and managing boarding and alighting activities. In some cases where sufficient ridership and services are provided, more active measures that include a wide range of traffic signal based measures can be used (e.g. transit biased signal progression, provision of transit specific signal phases, and traffic signal phase modification based on transit needs (TSP)). In other corridors, where service and ridership is significant and rapid transit services are envisioned, passive measures may be considered, such as: enhancements targeted at all modes and that also result in transit improvements (e.g. widening of roadways); provision of intersection queue jumpers; and, regulatory exemptions (e.g. exemption from turn restrictions or other prohibitions).

Recommended Action:

- **Identify and implement locations for the installation of passive and active transit priority treatments, as required, in order to improve the efficiency of the system and improve the customer experience.**
- **Work to review such opportunities should be undertaken in partnership with transportation, public works, and roadways groups at the City.**

D) Transition from Transit Terminals to BRT Stations

Bus terminals (or Transit Terminals) provide an important interface between the transit customer and the system. The terminals themselves typically accommodate the highest number of buses converging on a specific area and represent the primary starting or transfer points for most transit customers. There are currently six designated transit terminals in Saskatoon: City Centre (23rd Street), University of Saskatchewan (Place Riel), Confederation, Lawson Heights, Market Mall, and Wildwood Centre. Of these six, the City Centre and University (Place Riel) are the most prominent in terms of passenger activity.

While all transit terminals should be accessible and comfortable for passengers transferring from other services, walking or cycling to the terminal, or getting dropped-off, those terminals with the highest boarding activity require the greatest attention in the short-term. The Downtown and Place Riel terminals not only accommodate the largest number of passengers and services, but are also core parts of the Bus Rapid Transit corridor. The following discussion highlights the anticipated needs for the BRT stations that will ultimately replace the City Centre and Place Riel transit terminals.

- **City Centre Transit Terminal to 3rd Avenue Stations**. Today, nearly all transit routes terminate at the central transit terminal on 23rd Street. The terminal is the nexus for all transit services and is designed around a timed-transfer model. Bus routes are designed to arrive and depart the terminal at the same time, to maximize transfer opportunities for system users. While this method has significant advantages, it requires ample space to accommodate buses stopping and laying-over concurrently. 23rd Street between 2nd and 3rd Avenues is the exclusive domain of the transit terminal with no through traffic permitted. Additionally, the transit terminal extends onto 23rd Street west of 2nd Avenue and 3rd Avenue both north and south of 23rd Street.

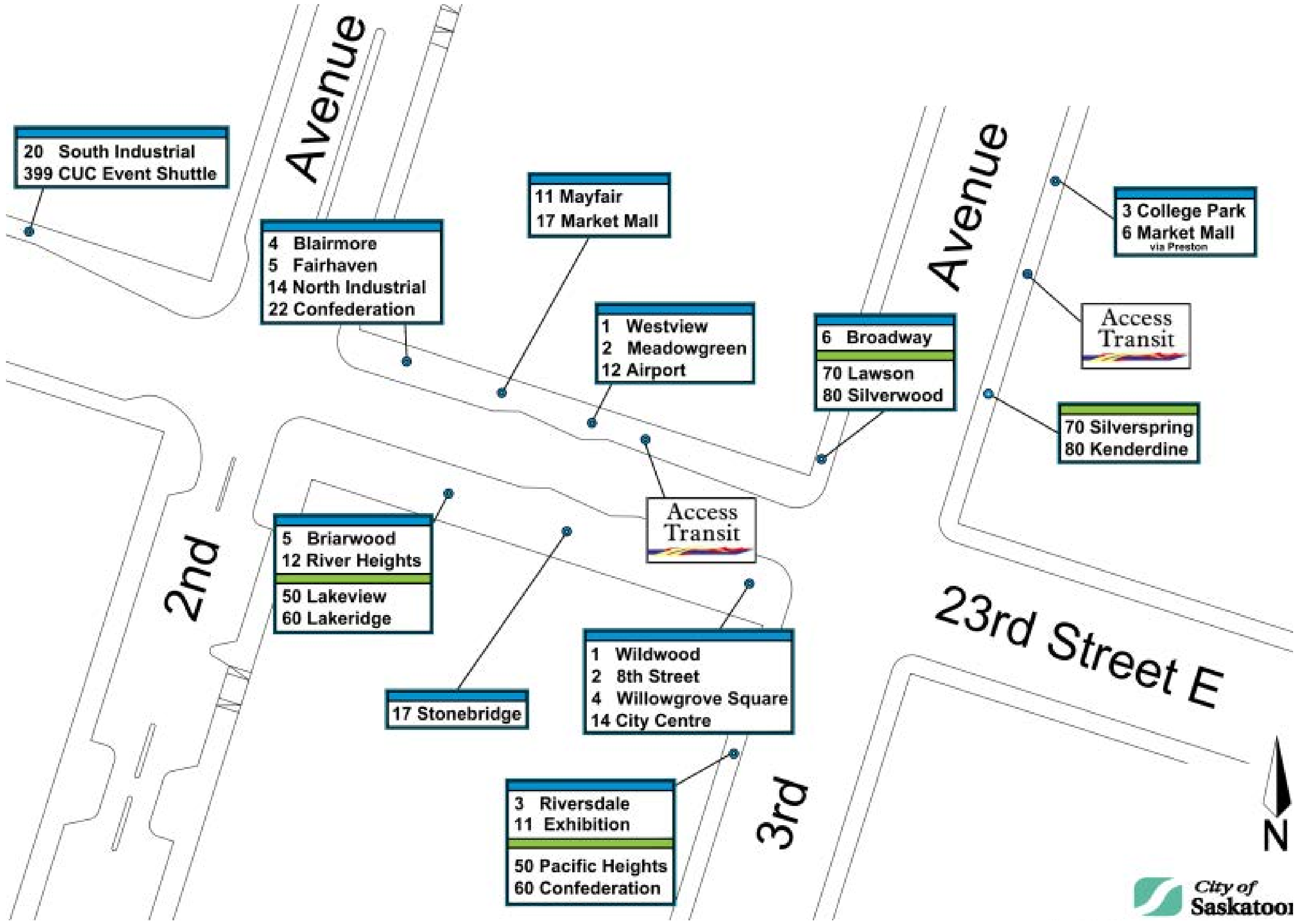


Figure 3.35 - Existing City Centre Transit Terminal

The 3rd Avenue corridor will ultimately host two BRT stations (near 22nd Street and 25th Street) serving both north-south and east-west services across the city. **Figure 3.36** conceptually illustrates three optional configurations for a curb, centre or side running BRT service along the 3rd Avenue corridor. Each station will include amenities such as heated shelters, large platforms for pick-up and drop-off, as well as other critical passenger information. Transit services will be redesigned to allow 3rd Avenue to accommodate all east-west and north-south services directed through the Downtown area. Interlining routes through the Downtown reduces the need for layover curb space for buses. For transit customers, a continuous service without stopover or transfer within the downtown will also increase convenience and travel time.

Recommended Action:

- **Once the timed-transfer model has been transitioned to a headway based model, implement two 3rd Avenue stations to replace the City Centre Transit Terminal on 23rd Street.**

Following this conversion, 23rd Street may potentially be converted to use for general purpose traffic, bicycle facilities and on-street parking.

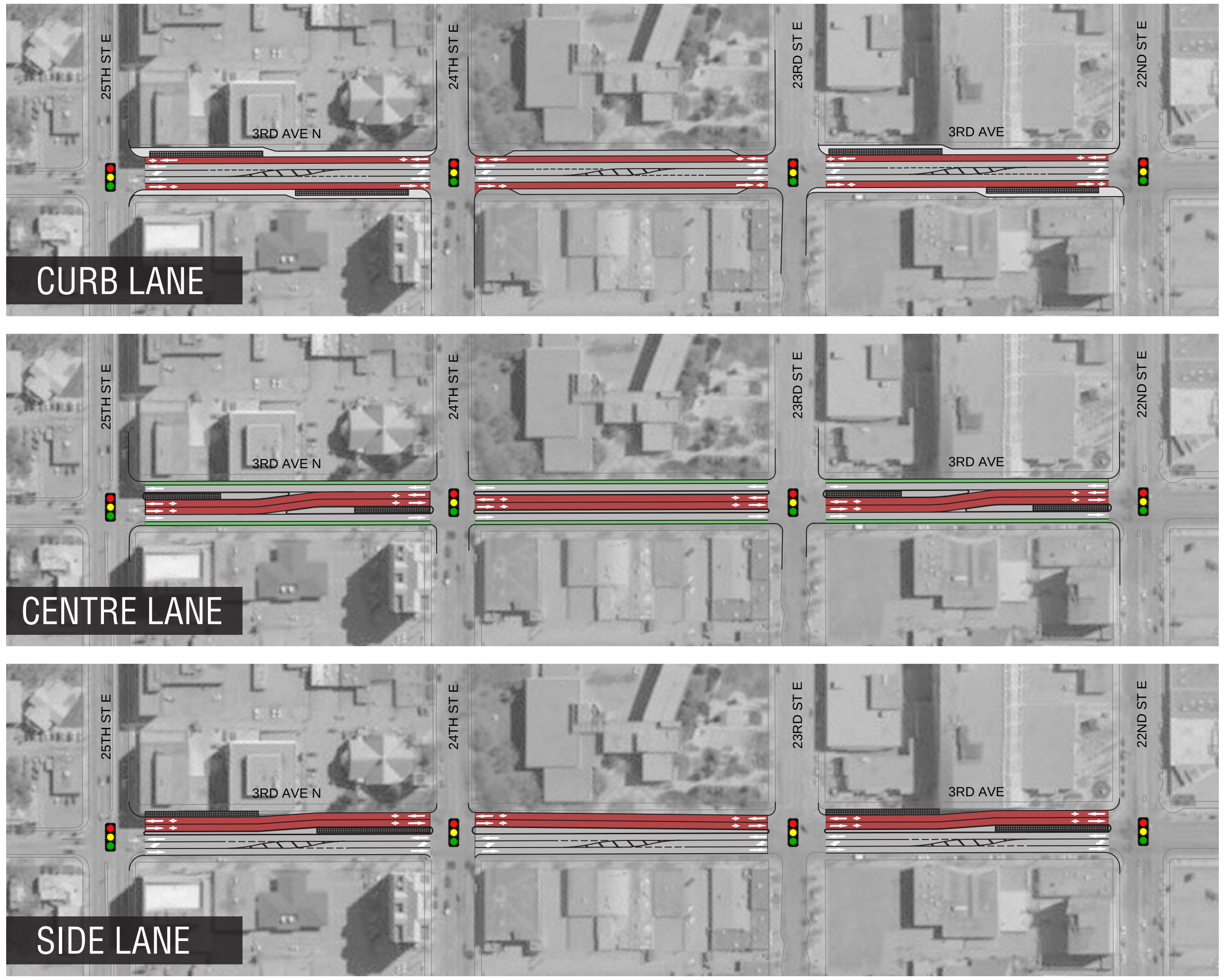


Figure 3.36 - Alternative BRT Configurations for 3rd Avenue

- **Place Riel Transit Terminal to College Drive Stations**. Today, on the eastern side of the city, most transit services leaving or destined to the Downtown are directed through the University. The Place Riel terminal is located off-line and requires a short detour through campus, resulting in indirect routing for through passengers and approximately five minutes of additional travel time. When aggregated for all routes serving the terminal and annualized, this represents a significant expenditure of service hours and system resources.

  With the provision of BRT lanes and stations along College Drive, three new stations are planned—Hospital Station, Central Campus Station and East Campus Station. Assuming the provision of safe and attractive pedestrian facilities along-side and crossing College Drive as well as large accessible station areas, transit services may remain on College Drive rather than entering the Place Riel terminal. Two optional BRT lane and station configurations may be considered, as displayed in **Figure 3.37.** A curbside option has designated bus lanes and stops on both the east and west side of College Drive, requiring University bound passengers to cross College Drive to access westbound transit stops. A side running option has bus lanes integrated onto Campus on the north side of College Drive, eliminating the need for transit users to cross the street.

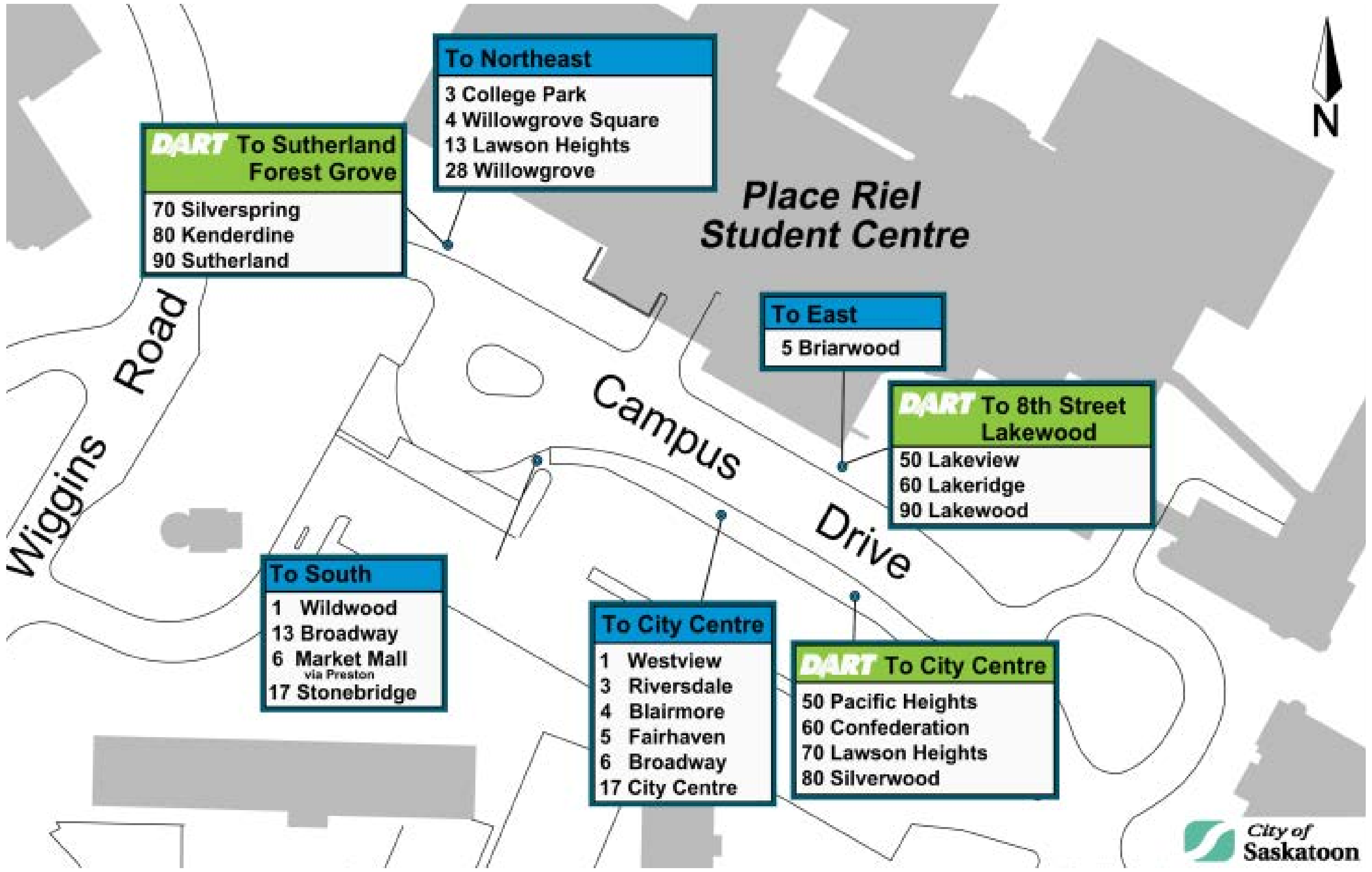


Figure 3.37 - Existing Place Riel Transit Terminal

Recommended Actions:

- **As part of the functional planning for BRT facilities and stations along College Drive, long-term station requirements should be confirmed. For planning purposes, 60 metre station areas have been conceptually identified to accommodate two or three stop areas in each direction.**
- **Develop BRT facilities along College Drive to include safe and attractive pedestrian facilities along-side and crossing College Drive as well as large accessible station areas, which will allow transit services to remain on College Drive rather than entering the Place Riel terminal.**

It should be noted that stops for local services that serve and turnaround within the University will still need to be accommodated on campus.

Figure 3.38 - Alternative BRT Configurations for College Drive (Central Campus Station)

E) Park-and-Ride Lots

Park-and-ride lots provide a means of accessing frequent transit services in lower-density areas where the walking distances to transit are lengthy and local services are not frequent. Studies in other communities have shown that park-and-ride lots must be located close to the start of the trip (within a distance of less than 20% of the total trip). If the distance to the park-and-ride lot is greater, most motorists will simply continue driving to their destination. As is the case in other winter cities, park-and-ride lots must be fully serviced with car plug-ins as well as other treatments to make it comfortable and safe to encourage passengers to transfer to transit.

Figure 3.39 illustrates the locations where park-and-ride lots could be considered. These locations include Blairmore Shopping Centre, Confederation Mall, Centre Mall, and University Heights Shopping Centre near the Red Line and Lawson Heights Mall near the Blue Line. They may begin as temporary small sites of 50 to 100 parking spaces with potential to expand to as many as 300 stalls at each location in the longer-term.

Recommended Actions:

- **Undertake siting and feasibility studies for these park-and-ride locations in support of functional planning and design for rapid transit stations.**
- **Implement park-and-ride lots as required to serve growing demand.**

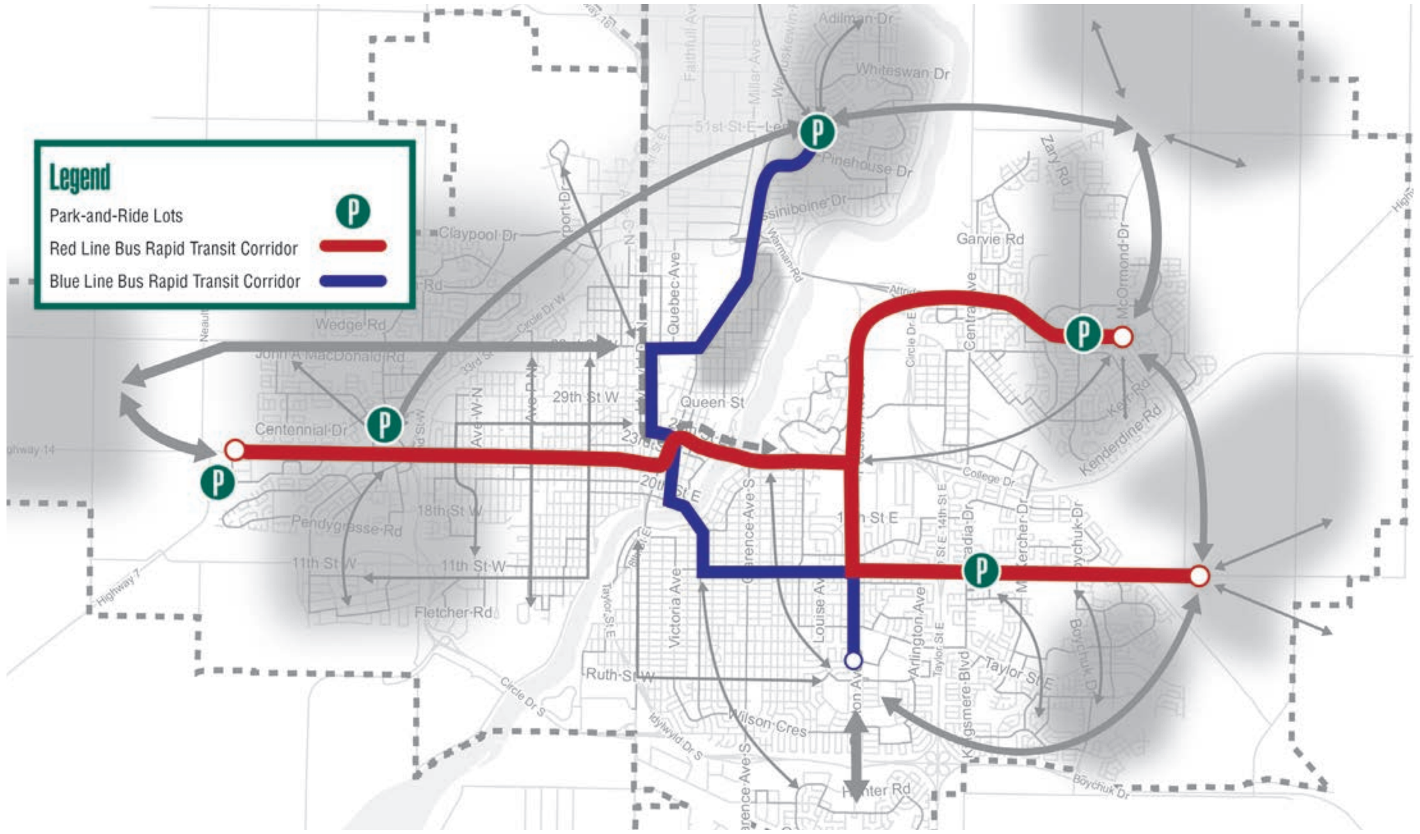


Figure 3.39 - Areas for Candidate Park-and-Ride Lots

3.5.4 Red Line BRT Corridor

The Service Plan highlights the most pronounced markets today and with the long-term growth planned for Saskatoon. Today, over 90% of all transit trips are destined to the downtown and University areas. Additionally, a large majority of the ridership is traveling east-west along corridors such as 22nd Street, College Drive and 8th Street, serving outlying communities as well as mixed-use development that surrounds these corridors. In the long-term, planned growth in New Suburban Areas such as Blairmore, University Heights and Holmwood as well as along these major corridors in the core areas mean that existing east-west travel demands across the city will only intensify.

The Service Plan described in Section 3.5.2 outlines the structure of the transit system planned for the next 30 years. Appendix A describes the identification and evaluation of alternative rapid transit technologies and routing across the city to serve the largest long-term transit markets. In order to attract and support east-west travel demands, a Red Line Bus Rapid Transit (BRT) service was identified. Consistent with cities such as Ottawa and what's planned for Winnipeg, the transit service along the Red Line BRT corridor will be made up of the combined services from different areas of the city in order to deliver a bus every 5 minutes or less and to take advantage of the BRT facilities (such as bus-only lanes, dedicated stations, and other customer amenities). In this regard, the BRT services and treatments along the corridor are designed to support the largest transit markets across Saskatoon and to also support transit-oriented land use patterns planned for some of the city's major corridors such as 22nd Street, College Drive and 8th Street (as described in Section 2.0).

This section of the report describes the Red Line BRT corridor treatments and facilities based on design guidelines developed as part of the overall Growth Plan. The rapid transit technology, route and BRT configuration options examined as part of the process are highlighted and inserted into Appendix A for further reference. This information may be used in discussion with senior levels of government for cost-sharing on the implementation of rapid transit in Saskatoon.

In the long-term, the preferred Red Line BRT corridor consists of approximately 22km of bus-only lanes with 25 stations between Blairmore, University Heights and Holmwood with direct connections to the Downtown and University areas of the city as illustrated in **Figure 3.40**.

Figure 3.40 - Proposed Red Line BRT

As a long-term technology, a BRT system in Saskatoon will ultimately combine the quality of rail transit with the flexibility of buses. A BRT system in the city could eventually incorporate frequent and rapid transit services, limited stops, unique vehicles and stations, real time customer information and exclusive running ways. It will provide a unique experience within the City's transit system and will form the spine of the network for moving around the city as well as become the focus of growth and development.

Within Saskatoon, the candidate BRT corridors must both serve to shape land use scale, density, mixture and form with a design that is people-oriented as much as it is transit-oriented. Street treatments should ultimately be designed and built to attract and accommodate people. In other words, BRT must be considered an integral part of the urban area along the candidate corridors rather than a separate utility to simply serve travel demands. Across North America, BRT systems operate in a variety of environments – mostly surface, with some elevated and/or underground sections – that are separated from general purpose traffic for much of the corridor where ridership is significant. Some of the general features that contribute toward the uniqueness of BRT include:

- Reduced travel times over and above regular bus operations;
- Frequent service during all periods of operation, seven days per week;
- Buses serve stations rather than regular stops, and stations are spaced further apart;
- Stations have unique and identifiable designs for passenger comfort and quality of experience;
- Buses operate with transit priority treatments or in exclusive space to ensure reliable and attractive travel times and to bypass areas of recurring congestion;
- Buses are generally larger and can carry more passengers; and,
- Passenger comfort is prioritized and alternative loading opportunities are often used to expedite boardings and alightings.

BRT design guidelines serve as the "vision" for service planning and facility design. They are based on best practices and experience with other systems planned and implemented in other North American cities. Although the design guidelines for Saskatoon describe an ultimate or ideal state for BRT, these services and facilities can be implemented in stages as ridership increases, recurring delays on city streets grow, resources become available, and community support for transit investments increases (See **Figure 3.41**).

Service design changes over time can evolve from conventional and express bus services that exist today along Saskatoon's recommended BRT corridors, to more frequent, two way services with increased stop spacing. In low ridership segments of the rapid transit corridors, transit services may operate in mixed travel lanes with general purpose traffic for many years. As investments are made in the transit system to increase service levels and transit priority facilities, services to and from suburban development areas will be interlined with the BRT corridors to connect passengers to the highest demand areas of the city, and to make use of transit priority treatments. Over time, as transit-oriented development and transit ridership grow along BRT corridors, service levels can continue to increase and dedicated lanes can be added or converted to accommodate travel demands and to bypass areas of recurring congestion.

Once the BRT corridors generate a larger portion of the ridership, dedicated BRT vehicles as well as services may be implemented to further enhance the brand identity of BRT in Saskatoon. At that time, the City may consider longer term plans and ridership potential for other tranist technologies such as LRT.

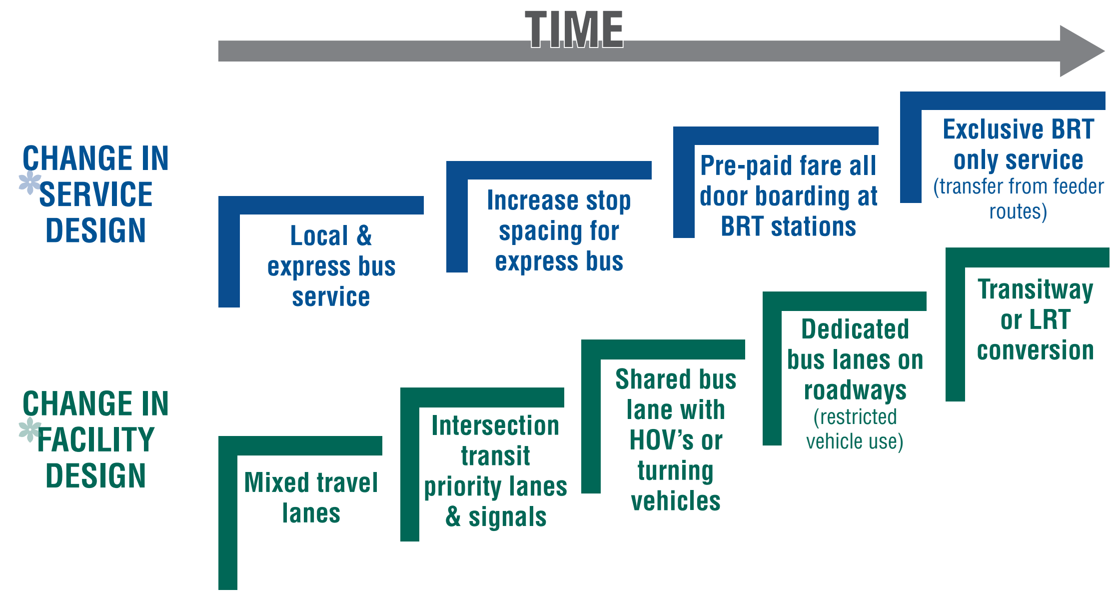


Figure 3.41 - Evolving Transit Service and Facilities

This section of the Transit Plan highlights the specific features of the recommended Red Line BRT corridor in terms of design guidelines, potential configurations as well as overall projected benefits and costs.

A. BRT Design Guidelines

The following discussion highlights the general guidelines for planning and designing BRT corridors in Saskatoon.

Operating Features

Service frequency and direct connections are of little value to customers if BRT services are not seen to be fast and reliable as compared with conventional bus services – or even with automobile travel. The operating features of BRT services – such as schedule reliability, number of stops, dwell times and traffic delays – will influence the real and perceived travel time advantages for transit customers. The following section highlights the operating procedures and system infrastructure that are important in attracting and growing BRT ridership.

Frequency and periods of operation are important to the identity of BRT systems. Similar to most rapid transit systems, BRT services should be in operation during all time periods when transit service is provided. This means that BRT services in Saskatoon would operate 7 days a week between 6 AM and 12:30 AM (or 18.5 hours per day). Additionally and as previously described, the rapid transit corridors should offer attractive frequencies in order to minimize wait times for customers. Typical minimum frequencies in North America are every 5 to 10 minutes during peak periods and every 10 to 15 minutes during off-peak periods. Busier sections of the BRT corridor (i.e. in the core area of Saskatoon) may experience frequencies as low as 2 minutes.

- **Advanced transit management technologies** such as global position systems (GPS) and automatic vehicle location (AVL) technology are used to identify the location of a bus on the road network, providing real-time monitoring of bus movements. Transit management technologies permit monitoring and management of bus headways, transit signal priority, and response to operating issues.
- **Headway based operation** ensures that buses will arrive at fixed intervals such as every 5 or 7 minutes along a BRT corridor rather than bunching and arriving two at a time every 10 minutes. Advanced transit management technologies effectively monitor headways between vehicles, which can result in shorter overall travel times for customers.
- **Station spacing** serves to minimize travel times for customers where stations are well spaced –approximately 400 metres apart in urbanized areas and 1,000 metres apart or more in suburban areas. Customers are typically willing to walk further to access transit services that provide attractive travel times. Increased station spacing will also serve to reduce delays.
- **All door boarding** can significantly reduce dwell times at busy stations, particularly in combination with advanced fare payment technologies such as smart cards. On-board fare enforcement will be required periodically to minimize fare evasion. Studies in the U.S. indicate that boarding times with prepaid fares average 2.5 seconds per passenger, compared with boarding times of 4.2 seconds per passenger for dip passes and tickets. The boarding process can be reduced up to 30 seconds for every 18 passengers with a proof of payment system and corresponding fare technology.
- **Transit priority** is designed to provide travel time advantages for buses as a result of traffic congestion, signals and other non-recurring delays such as collisions. The use of transit priority can range from transit signal priority at intersections that alter green phases when buses are approaching an intersection, to transit only bus lanes or intersection queue jumpers that further reduce the impacts of recurring traffic congestion. Enforcement of transit priority lanes is perhaps the most significant challenge in most communities, particularly when shared with other traffic including high-occupant and right-turn vehicles.
- **Real time passenger information** is an important feature for BRT to enhance the customer perception and experience of reliable, fast service. Real-time information helps to eliminate uncertainty on the part of passengers by providing accurate information regarding the arrival times of vehicles. Most agencies have found that the customer benefits of real-time passenger information far outweigh the relative costs of providing the technology.

Running Ways

In the long-term, vehicle travel speeds along the Red Line BRT corridors are projected to decline significantly with average travel speeds declining by as much as 5km/hr to 15km/hr as illustrated in **Figure 3.42**. Although average speeds along most urban streets may be generally between 25km/hr to 30km/hr the Red Line BRT corridor vehicle speeds are expected to decline significantly along corridors such as 22nd Street, College Drive and 8th Street in the long-term. In fact, without dedicated bus-only lanes, a non-stop trip between Blairmore and University Heights along the preferred BRT corridor will take 85 minutes in the PM peak hour and 90 minutes to Holmwood.

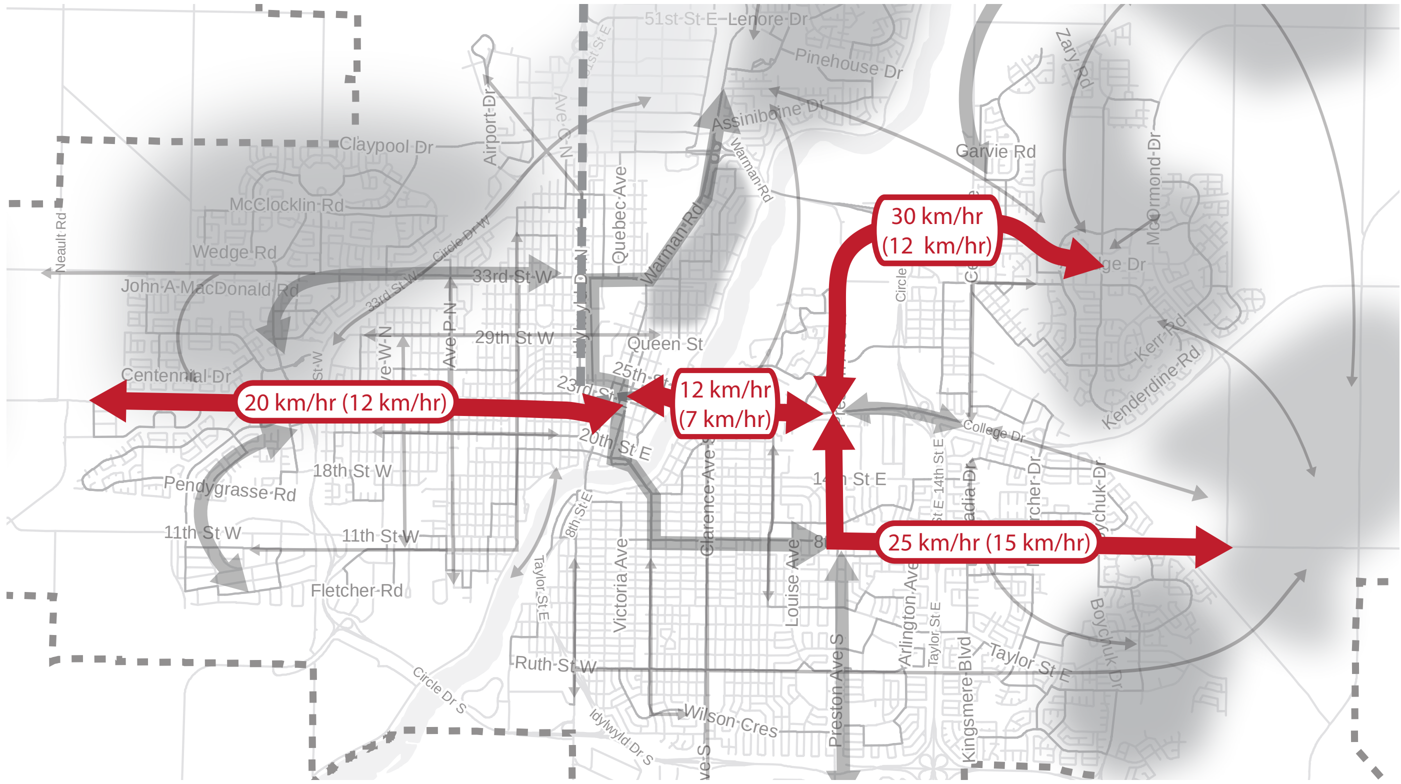


Figure 3.42 - Existing (Forecast) Average Peak Period Vehicle Speeds

Where there are significant passenger volumes and recurring areas of traffic congestion, consideration should be given toward providing segregated running ways for buses. In general, three types of urban roadway bus lanes have been used in communities throughout North America, as summarized below and illustrated in **Figures 3.43 to 3.46**. These types of urban roadway bus lanes are used to guide the identification and evaluation of options for Saskatoon.

Figure 3.43 - Curb Bus Lane (Ottawa)

- **Curb bus lanes** operate on an outer lane on the right side of the roadway in both directions. Curb bus lanes can generally evolve from peak period, peak direction operations to full day bus lane operations in both directions. Right turning vehicles are often mixed with curb bus lanes and in some cases, these right side lanes may also be shared with high-occupant vehicles where bus volumes are modest.

  This approach often reduces the public perception of the 'empty lane' syndrome that can reduce community support for bus only lanes. Although parking can be permitted in curb bus lanes in the off-peak period, the bus lane could utilize this space during peak periods or for the entire day if right-of-way is limited. During peak periods, right-turn restrictions may be implemented at minor intersections to reduce delays for transit. BRT stations would be located along sidewalks, adjacent to and integrated with surrounding land uses where possible.

- **Centre running bus lanes** are similar to side running bus lanes in that they are dedicated for bus use only. In this regard, conflicts with general purpose traffic are limited to signalized intersections where buses would be prioritized and left turns for general purpose traffic could be permitted and accommodated with turn lanes. Centre running bus lanes would eliminate mid-block left-turn movements to access property. Right-turn access to properties along with minor intersections could be maintained along with on-street parking where adequate rights of way exist.

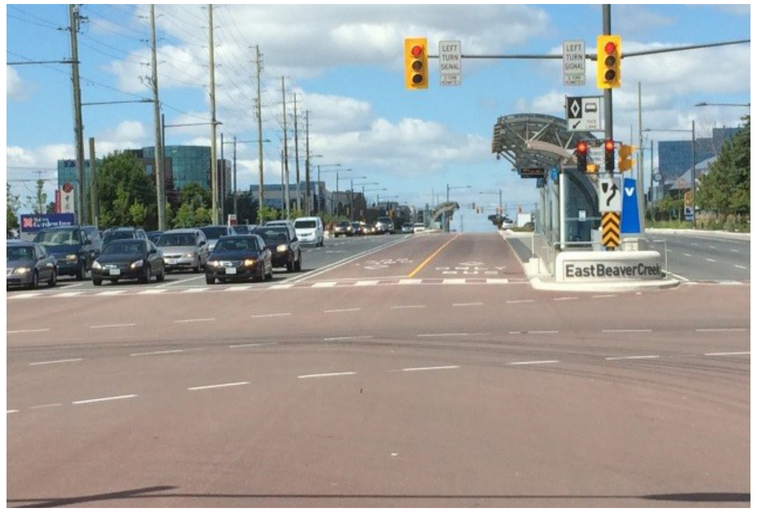


Figure 3.44 - Centre Bus Lane (Toronto Area)

- **Side running bus lanes** are dedicated areas of the road for bus only operation. The side running lanes can be located on either side of the road with protected space to physically separate buses from general purpose traffic. Reduced conflicts with general purpose traffic and transit signal priority would further reduce transit travel times relative to curb bus lanes. Because of the configuration, however, side running bus lanes could never be opened for general purpose traffic or parking at any time and would eliminate access to adjacent property driveways and minor intersections.

Figure 3.45 - Side Bus Lane (Barcelona)

- **Rural shoulder bus lanes** are similar to urban curb bus lanes in that transit lanes occur on the right side along roads without curb, gutter and sidewalks. Use of the shoulder for buses only can be a cost-effective strategy for prioritizing transit on highways or rural roadways where bus frequency may not be as high as in urban areas, but where transit passenger travel times are still impacted by areas of recurring congestion.

Figure 3.46 - Rural Shoulder Bus Lanes (Vancouver)

Recommended Action:

- **Although the City will want to ultimately plan for centre or side running dedicated bus lanes along the entire Red Line BRT corridor, curb lanes are recommended for most of the priority corridors over the next 10 years (alternative configurations should be further explored for curb and side BRT lanes and stations for College Drive). In general, incrementally investing in and implementing BRT facilities over time as service levels and ridership grows will improve the public's perception of transit expenditures and dedicated facilities. Conversely, investing in BRT facilities well ahead of the basic needs of the city's transit system and converting general purpose traffic lanes for buses will potentially result in more negative public reaction to transit in Saskatoon.**

Some of the reasons for implementing curb bus lanes along most corridors in the first 10 years of the Plan are briefly highlighted below. It should be recognized that these facilities may be altered to centre or side running BRT lanes in the longer-term as service levels and ridership grow.

- **The City needs to increase investments in many other areas of transit that are essential for the Plan's success.** Much like other cities in Canada, Saskatoon is struggling to maintain existing service levels as the population grows and needs to invest in many foundation services and facilities to improve the customer experience. The Transit Plan includes significant investments to increase service levels, provide customer-oriented programs and facilities and to build rapid transit. Even with assistance from senior levels of government on capital funding for BRT, the City must spend significantly more on the transit system in order to increase ridership.

- **Saskatoon does not yet have a 'transit' culture. There are two critical aspects to a transit culture in any community.** The first and most important of which is the customers themselves. As described earlier in the Plan, the resources allocated to transit today permit a coverage model where most residents are within a reasonable walking distance to transit. As resources grow, more and more residents (although not everyone) will have access to more frequent and direct transit services. This will change the customer experience and ultimately increase ridership.

- **With low ridership and cost recovery, all residents are concerned about the amount of investment and resources that are directed toward the transit system.** In particular, advancing significant investment in capital—centre or side bus lanes—that may not address the basic challenges facing transit will be difficult to support over the first 10 years of the Plan. Although most survey responses supported the preliminary directions of the Transit Plan (and the proposed Red Line BRT route in particular), many are concerned about the extent of the expenditure relative to where the system is at today.

- **Although the frequency of services along the Red Line BRT corridors will increase during the first 10 years of Plan, the 'empty lane syndrome' will affect public perception of the benefits of dedicated bus lanes.** Over the first 10 years of the Plan, the number of buses operating along BRT corridors such as 22nd street will increase from approximately 4 to 6 buses per hour—or from every 15 minutes to every 10 minutes. Along College Drive, the number of buses will increase from approximately 12 to 20 per hour—or from about every 5 minutes to every 3 minutes. Consistent with the intent of rapid transit, service frequencies will only be slightly lower during off-peak weekday and weekend periods.

- **With the exception of College Drive and 3rd Avenue, long-term peak period ridership on most BRT corridors will generally result in frequencies of 5 to 10 minutes.** Although dedicated lanes will be required to move through congested areas of the city, most drivers will see empty lanes much of the time if centre or side bus lanes are implemented within the next 10 years or so.

- **Curb bus lanes provide flexibility to grow the facilities along with the ridership over time, whereas centre or side bus lanes must operate 24 hours a day, 7 days a week from the outset.** Curb bus lanes can be implemented in stages and for increasingly longer periods of the day. In fact, many communities will begin implementing curb bus only lanes during peak periods and in the peak direction where traffic congestion is most significant and ridership is highest. During the first 10 years of implementation for example, dedicated curb lanes may be implemented along 22nd Street in the peak directions to and from downtown in the morning and afternoon periods respectively. During off-peak periods, these lanes may remain for general purpose traffic or may be used for parking in some instances until full-time bus only lanes are required.

Stations

Beyond the important connection with the land uses that surround them, BRT stations are the interface between passengers and services. Stations that are conveniently located, comfortable, safe and accessible for all transit users will enhance the passenger experience with transit in Saskatoon. Stations will also serve to create and reinforce the identity for BRT related services.

BRT stations include features that are more often associated with rail transit. As is the case in cities where both LRT and BRT exist (such as Paris and Rouen, France), the same basic elements and design are used for both facilities.

Figure 4.01 - Concept BRT Station

- **Unique, identifiable design** of stations not only serve to provide a consistent experience for passengers throughout the system, but also create awareness and a sense of permanence for BRT in the same way that rail transit infrastructure does. Everything from the design of platform areas through to the shelters and signage within stations needs a consistent standard that creates a unique identity and help to attract new customers.

- **Platform width and length** is large enough to accommodate 2 or 3 buses arriving at once (up to 45m), along with additional length to accommodate passenger flows to and from the station. Stations must also be wide enough to accommodate passengers and station equipment (3.5 – 4m). Since all services operate through the station (without layover), most stations utilize standard curbs rather than saw-tooth design in order to minimize station dwell times. In busier stations, bus bypass lanes may be required to minimize delays and queuing of buses.

Figure 4.02 - Completed BRT Station

- **Customer information** includes displays of real-time information such as next bus arrival as well as static information about hours and frequencies of services. Dynamic information signage at the station increases passenger comfort and awareness of wait times and any other delays that may affect a trip on BRT.

- **Permanent weather protection** is required for all BRT stations and can extend for the length of the station platform so that all doors are protected while passengers board transit. Shelters provide protection from sun, rain, and snow. In cold climates such as Saskatoon, parts of the station shelter can be enclosed and incorporate radiant heating for passenger comfort.

- **Safety and security** are important elements in the design of transit stations. Perhaps the most important element is visibility. Stations and activities in the station must be visible from the street to allow for passive monitoring of the station. Additionally, more active video monitoring equipment and surveillance as well as access to emergency assistance for passengers must also be available to increase passenger comfort and safety while waiting at BRT stations.
- **Off-board fare payment** at stations allows for all-door boarding and reduces overall dwell times for transit passengers. The result is a significant savings in travel times for customers (up to 30 to 60 seconds per stop) as well as for vehicle requirements and system operating costs. Fare paid zones are typically incorporated with centre bus lanes as they are easier to monitor and enforce than curb side lanes. Although many rapid transit systems have turnstiles to limit entry to only those that have paid, ‘proof of payment’ zones can be used where passengers would purchase fares before entering the area and boarding a bus.
- **For people of all ages and mobility levels**, universal design, such as low floor or kneeling buses, tactile warning strips, on-board stop displays and announcements, and an intuitive design can go a long way towards making conventional transit a more attractive option. These techniques also make transit more accessible for passengers with physical or cognitive disabilities, thus reducing the demand for more expensive Access Transit para-transit services.

Vehicles

Vehicles are an integral part of the transit experience for customers, and BRT services are no exception. As system ridership grows over the next 10 to 20 years, dedicated vehicles may be required to operate along BRT corridors in order to increase the carrying capacity of the system and to reinforce the rapid transit identity. Generally, vehicles can provide more of a rapid transit experience not only in the look and appearance, but also in the physical design of the vehicle. The following discussion highlights some of the ultimate features for BRT dedicated vehicles that may be considered for Saskatoon in the long-term as well as some of the short-term features that may be considered in all fleet operating on the BRT corridors.

- **High capacity articulated vehicles** are essential for BRT corridors in order to support higher volume travel demands. The principle way of accommodating higher passenger capacity is through the use of larger, articulated buses that can be as long as 20 metres or bi-articulated vehicles that can reach 25 metres.
- **Low floor, accessible vehicles** are important throughout the transit system in Saskatoon. On BRT corridors, low floor vehicles are often configured similar to rail rapid transit vehicles with fewer seats and more open configuration to reflect the higher passenger loads. An open interior is particularly beneficial when all-door boarding is permitted and passenger turnover is high due to short-distance travel.
- **On-board information and announcements** for customers are generally growing throughout many systems in North America. In particular, many BRT systems provide interior customer information displays and provide real time visual and audible notice of upcoming stations and connecting lines, as well as static information about the transit system.
- **Advanced vehicle technology** allows for the tracking of buses on the BRT corridors and it is essential to enhance reliability and operating speeds for transit. As previously noted, technologies include on-board GPS (global position systems) and AVL (automatic vehicle location) on all buses that utilize BRT corridors. The addition of Automatic Passenger Counting (APC) technologies should also be installed on all BRT buses at a minimum to monitor ridership and to utilize dynamic systems for deploying additional fleet where necessary to support high passenger loads in the system.

As ridership along the BRT corridors continue to grow in the long-term, dedicated, distinct vehicles should be considered. Distinct vehicle designs, with multiple doors and open interior space with enhanced features such as air conditioning may be considered as part of the rapid transit experience. A unique design and dedicated fleet will also serve to enhance the identity of rapid transit in Saskatoon.

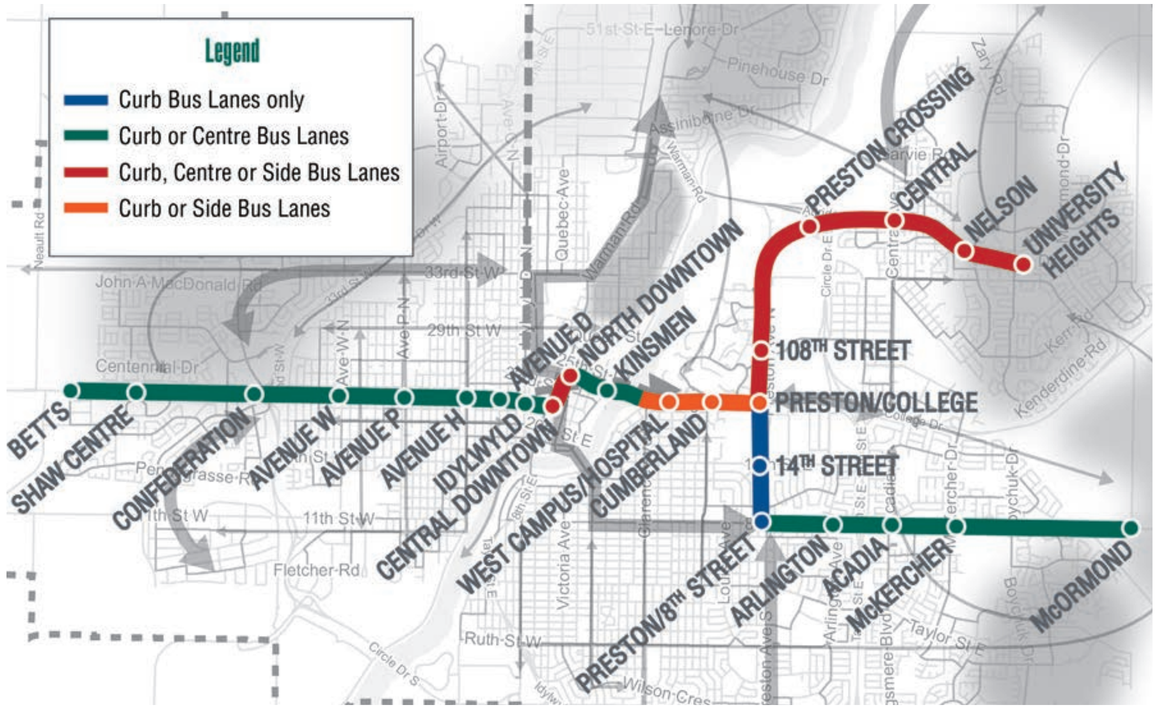


Figure 3.47 - Optional Red Line BRT Corridor Configurations

B. Potential Configurations

As indicated, there are three types of bus lane configurations available for consideration in Saskatoon: curb, centre and side running configurations. These options are illustrated on a six lane road for illustrative purposes in **Figure 3.48**.

A high level evaluation framework was used to compare alternative configurations along each corridor segment and to identify feasible configurations for the City to consider once the Growth Plan is approved. The details of this evaluation are provided in Appendix A. In much the same way that the overall BRT system may evolve with ridership, so too could the implementation of dedicated bus-only lanes. In this regard, curb bus lanes may be the first step toward centre or side running bus lanes. It should be noted however that the planned rights-of-way along all corridors should be designed for either centre or side running facilities to ease the longer-term potential for Light Rapid Transit (LRT). **Figure 3.47** illustrates the feasible configurations for the Red Line BRT corridor.

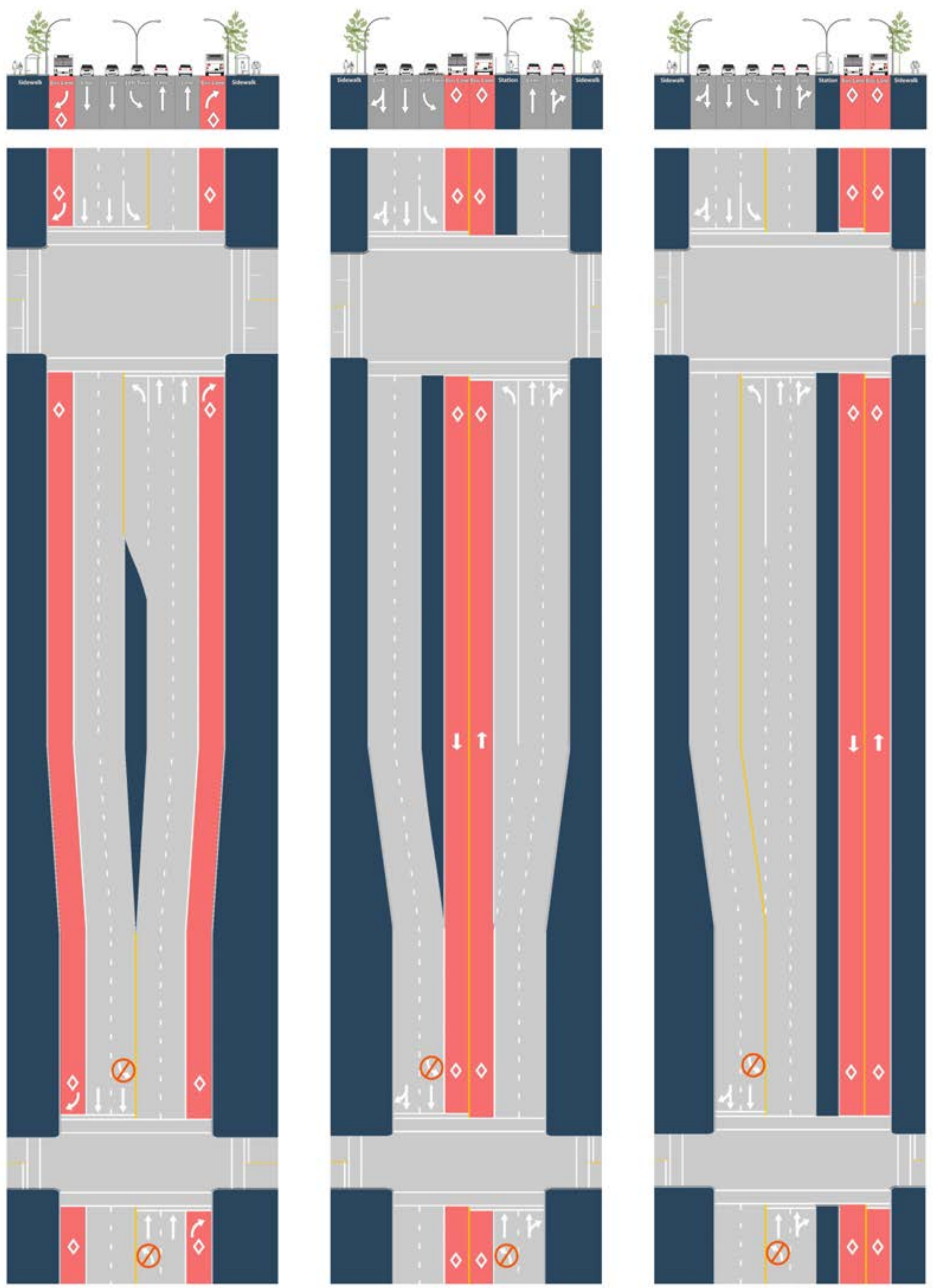


Figure 3.48 - Alternative BRT Laning Configurations (6 Lane Road)

The following discussion highlights the optional configurations identified through the assessment for each segment. The details of this assessment are provided in Appendix A.

A. **22nd Street (Blairmore to 3rd Avenue).** Between Betts Station and Central Downtown along 22nd Street, curb or centre bus lanes are potential short-term and/or long-term optional configurations. Side running lanes are not feasible as they would restrict driveway access along one side of the corridor. Outside Circle Drive, BRT lanes could be added to the existing roadway as either centre or curb facilities. Inside Circle Drive, general purpose traffic lanes would need to be converted to bus-only lanes. Curb lane operations permit time based evolution of bus-only lanes during the peak periods of the day while centre lane facilities would support full-time bus-only use. It should be noted that centre lanes and stations would require additional rights-of-way inside Circle Drive that may only be available through redevelopment. It should be noted that a grade-separated overpass of the rail corridor would be required and has been assumed as part of the overall concept for BRT on 22nd Street.

B. **3rd Avenue (22nd Street to 25th Street).** This section would ultimately support the Red and Blue Line rapid transit services through the downtown core with two stations at the south and north ends of the segment. All configurations are possible along this segment and can be accommodated within the existing right-of-way. All configurations would impact one travel lane and on-street parking to varying degrees.

C. **25th Street / University Bridge / College Drive (3rd Avenue to Preston Avenue).** This segment would accommodate four stations at Kinsmen, West Campus / Hospital, Cumberland and Preston. The 25th Street corridor and University Bridge could support either curb or centre running bus-only lanes. Side running facilities would require widening of the bridge which was a show-stopper based on advice from the City's structural engineering staff. East of the bridge, curb running bus-only lanes could continue along College Drive, or transition to the north side to provide a side running configuration. A general purpose travel lane in each direction would be converted to bus-only lanes either during peak periods only for curb side facilities or permanently with centre or side running lanes. It should be noted that general purpose travel lanes on the University Bridge could remain for several years with transit priority and operational changes on either side of the bridge.

D. **Preston Avenue.** Attridge Drive (College Drive to McOrmond Drive). This segment of the Red Line BRT corridor would support five stations extending to University Heights in either curb, centre or side running bus-only lanes. In general, most of this section could support additional lanes to accommodate BRT with some lane conversions near Preston Crossing and across Circle Drive. All concepts would benefit from grade-separation at the rail line north of 108th Street and side running facilities would require a new overpass of Circle Drive with changes to the interchange.

E. **Preston Avenue (College Drive to 8th Street).** This segment of the Red Line BRT corridor would support two stations south of College Drive. Widening of this corridor is constrained by a transmission corridor on the east side, but curb or centre facilities are feasible for this segment. Side running facilities could not be accommodated with access requirements with current land use patterns.

F. **8th Street (Preston Avenue to McOrmond Drive).** There are five stations planned along 8th Street. While both curb and centre running lanes are feasible, side running facilities would restrict driveway access to adjacent properties. As such, side running lanes are not feasible without alternative access arrangements for most properties. Although the right-of-way could accommodate widening to support bus-only lanes, consideration should be given toward converting existing general purpose travel lanes in order to manage the scale of the roadway and to support transit-oriented land use patterns and street character.

3.0 TRANSIT

C. Projected Benefits and Costs

Not only are investments in dedicated bus lanes along the Red Line BRT corridors essential to support the projected demands, they will also allow transit to bypass areas of recurring congestion and provide significant travel time savings to customers and the system. Depending on the configuration, transit customers could experience up to a 30 minute (curb lane) to 50 minute (centre or side lane) travel time savings in the long-term between Blairmore and University Heights. Reduced delays and increased system reliability on top of improved bus frequencies will dramatically improve the transit customer experience. Additionally, the travel time savings will also benefit the transit system operation with reduced delays and platooning of buses caught in congested areas.

The overall economic evaluation of curb, centre or side running facilities is summarized in **Table 3.06**. As indicated, both curb and centre/side BRT configurations will generate a positive net present value and a benefit-cost ratio of greater than 1.0 – meaning all configurations are attractive investments for funding partnerships with local, provincial and federal governments. Curbside lanes are estimated to cost approximately $44 to $66 million, while centre or side bus lane configurations could cost as much as $390 to $410 million.

Criteria	Curbside Bus Lanes	Centre or Side Bus Lanes
COST RANGES CLASS D		
CAPITAL COST	$44.2 M - $66.3 M	$387.3 M - $412.3 M
CAPITAL COST (PV)	$33 M - $49.5 M	$289.4 M - $308 M
MAINTENANCE COST	$3.5 M	$3.5 M - $3.6 M
SALVAGE VALUE (20%)	$(6.6 M) - $(9.9 M)	$(57.9 M) - $(61.6 M)
TOTAL COST	$30 M - $43.2 M	$235.1 M - $250 M
SAVINGS		
TRANSIT TRAVEL TIME SAVINGS	$173 M	$297.1 M
TRANSIT OPERATING	$19.7 M	$35.8 M
TOTAL BENEFITS	$192.8 M	$332.9 M
ECONOMIC		
NET PRESENT VALUE	$149.6 M - $162.8 M	$82.9 M - $97.8 M
BENEFIT-COST RATIO	4.5 - 6.4	1.3 - 1.4

Table 3.06 - Summary Costs & Benefits of Alternative BRT Configurations

With an investment period of 25 years, curbside lanes result in a net present value ranging between $150 and $163 million and a benefit-cost ratio ranging from 4.5 to 6.4. Alternatively, centre or side-running lanes have a total lifecycle cost ranging between $235 and $250 million and result in $333 million of travel time and operations benefits over 25 years. The implementation of centre or side lanes (wherever possible) results in a net present value of $83 to $98 million and a benefit-cost ratio ranging from 1.3 to 1.4 over a 25 year term.

3.5.5 Blue Line BRT Corridors

The Blue Line BRT corridor extends approximately 12 km supporting transit services between Nutana and Lawson Heights as illustrated in Figure 3.49 below. Although the projected long-term ridership would not necessarily support dedicated bus-only lanes throughout the corridor, aspects of the BRT design guidelines presented for the Red Line BRT corridor could be utilized (such as the operational, station and vehicle features).

Much like the Red Line BRT corridor, many services would extend beyond the corridor into neighbourhoods at their outer limits and provide direct service to connect with the Blue Line BRT corridor. Rather than consider bus-only lanes throughout however, transit priority treatments described in Section 3.5.3 may be used to enhance service quality and reliability. This will ensure that transit customers will move faster than cars through areas of recurring congestion with the use of queue intersection jumpers and signal preemption. Additionally, buses will be more likely to arrive and depart stops at the scheduled times, and in turn passengers can arrive at their destinations on time.

Through service planning and design, ongoing improvements to the customer experience and efficiency of the system can be made through operational changes such as by simply increasing stop distance and managing boarding and alighting activities. In some cases where sufficient ridership and services are provided on the Blue Line BRT corridors, more active measures that include a wide range of traffic signal based measures can be used (e.g. transit biased signal progression, provision of transit specific signal phases, and traffic signal phase modification based on transit needs (TSP)). Work to review such opportunities should be undertaken in partnership with transportation, public works, and roadways groups at the City.

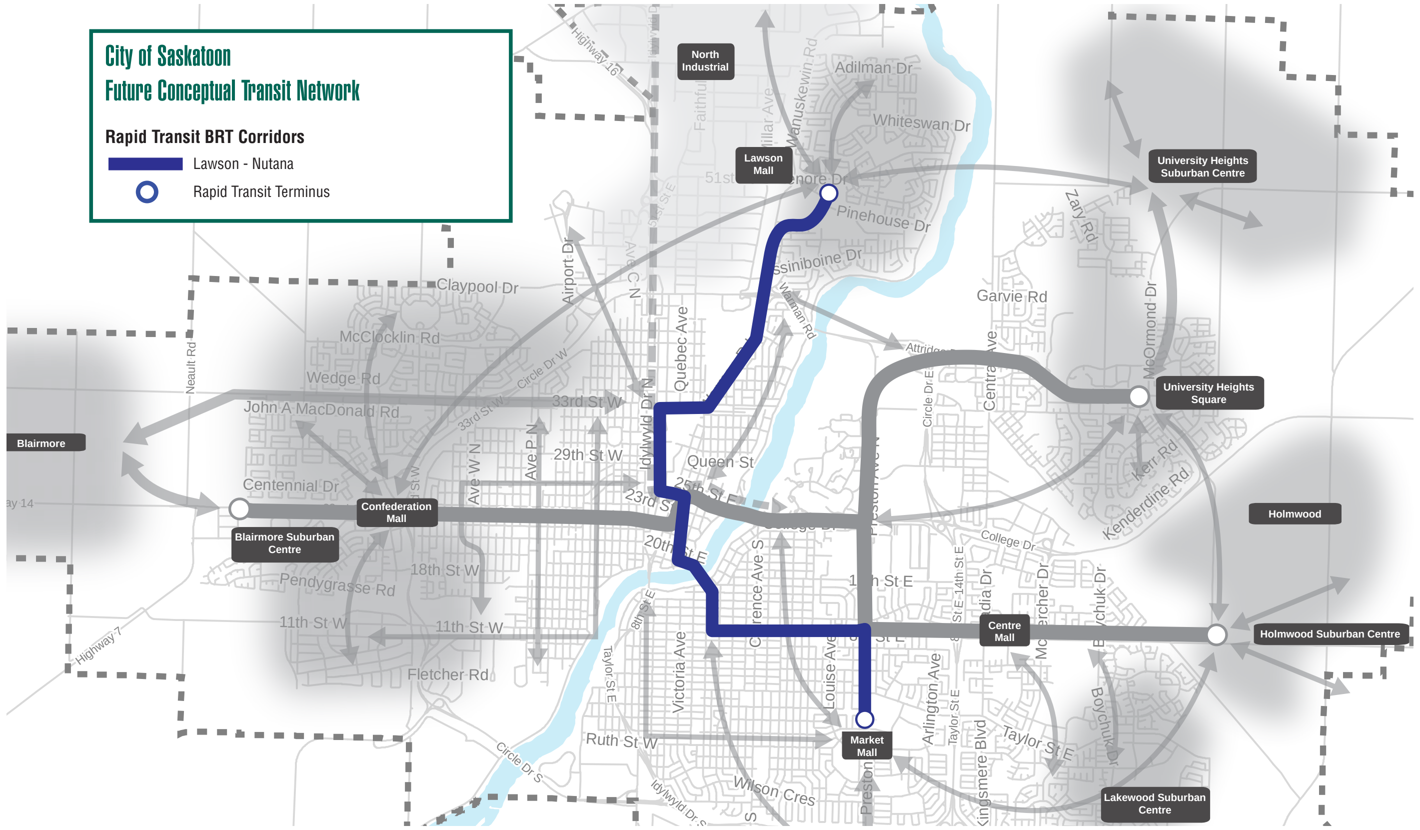


Figure 3.49 - Proposed Blue Line BRT

3.6 Implementing the Plan

The long-term Transit Plan is about more than simply increasing service frequencies and extending more of the same services to growing areas of the city. Simply put, the Transit Plan is transforming the city's transit system with significantly more resources. The Transit Plan uses a multi-faceted approach to improve and expand services, to implement new and more comfortable facilities, and to provide support programs and services that will enhance the customer experience.

3.6.1 5 Year Priorities

For the most important improvements, the City can begin implementation in the next few years as additional resources become available. In other cases, the city will want to stage the expansion of services, facilities and programs to support growth and further increase transit ridership. This section highlights the 5 year implementation priorities and provides the annual or total cost allocations. It should be noted that the cost allocations are estimates only and are intended to provide guidance on the order-of-magnitude investment that may be required. These figures should not be used for budgeting purposes. It should be noted that these costs do not include increases to operating and maintenance costs.

A. Improving the Customer Experience

The improvements designed to enhance the customer experience at all stages of the journey – from planning a trip to exiting transit – largely consist of initiatives that are ongoing and build from customer feedback and suggestions. As noted in **Table 3.07**, most of the initiatives involve enhanced customer service, while some of the initiatives lead to physical changes to the website or transit facilities to make them universally accessible. While the former initiatives can begin with target groups within the first 5 years of implementation, facility upgrades to improve accessibility and comfort for all transit customers will require planning time and will require many years to implement.

Plan Item	Implementation Activities	Order of Magnitude Cost
Real Time Bus Arrivals	Implement GPS technology within all new buses and upgraded stop facilities. Implement digital displays at BRT stations	$50,000/yr
Mobile App	Provide routing, stop and GPS location data to third party developers.	$25,000/yr
Ongoing Website Upgrades	Review and develop best practices for website design features. Implement ongoing upgrades to enhance trip planning.	$20,000/yr
Universal Accessibility	Prepare universal accessible bus stop design guidelines. Implement accessibility improvements at select number of stop locations. Work with other City departments to explore accessibility treatments surrounding transit.	$52,000/yr
Community Outreach	Engage and share information with special interest groups on the transit system, particularly with groups such as seniors, youth and people with disabilities.	$180,000/yr
Customer Service Staff Training	Provide basic customer service level training for all staff. Provide expanded training for working with disabled customers.	$180,000/yr
Customer Satisfaction Surveys	Implement annual customer satisfactions surveys by route.	$40,000/yr

Table 3.07 - 5 Year Customer Service and Facility Improvements

B. Service Plan

Providing higher quality service for larger potential transit markets and managing the amount of service in lower demand areas are essential for transit to be successful. The 5 year priorities for expanding transit are starting the shift from providing equal transit services everywhere, to a system where some areas will see more attractive services while other areas with limited ridership potential see less services. Steps can be taken now to adjust service frequency, directness and hours of operation during weekday and weekend periods so more resources can be invested where they have more impact. In this regard, existing services can be modified and new service hours can be allocated to the largest and growing transit markets in the city. The following discussion highlights the 5 year priorities for modifying and expanding service levels.

- **Optimize Existing Transit Services.** As part of ongoing annual reviews and 3 to 5 year planning, the City may consider strategies that address routes with low ridership and disproportionately higher levels of service. These may be area or route specific issues that should be continually examined to improve efficiency as well as effectiveness of resources. Strategies to address these may include altering routes to provide more direct service, reducing service frequencies, or modifying service periods. Ridership, boarding and other data should be used to consider any routing changes along with customer input and feedback as part of local area planning or annual routing changes.

  Although any routing changes require direct input and feedback from existing customers, **Figure 3.50** below illustrates the relative rides per service hour and total annual service hours provided to each route in the system based on 2013 data. While many routes (including Route 2 and 50/60 DART services) are performing adequately, several routes such as Routes 1, 3, 11, 14, 28, and DART 70/80 are under performing. Many of these routes, including Routes 1, 3 and DART 70/80, represent significant allocations of service resources.

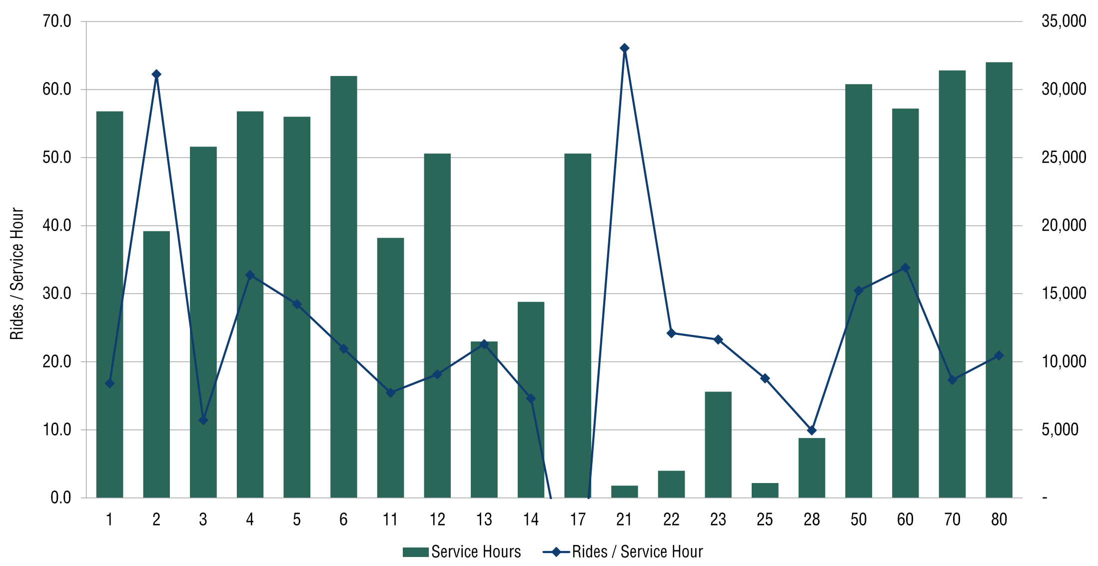


Figure 3.50 - 2013 Route Performance

Source: Ridership Data: March 24 - March 30, 2012; Service Hour Data: July 2012 Schedules

- **Enhance Existing Services.** In many areas of the City, existing services and corridors may be increased to support ridership throughout the City and where transit markets are strongest. In particular, increasing services along the rapid transit corridors are considered a high priority and will grow long-term transit ridership across the City as growth occurs in Blairmore, Holmwood and University Heights. Additionally, conventional services may be modified to retain coverage in growing areas and where rapid transit services are streamlined.
- **Introduce New Services.** In the first 5 years, new and modified services will be designed to increase frequencies and directness of services along planned Red and Blue Line BRT corridors, enhance neighbourhood services in higher demand neighbourhoods and to examine the potential of community shuttle services to low density areas that may be implemented in the 5 to 10 year horizons.

The 5 year implementation priorities are centred on increasing overall annual service hours at 2.5% per year. Service increases are primarily directed towards improving weekday peak and midday services. . Over the first 5 years of the implementation, service levels would increase from approximately 410,000 to 463,000 annual service hours. A conceptual level 5 year service plan is thematically illustrated in **Figure 3.51**. All service changes should be examined with annual performance data as well as through the engagement of transit customers and other stakeholders.

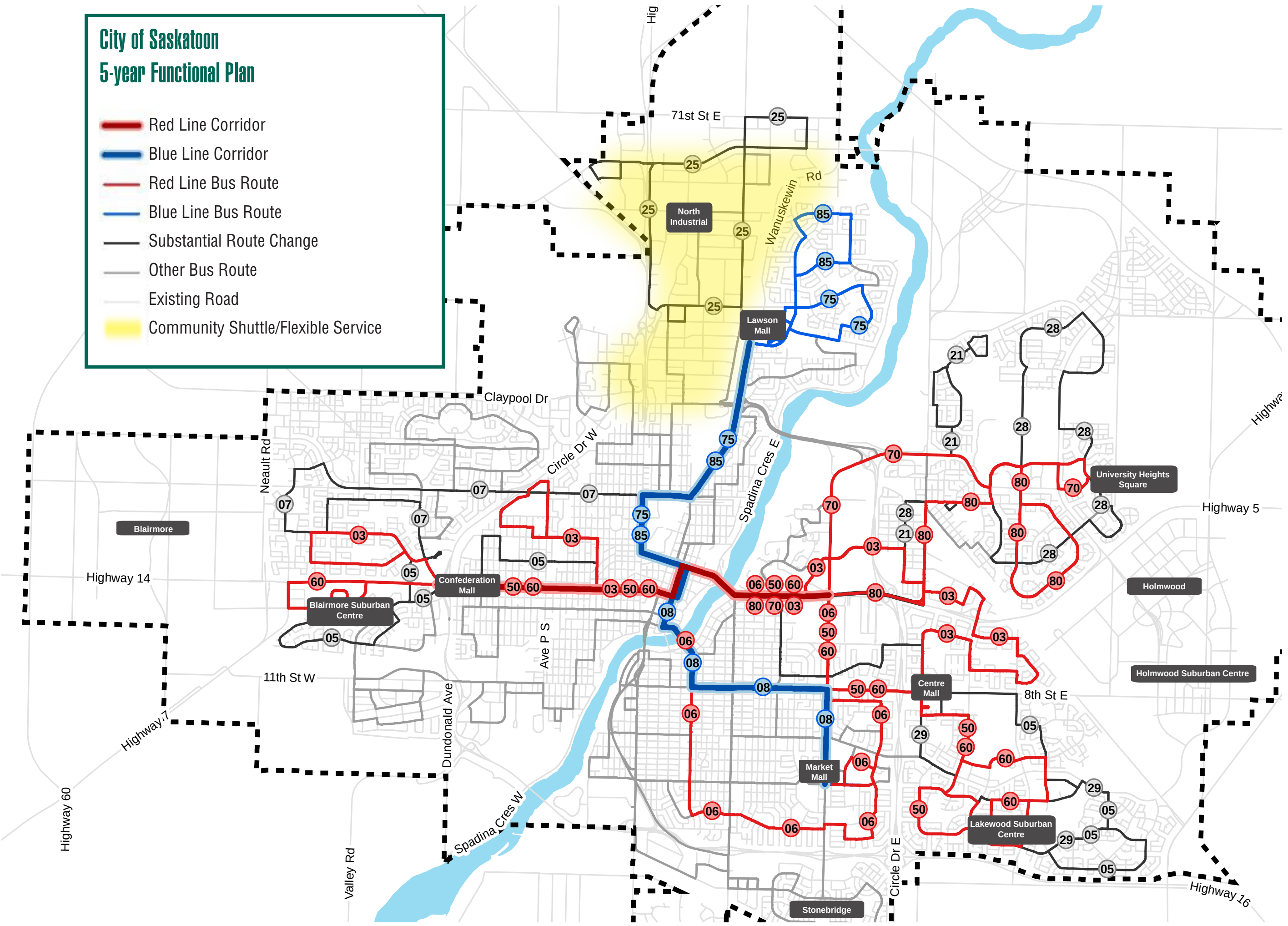


Figure 3.51 - 5 Year Transit Plan Implementation Process

C. Support Facilities

All of the support facilities for the Transit Plan are essential for the success of the long-term Transit Plan and are needed in the next 5 years to support planned service improvements and enhancements to customer service. **Table 3.08** summarizes the implementation priorities and order of magnitude cost estimates.

Plan Item	Implementation Activities	Order of Magnitude Cost
Bus Fleet Replacement	Replace 10 buses every year.	$5.0M per year
Bus Fleet Expansion	Purchase 5 additional buses every year.	$2.7M per year
Park-and-ride Lots	Complete siting studies for 5 park-and-ride lots with priority for implementation being given toward Red Line BRT station areas as noted on the plan.	$50,000 per year
Transition from Transit Terminals to BRT Stations	With the implementation of BRT corridors and stations along 3rd Avenue and College Drive, as well as alterations to the time transfer service design downtown, the existing downtown and University bus terminals may be decommissioned.	$5.0M

Table 3.08 - 5 Year Priorities for Transit Supportive Facilities

D. Red Line BRT Lanes and Stations

The 22 km and 25 stations along the Red Line BRT may be implemented in stages over the next 20 years as illustrated in **Figure 3.52**.

Figure 3.52 - Proposed Phasing for Red Line Dedicated Lanes and Stations

3.0 TRANSIT

Within the short-term, dedicated BRT lanes and stations could be implemented in the core areas of the city where transit service and ridership are highest, and congestion already impacts travel time and reliability for transit passengers. During the first 5 years of the Plan, dedicated lanes and stations along segments of 3rd Avenue and College Drive could be planned, designed and implemented.

Although the City will want to ultimately plan for centre or side running dedicated bus lanes along the entire Red Line BRT corridor, curb lanes are recommended for most of the priority corridors over the next 10 years. For College Drive, alternative configurations should be further explored for curb and side BRT lanes and stations. In general, the public's perception of transit expenditures and dedicated facilities will improve through incremental investment and implementation of BRT facilities over time as service levels and ridership grow. Conversely, a more negative public reaction could occur if there is investment in BRT facilities and conversion of general purpose traffic lanes for buses well ahead of the basic needs of the city's transit system.

Table 3.09 summarizes the implementation actions and costs associated with BRT facilities for the first 5 years. It should be noted that these costs are unit rates and should not be used for budgeting purposes. Rather, functional designs of the BRT streets and station areas will provide more reliable concepts and estimates of the changes required.

Implementation Activities and Cost

Activity:	Order of Madnitude Cost:
^ 3rd Avenue design and implementation	$1.2 – 1.8 M
^ College Drive design and implementation	$3.2 – 4.8 M

Table 3.09 - 5 Year Red Line BRT Implementation Priorities

E. Blue Line BRT Transit Priority

Over the next 5 years, the Blue Line BRT corridor will begin to see an increase in transit service and ridership. At the same time, corridors such as Broadway Avenue, 8th Street, Idylwyld Drive, and Warman Road will continue to experience growing levels of congestion during the peak periods of the day. In order to enhance travel time and reliability of transit service as well as the comfort of more and more passengers, transit priority treatments and facilities have been identified in the long-term plan. For all Blue Line BRT corridors, enhanced bus stop facilities with shelters, seating, lighting and other amenities will be implemented. **Table 3.10** summarizes the Blue Line BRT corridors that are planned to see transit priority treatments and facilities within the first 5 years of the Transit Plan.

	8th Street	Broadway Avenue	3rd Avenue
TRANSIT OPERATIONS			
Express Bus Service	✓	✓	✓
Increase Stop Spacing	✓		
All Door Boarding	✓	✓	✓
TRANSIT FACILITIES			
Optimize Signals	✓	✓	✓
Signal Pre-emption	✓	✓	✓
Intersection Queue Jumpers	✓	✓	
All Door Boarding	✓	✓	✓

Table 3.10 - 5 Year Blue Line Transit Priority Treatments

Table 3.11 summarizes the 5 year implementation priority actions and costs associated with implementation of Blue Line BRT treatments. It should be noted that these costs are unit rates and should not be used for budgeting purposes.

Implementation Activities and Cost

Activity:	Order of Madnitude Cost:
^ 8th Street (Broadway - Preston)	$2.5 M
^ Broadway Avenue (8th – Bridge)	$2.0 M
^ 3rd Avenue (Bridge – 22nd Street)	$2.0 M

Table 3.11 - 5 Year Blue Line BRT Implementation Priorities

3.6.2 10 Year Priorities

This stage of implementation will involve monitoring progress on the first 5 years of the Plan and to gauge the impacts of the changes as they are being implemented. In all likelihood, adjustments will be required to address issues and to raise public confidence in the City's commitment toward strengthening transit in Saskatoon.

This stage of implementation will also build many of the initiatives that began during the first 5 years and begin new initiatives where needs are anticipated and being realized. The following discussion highlights the 5 to 10 year priorities for implementing the Transit Plan. Once again, it should be noted that the cost allocations are estimates only and intended to provide guidance on the order-of-magnitude investment that may be required. These figures should not be used for budgeting purposes.

A. Improving the Customer Experience

Once again, the City will want to monitor progress on the first 5 year initiatives around improving the customer experience and confirm that these investments are making a difference. Through customer surveys, the City will also be able to assess customer feedback that may be used to guide not only the customer service improvements, but all aspects of current day services and possible improvements.

For the next 5 years of the implementation, the City will want to continue with many of the customer service initiatives, in addition to implementing key facility improvements such as required with universally accessible transit stops and stations. **Table 3.12** highlight the priorities for implementing customer service and facility improvements for the 5 to 10 year period.

Plan Item	Implementation Activities	Order of Magnitude Cost
Real Time Bus Arrivals	Implement GPS technology within all new buses and upgraded stop facilities. Implement digital displays at BRT stations	$50,000/yr
Mobile App	Provide routing, stop and GPS location data to third party developers.	$25,000/yr
Ongoing Website Upgrades	Review and develop best practices for website design features. Implement ongoing upgrades to enhance trip planning.	$20,000/yr
Universal Accessibility	Prepare universal accessible bus stop design guidelines. Implement accessibility improvements at select number of stop locations. Work with other City departments to explore accessibility treatments surrounding transit.	$52,000/yr
Community Outreach	Engage and share information with special interest groups on the transit system, particularly with groups such as seniors, youth and people with disabilities.	$180,000/yr
Customer Service Staff Training	Provide basic customer service level training for all staff. Provide expanded training for working with disabled customers.	$180,000/yr
Customer Satisfaction Surveys	Implement annual customer satisfactions surveys by route.	$40,000/yr

Table 3.12 - 5 to 10 Year Customer Service and Facility Improvements

B. Service Plan

Once again, the City will want to monitor performance of all routes in the system and compare with customer feedback and suggestions. The intent of the 5 to 10 year implementation plan is to continue the shift of providing the most attractive services to the largest transit markets, while providing a basic level of coverage in low density, single use areas where ridership is likely to remain well below the system performance averages and acceptable levels based on common measures such as cost per ride. The following discussion highlights the 5 to 10 year priorities for modifying and expanding service levels.

- **Optimize Existing Transit Services.** The City should continue annual reviews and reporting of performance of existing services and identify opportunities for optimizing resources through service cuts, routing or modifying periods of operation.

- **Enhance Services on Key Corridors.** In some cases, current day service hours may be modified or shifted to other routes in the system where ridership is high and potential is greatest. The City will want to explore the trade-offs of shifting services toward routes and corridors that increase frequencies on the Red and/or Blue Line BRT corridors.

- **Introduce New Services.** During the 5 to 10 year periods of implementation, the City will want to not only concentrate more services on the rapid and frequent transit corridors presented in the Transit Plan, but to begin implementing community shuttle or flexible neighbourhood services as a replacement for fixed route service in low density residential and employment areas.

- Once again, the 5 to 10 year implementation priorities are centred on increasing overall annual service hours at 2.5% per year. Service increases are primarily directed towards improving weekday peak and midday services as well as some weekend service improvements. Over the next five years of the implementation, service levels would increase from 463,000 to 524,000 annual service hours. A conceptual level 10 year service plan is thematically illustrated along with the 5 year changes in **Figure 3.53**. All service changes should be examined with annual performance data as well as through the engagement of transit customers and other stakeholders.

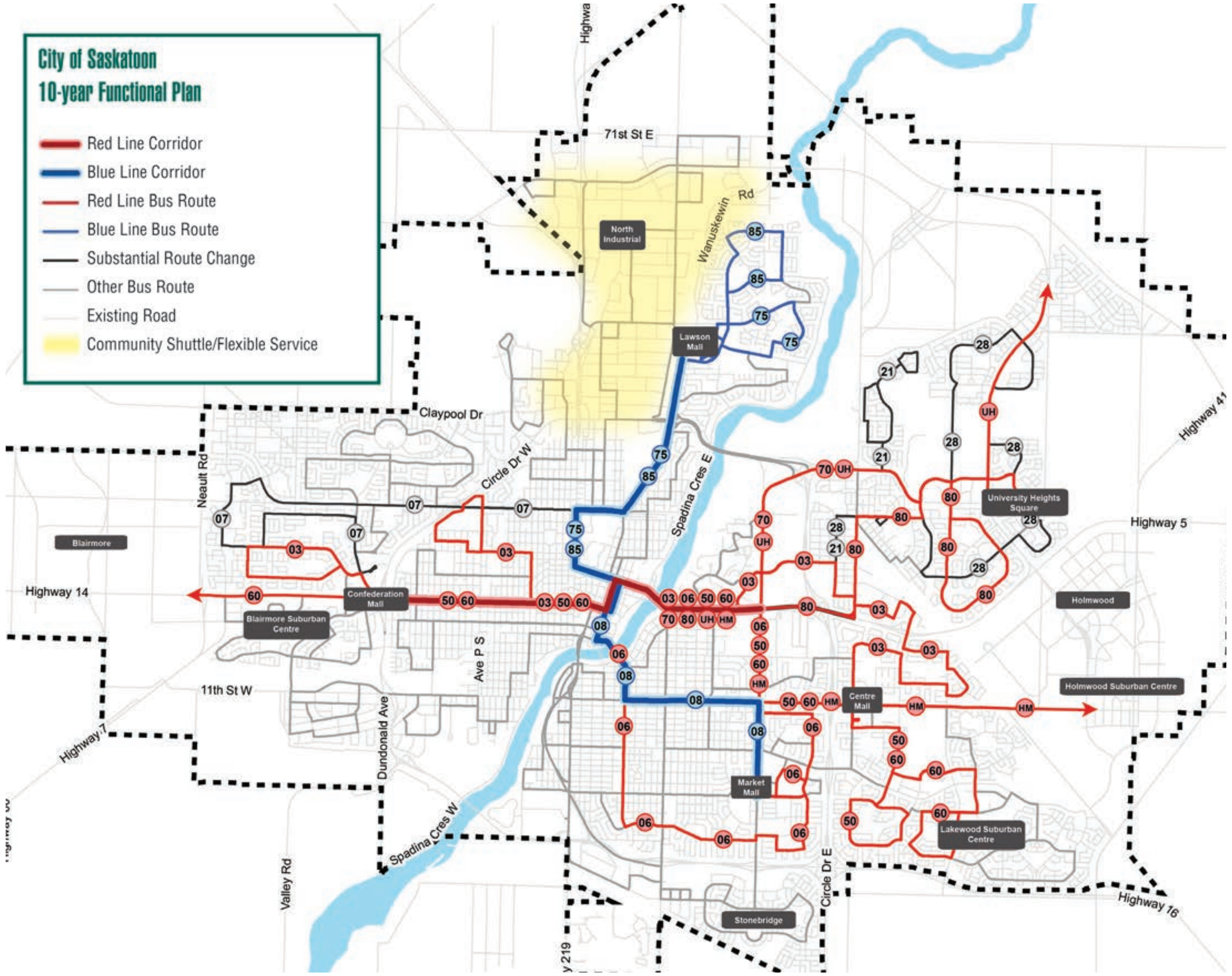


Figure 3.53 - 10 Year Transit Plan Implementation Process

C. Support Facilities

Support facilities required for the 5 to 10 year implementation period are essentially building from the service plan commitments as previously described along with other support facilities. **Table 3.13** summarizes the implementation priorities and order-of-magnitude cost estimates.

Plan Item	Implementation Activities	Order of Magnitude Cost
Bus Fleet Replacement	Replace 10 buses every year.	$5.0M per year
Bus Fleet Expansion	Purchase 5 additional buses every year. Annual Maintenance.	$2.7M per year $40,000 per year
Park-and-ride Lots	Implement 3 park-and-ride lots near Confederation, Wildwood and University Heights	$50,000 per year

Table 3.13 - 5 to 10 Year Priorities for Transit Supportive Facilities

D. Red Line BRT Lanes and Stations

After the first 5 years of implementation, the City will want to monitor progress and results with the implementation of high priority facilities already implemented. In some cases, improvements may be required while other locations may require expanding periods of operation or even operational improvements at signalized intersections. As with any of the monitoring initiative, changes should be transparent to all decision-makers and the public in order to assure the community that resources are be invested and results are being achieved.

The second stage of priorities for implementing BRT lanes and stations should continue in the core ares of the city where transit service and ridership are growing, and congestions levels continue to impact travel times for transit customers and the system. Between years 5 and 10, bus lanes and stations should be implemented along 22nd Street between 3rd Avenue and Circle Drive, as well as along 25th Street between 3rd Avenue and the University bridge. It should be noted that grade separation of the 22nd Street railway crossing would support investments in BRT but would not be a precondition for implementing curb bus-only lanes along the Red Line BRT corridor. Additional planning and design could also commence for BRT corridors and stations to be implemented beyond the 10 year time-frame.

Table 3.14 summarizes the implementation actions and costs associated with BRT facilities for the 5 to 10 year implementation period. It should be noted that these costs are unit rates and should not be used for budgeting purposes. Rather, functional designs of the BRT streets and station areas will provide more reliable concepts and estimates of the changes required.

Implementation Activities and Cost

Activity:	Order of Madnitude Cost:
^ 22nd Street design and implementation	$8.2 M – 14.1 M
^ 25th Street design and implementation	$2.2 – 3.3 M
^ Preston-University Heights design	$11.4 – 17.1 M
^ 22nd Street-Blairmore design	$5.0 – 7.5 M
^ Preston – 8th Street Holmwood design	$13.0 – 19.5 M

Table 3.14 - 5 to 10 Year Red Line BRT Implementation Priorities

E. Blue Line BRT Priority Treatments

Over the next 5 years, segments of the Blue Line BRT corridor will continue to see increased transit service and ridership as well as growing congestion and delays during peak periods. Transit priority treatments may be expanded to further enhance the transit service reliability and speed through treatments and facilities identified in the Plan.

Implementation Activities and Cost

Activity:	Order of Madnitude Cost:
^ Idylwyld Drive (25th Street – 33rd Street)	$2.5 M
^ 33rd Street (Idylwyld Drive – Warman Road)	$2.0 M
^ Warman Road (33rd Street – Primrose Drive)	$2.0 M

Table 3.15 - 5 to 10 Year Blue Line Transit Priority Treatments

For all Blue Line BRT corridors, enhanced bus stop facilities with shelters, seating, lighting and other amenities will be implemented. **Table 3.15** summarizes the Blue Line BRT corridors that are planned to see transit priority treatments and facilities within the 5 to 10 year periods of the Transit Plan. It should be noted that these costs are unit rates and should not be used for budgeting purposes.

3.6.2 Longer Term (Beyond 10 Years)

Throughout the first 10 years of implementation, the City will monitor progress in terms of both investments and outcomes of the transit system along with land use patterns. Beyond the 10 year priorities, the City will:

- Continue annual reviews to optimize service delivery and ensure Transit Plan implementation is on track.
- Implement additional customer service improvements (outreach, website upgrades, customer satisfaction surveys)
- Continue fleet renewal and expansion.
- Continue increasing service hours and frequencies to high ridership areas.
- Expand planning, designing and constructing remaining Red Line BRT.
- Plan, design and implement park-n-ride lots for Lawson Heights and Market Mall.

3.7 Financing Transit

Transit in Saskatoon is governed by City Council and managed through the City's Transportation and Utilities Department. In this regard, City Council is responsible for all decisions regarding service plans, fares and local taxes associated with transit investments. The operation of conventional and specialized transit services is the responsibility of Saskatoon Transit, which operates all fixed route bus and Access Transit services. This responsibility also includes the delivery of services, maintenance, marketing, customer service, and fare collection.

Unlike many jurisdictions in Canada, transit decisions in Saskatoon are very much in the purview of those making decisions on other matters that can dramatically influence the success of transit as illustrated in **Figure 3.54**. In particular, land use and transportation decisions can affect everything from access to transit through to the ability of transit to serve larger customer markets associated with higher scale of development, density of development, and mixture of land uses. Consistent with the Growth Plan, 50% of new growth in Saskatoon is expected to occur within the core areas of the city inside Circle Drive. This growth will ensure that frequent, direct and fast services can be provided to the largest customer markets. As a result, more people will have access to the most attractive transit services in the city. Council's commitment to promote plans for Strategic Growth Areas, Neighbourhood Infill and Corridor Growth will ultimately influence the success of transit.

Beyond planned land use changes, directions for other modes can also impact the success of transit. For example, building roadway capacity to address congestion in the core area of the city, and providing abundant supplies of low cost long-term parking in the Downtown and other growth areas can undermine the success of transit and other sustainable modes of transportation.

Figure 3.54 - Key Factors to the Success of Transit

The funding for transit operations in Saskatoon is primarily the City's responsibility, with some Federal assistance for capital improvements through grant programs. Unlike many other provinces however, there has historically been no provincial funding provided directly to transit operations and capital expansion. Further, transit operations are principally funded through the farebox and property taxes, with limited ability to access other funding sources. Although many factors contribute toward the success of transit as previously noted, the efficiency of the system is important to ensure that resources are used wisely.

Over the next 30 or more years, investments in transit services and facilities must increase significantly in order to improve not only the experience for transit customers, but also to ultimately increase ridership. Annually, additional service hours and new fleet are required to gradually change and increase service levels in key areas of the city as summarized in **Table 3.16**. Improved facilities ranging from accessible stops and station areas with customer amenities through to BRT lanes and transit priority treatments on select streets will require significantly more financial resources to implement and support.

	Total Population	Cost per Service Hour (2015 $)	% Farebox Recovery
Saskatoon Today	248,700	$87	35%*
Saskatoon Tansit Plan (long-term)	500,000	$87	49%
Other Communities			
Regina	210,600	$77	37%
Victoria	359,800	$108	43%
Waterloo Region	509,400	$108	41%
Winnipeg	699,300	$86	61%

Source: Saskatoon: % Farebox Recovery derived from 2012 farebox ridership and passenger revenues; other categories and all other cities: CUTA Factbook (2013).

Table 3.16 - Measures of Efficiency

Even with changing land use patterns and strategic improvements in other parts of the transportation system, investments in additional service hours as well as transit programs and facilities must be targeted. In this regard, the largest potential customer markets should see the most attractive service levels and facilities, while other lower density areas of the city may continue to see modest levels of service. With this strategic approach, a more than doubling of service hours is projected to yield a threefold increase in ridership by the time that Saskatoon's population reaches half a million people. Despite an improved farebox recovery with increased ridership, Saskatoon will still rely on property taxes to cover approximately 50% of the operating cost for transit without other funding sources.

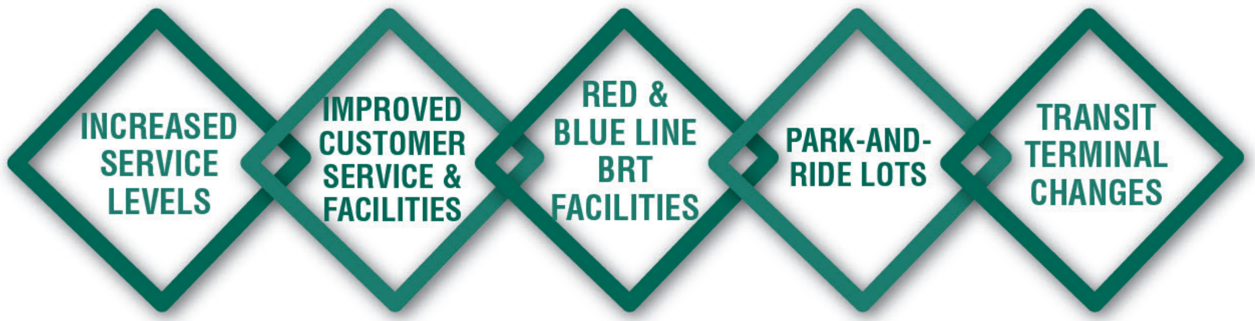


Figure 3.55 - Increased Transit Capital, Operating and Maintenance Responsibilities

As Saskatoon grows, the City will continue to see more diverse needs and expectations beyond transit and transportation that rely on property tax for funding. Much like other cities, Saskatoon's growth to half a million people will continue to place increasing pressures on social, recreational and community safety services and facilities. With growing reliance on property taxes to fund many other municipal priorities, Saskatoon must seriously consider additional funding sources for transit services, facilities and programs. Some of those potential funding sources are already permitted within current practices and others will require legislative changes as well as new agreements with the Province.

The City recently completed a study on funding growth related infrastructure (Financing Growth Study), a portion of which may apply to transit facilities such as BRT lanes and stations. Development levies for example, allow Saskatoon to charge for local and off-site services required to support new development. The fees are administered under the annual prepaid services rates (Direct and Offsite) adopted by Council. Levies may generally be applied to growth related infrastructure such as roads (including bridges), parks, and recreational facilities as well as water, wastewater and stormwater infrastructure. Although transit is technically not included as a defined service supported by development levies, road improvements supporting BRT related facilities may be included if serving growth in the city. For example, BRT lanes and related street improvements are essential to support long-term growth of the city. Without growth, in fact, there would be very little need to alter streets and invest in BRT related facilities. The City should explore the extent of the capital investments in BRT facilities that may be supported through development levies in addition to other funding from the province and federal governments.

As a starting point for the discussion with Council and senior levels of government, **Table 3.17** summarizes additional revenue sources that should be considered to implement planned transit services and facilities identified in the Growth Plan. The City will want to examine these alternatives and carefully consider the experience of other jurisdictions.

Potential Funding Sources

Operating Revenues:	^ Transit Fares, Program Revenues, Charters & Special ^ Event Fees ^ Advertising	
Local Property Tax		
Park-and-ride Facility Charges		
Surcharges	^ Parking Surcharge ^ Sales Surcharge ^ Vehicle Registration Levy	^ Motor Vehicle Fuel Surcharge
Private Sector Partnerships	^ Partnership with Major Employers ^ Land Value Capture & Leases	
Senior Government	^ Capital Grant Programs ^ Regional Partnerships Initiative	^ Building Canada Fund ^ Provincial Grants and Funding to be explored

Table 3.17 - Potential Funding Sources

APPENDIX A - ALTERNATIVE RAPID TRANSIT EVALUATION

Part 1 - Alternative Rapid Transit Technologies

Ultimately, rapid transit is intended to shape and support growth in addition to providing an attractive transportation choice. Rapid transit stations and corridors are more than a 'utility' for the community. They should be designed as vibrant urban environments that are attractive and comfortable for people. Rapid transit systems are also unique from the rest of the transit system in that they are identifiable corridors with mostly or entirely separate travel lanes, enhanced transit stations for the comfort of passengers and real-time information that can enhance the customer experience and system operation. Depending on the demands, the goals for growth and an enhanced experience can be achieved with either a bus or rail based system. This section of the report examines forecast rapid transit ridership levels and patterns along the designated rapid transit corridors and the capacity of bus and rail rapid transit technologies.

The general features of Bus Rapid Transit (BRT) and Light Rail Transit (LRT) considered for Saskatoon are summarized in **Table A.01.**

- **In the long-term (thirty years), the Red Line candidate rapid transit corridors in Saskatoon are projected to carry as many as 2,400 passengers per hour in the PM peak direction. Figure A.01** illustrates the forecast 2040 afternoon peak hour transit ridership for each corridor carrying transit services including the candidate rapid transit corridors. Along the Blairmore – University Heights – Holmwood segments of the rapid transit routing, the peak directional ridership of 2,400 passengers occurs in the eastbound direction on College Drive, just east of the University. Within and on the western portions of the downtown, peak directional ridership on 22nd Street and 3rd Avenue is projected to be as much as 1,600 passengers during the PM peak hour. Beyond the Downtown and University areas of the east-west rapid transit route, projected long-term ridership along 22nd Street, Preston Avenue and Attridge Drive segments of the rapid transit corridor is approximately 1,000 passengers or less per direction during the PM peak hour.

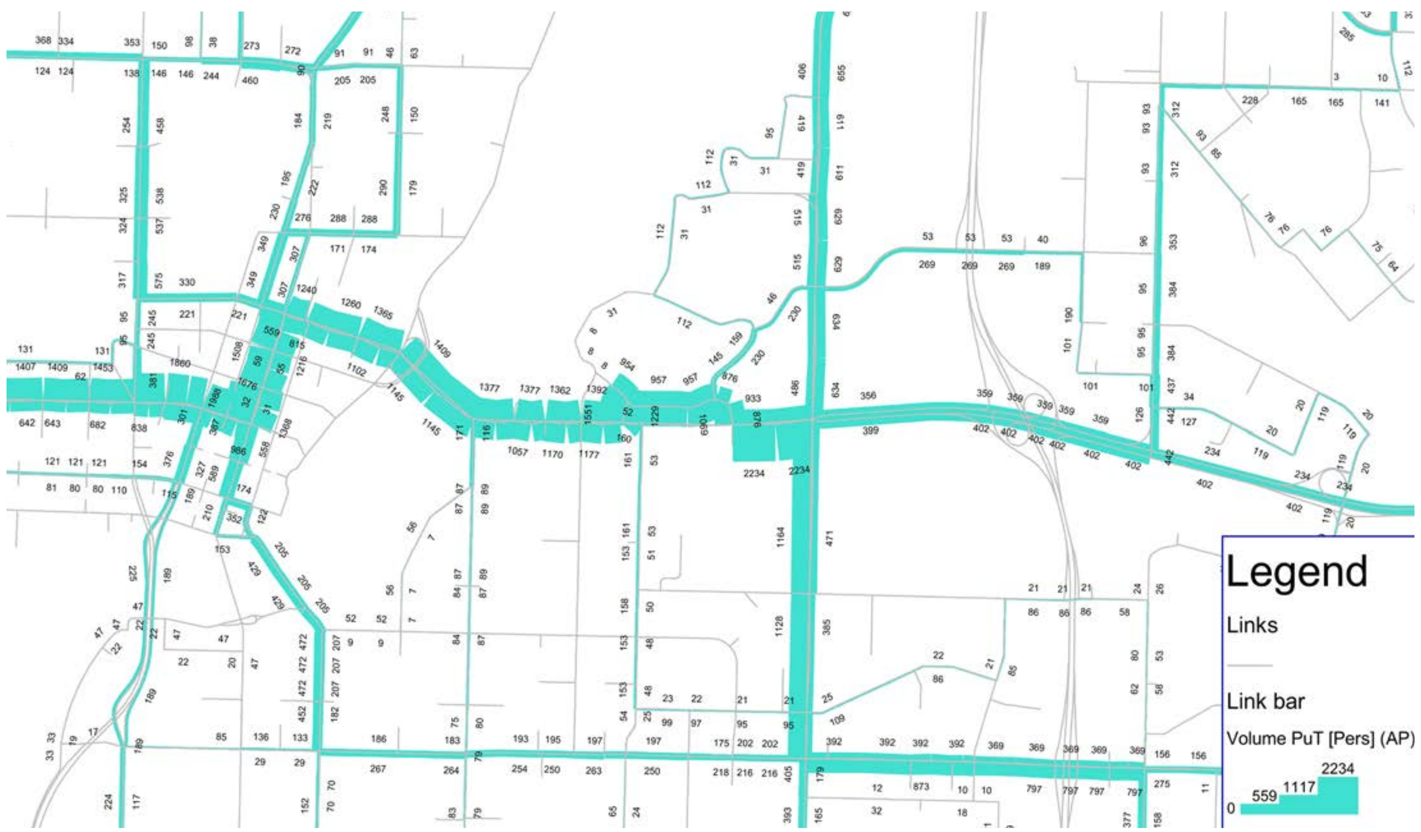


Figure A.01 - PM Peak Hour Transit Ridership Forecast (2040)

	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)
OVERVIEW	 Conventional and articulated buses operating in an exclusive, dedicated road space with priority through signalized intersections and enhanced customer information at stations. Some segments may be shared with general purpose traffic.	 Rapid transit service operating in a dedicated transit right-of-way using rail vehicles
RIGHT-OF-WAY	Bus lanes operating in: a. Centre Lanes separated from traffic b. Side Lanes separated from traffic c. Curb Lanes shared with right turn vehicles at key intersections d. Roadway shoulders without curb and sidewalks	Rail tracks with LRT vehicles operating in: a. Centre Lanes separated from traffic b. Side Lanes separated from traffic c. Curb Lanes shared with right turn vehicles at key intersections
MAXIMUM FREQUENCIES	As much as every 1-2 minutes	As much as every 2 minutes
VEHICLE TYPES	Typically 20 metre articulated buses, using low floor technology for universal access. Approximately 120 passengers seated and standing.	Light rail vehicles range in size up to 40 metres and can carry up to 4 cars. Approximate capacity of 250 passengers per car seated and standing.
SYSTEM CAPACITY	As much as 5,000 and 10,000 passengers per hour per direction on urban roads and dedicated transitways.	Up to 20,000 passengers per hour per direction.
2040 ONE-WAY TRAVEL TIMES SAVINGS (BLAIRMORE TO UNIVERSITY HEIGHTS)	25 to 50 minutes	25 to 50 minutes
2040 ONE-WAY TRAVEL TIMES SAVINGS (BLAIRMORE TO HOLMWOOD)	30 to 50 minutes	30 to 50 minutes
EXAMPLES	Ottawa, Winnipeg, York Region and Eugene	Edmonton, Calgary, Portland, Seattle, Strasbourg and Berlin

Table A.01 - General Features of Bus Rapid Transit (BRT) and Light Rail Transit (LRT)

As previously indicated, the Blue Line rapid transit service between Nutana Suburban Centre and Lawson Heights generates significantly less ridership in the long-term than the east-west corridor. Combining the Idylwyld and Broadway routes, the maximum peak hour ridership on any specific segment of the candidate rapid transit corridor for the long-term is estimated to be less than 600 passengers in the peak direction.

- **The peak directional ridership of 1,600 and 2,400 passengers per hour along the Red Line (Blairmore-University Heights-Holmwood) could be accommodated in 30 to 40 buses per hour (as opposed to 1,450 to 2,150 vehicles per hour).** Similar to other cities in North America, roadway space in the established areas of Saskatoon is finite. In other words, the street network is largely built out and most major roadways are already four travel lanes or more without additional right-of-way for widening. As previously described, forecast delays and congestion in the core areas of the city are projected to increase dramatically over the next thirty years.
- **Looking ahead, the carrying capacity of the transportation system inside Circle Drive must be increased in order to accommodate growing travel demands with limited opportunity to expand the roadway network.** Transit in general, and rapid transit specifically, provides the opportunity to substantially increase the people carrying capacity of the transportation system. The forecast peak directional ridership of 2,400 passengers (at the maximum load point in the east-west rapid transit corridor) could be accommodated with approximately 40 buses per hour (or 1 bus every 90 seconds) as illustrated in **Figure A.02** below. Alternatively, this travel demand would require approximately three lanes of urban roadway in each direction in order to support up to 2,150 vehicles.

Figure A.02 - Carrying Capacity of Cars and Buses

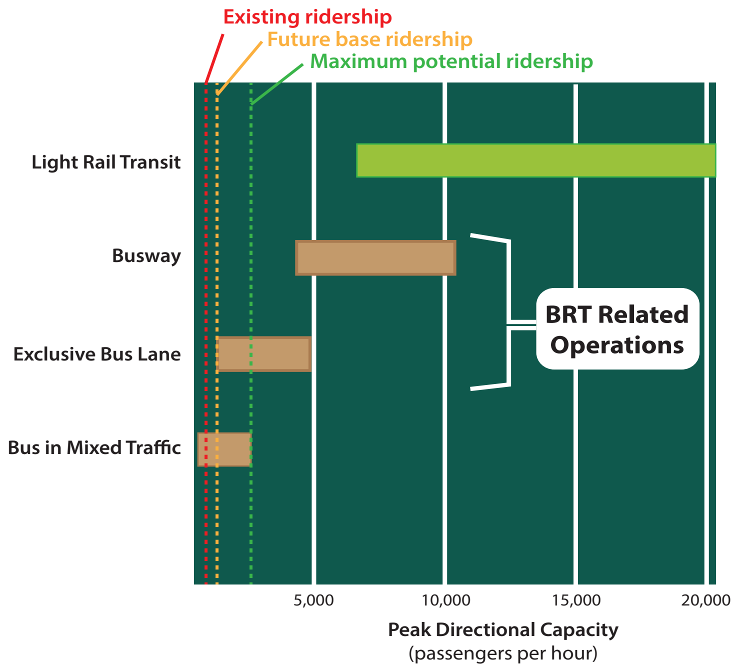


Figure A.03 - Peak Directional Capacity vs Transit Mode and Ridership

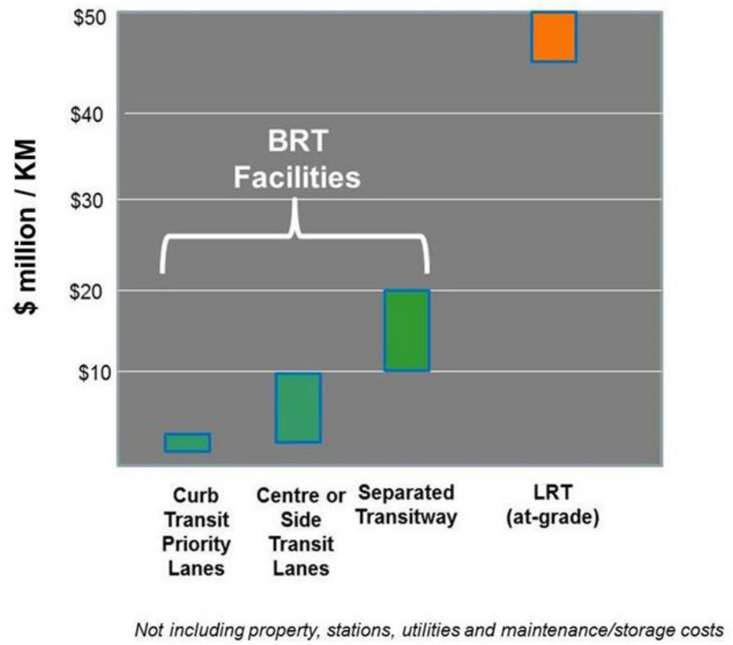


Figure A.04 - Typical Rapid Transit Facility Capital Costs

- **The capacity of a Bus Rapid Transit (BRT) technology can comfortably serve the projected peak ridership for more than the next thirty years.** The carrying capacity of a transit corridor can act as a constraint to growing ridership once operating capacities are approached or exceeded. **Figure A.03** illustrates the capacity ranges and projected thirty year peak ridership levels for each of the candidate rapid transit corridors. These forecasts suggest that the maximum passenger loads along the Red Line rapid transit corridor are well within the capacity of a dedicated bus lane operation for an urban street environment. Outside the core areas of the city, peak directional ridership projections along the rapid transit corridor could be accommodated in mixed-use lanes with general purpose traffic. In the very long term however, the City will want to implement dedicated lanes to reduce delays due to traffic congestion and increase capacity of the transit system.
- **Although a higher capacity system such as Light Rail Transit (LRT) may be required to support long-term ridership well beyond the next thirty years, the capital and operating cost differences between bus and rail technologies are significant. Bus based systems can typically cost anywhere from $100 to $120 per service hour to operate where rail based systems can cost approximately $400 to $500 per hour.** Beyond the significant operating cost differences, the capital cost for bus based rapid transit systems can also be significantly different as illustrated in **Figure A.04.** BRT facilities can cost anywhere from $2 million per kilometre to as much as $20 million per kilometre, while rail based or LRT systems can cost up to $50 million per kilometre. These costs do not include fleet, stations, property, utility and storage, and maintenance for vehicles. Considering the projected ridership for the next thirty years, Saskatoon is well within the capacity of a BRT system. As such, the additional investment required to implement and operate LRT could not be justified with a business case where the system benefits would exceed the expected costs.

Part 2 - Alternative Routing for Rapid Transit

The Red Line Rapid Transit connection serves travel between Blairmore, University Heights and Holmwood. This east-west corridor supports the largest ridership in the city today. In fact, many of the existing transit generators are located along these proposed east-west rapid transit corridors illustrated below in **Figure A.05**.

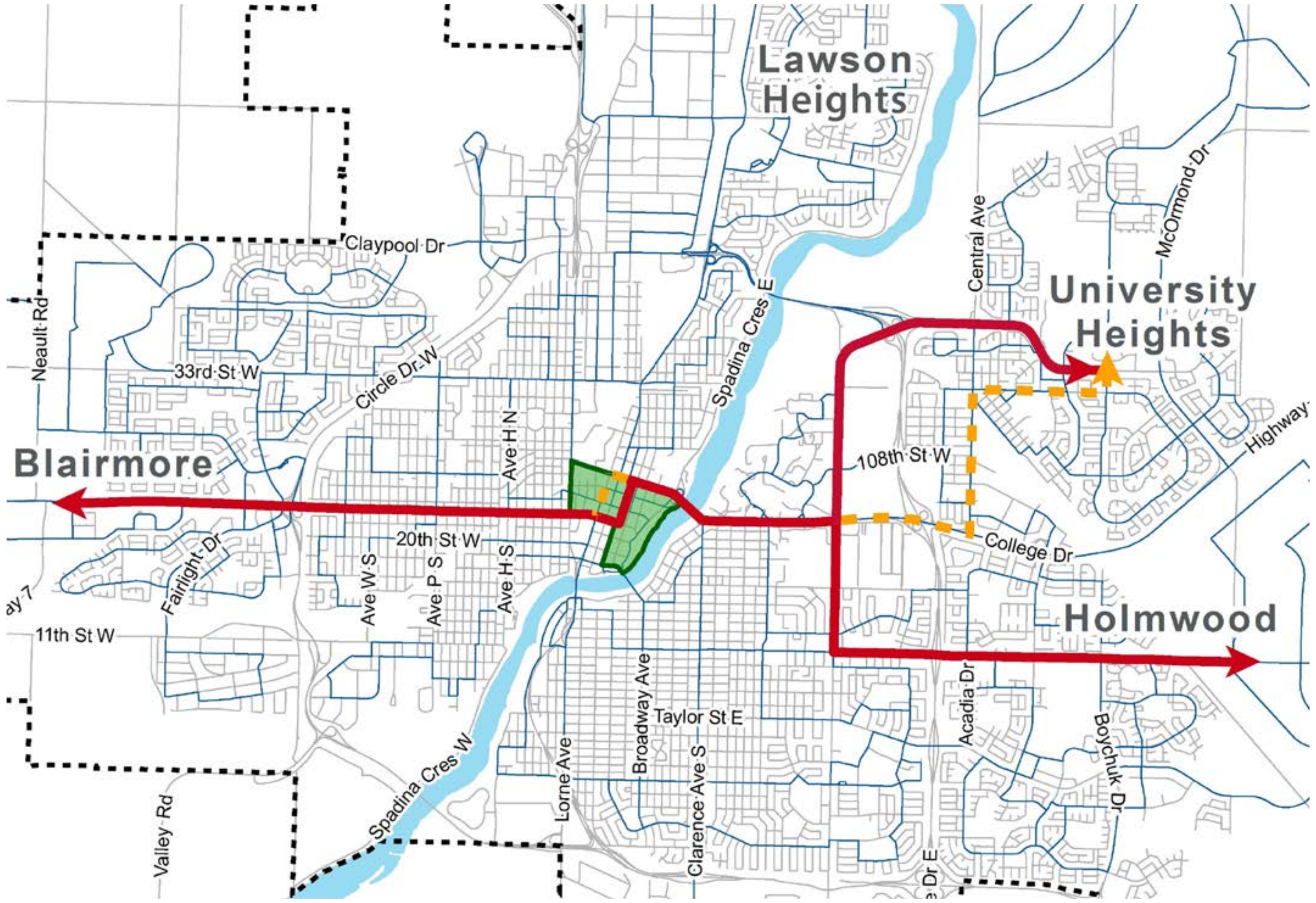


Figure A.05 - Alternative Routing

The proposed corridors for the east-west rapid transit service are briefly highlighted below by segment:

A) DOWNTOWN RED LINE ROUTING (3RD AVENUE OR 1ST AVENUE DOWNTOWN);

3rd Avenue or 1st Avenue would serve as the north-south connection between 22nd Street and 25th Street within the downtown. Both 3rd and 1st Avenues are four lane roadways with on-street parking on both the east and west sides of the street. Peak hour, peak directional traffic volumes on 1st Avenue are approximately twice that of 3rd Avenue, which is generally a function of the difference in network connectivity. 1st Avenue serves north-south travel entering the downtown area from the Senator Sid Buckwold Bridge and serves as an alternative to Idylwyld Drive, while 3rd Avenue generally serves the downtown area between 19th Street and 25th Street.

Criteria	Downtown Red Line Options: 3RD AVENUE	Downtown Red Line Options: 1ST AVENUE
Existing Population	◐	○
Existing Employment	●	◐
Potential for Transit Oriented Growth	●	◐
Ridership Potential	●	●
Roadway Suitability	●	○
Comments	^ Connects with more jobs and residents ^ Similar ridership potential 2,000 passengers/hr in pk direction ^ Secondary downtown street with 400 veh/hr / direction today & 900 v/h/d future ^ Permanent transit lane physically possible	^ Ridership potential (2040): 2,000 passengers/hr in pk direction ^ Vehicle volumes: 800 Ex. (1,300 Fut. Base) vehicles/hr in pk direction ^ Permanent transit lane physically possible ^ Primary N-S traffic corridor ^ Higher traffic volumes impacted
Recommendation	PREFERRED OPTION	NOT RECOMMENDED

● HIGH ◐ MODERATE ○ LOW

Table A.02 - Evaluation of Alternative Downtown Red Line Routing

The comparative assessment of each route alternative through the downtown is summarized in **Table A.02** in terms of relative land use patterns, potential transit ridership, and roadway suitability. Based on this review, 3rd Avenue serves a larger proportion of the population and employment within the downtown area than 1st Avenue today and in the long-term. In other words, a larger number of residents and jobs are located within closer walking distance to 3rd Avenue than the 1st Avenue corridor.

The implementation of rapid transit along either north-south corridor will also require the removal of one general purpose traffic lane in each direction and potentially on-street parking in select locations to accommodate station areas. Existing and forecast traffic volumes, as well as the broader network connectivity, suggests that the impacts of reducing travel lanes on 1st Avenue is slightly greater than 3rd Avenue. Based on these factors, 3rd Avenue is recommended as the preferred rapid transit corridor through the downtown area.

A

B) EAST SIDE ROUTING OPTIONS (UNIVERSITY HEIGHTS TO COLLEGE / PRESTON);

Alternative routes between University Heights and College Drive at Preston Avenue include: College Drive / Central Avenue / 115th Street; or Preston Avenue / Attridge Drive. College Drive and Central Avenue are classified as major arterial roads and 115th Street is classified as a major collector roadway. East of Preston Avenue, College Drive supports six travel lanes and Central Avenue and 115th Street support two travel lanes and on-street parking in some sections. Preston Avenue (north of College Drive) and Attridge Drive are classified as major arterial roads that support four to six travel lanes. On-street parking is restricted along both roadways.

Criteria	EASTSIDE RED LINE OPTIONS: VIA CENTRAL AVENUE	EASTSIDE RED LINE OPTIONS: VIA ATTRIDGE
Existing Population	●	○
Existing Employment	○	●
Potential for Transit Oriented Growth	◐	●
Ridership Potential	○	◐
Roadway Suitability	◐	●
Comments	^ Ridership potential (2040): 500 passengers/hr in pk direction ^ Vehicle volumes: 800 Ex. (1,500 Fut. Base) vehicles/hr in pk direction ^ Established community and 'main street' through Sutherland ^ Central Ave - Limited travel lanes & ROW crossing delays	^ Ridership potential (2040): 700 passengers/hr in pk direction ^ Vehicle volumes: 800 Ex. (2,400 Fut. Base) vehicles/hr in pk direction ^ Serves major regional shopping centre & significant planned growth ^ Serves north UofS campus and research park
Recommendation	NOT RECOMMENDED	PREFERRED OPTION

● HIGH ◐ MODERATE ○ LOW

Table A.03 - Evaluation of Alternative East Side Red Line Routing

Table A.03 summarizes the assessment of the relative land use, ridership and roadway suitability of each corridor for rapid transit. In terms of land use patterns, the Preston / Attridge routing offers greater potential for rapid transit based on existing employment and future potential transit-oriented growth than Central Avenue. In the long-term, potential ridership along the Central / 115th Street route is projected to be moderately lower than Preston / Attridge route.

When comparing roadway suitability, Preston / Attridge routing also rates higher. The constrained right-of-way and impact of rapid transit on parking would increase the impacts of rapid transit along Central Avenue and 115th Street. In comparison, rapid transit could generally be accommodated within the right-of-way along Preston Avenue and Attridge Drive with potential widening in some locations. Based on these factors, the Attridge / Preston routing is recommended as the preferred rapid transit corridor on the east side connecting University Heights to College Drive nearby the University.

Part 3 - Optional Configurations and Evaluations

As indicated in the following figure, there are three types of bus lane configurations available for consideration in Saskatoon: curbside, centre and side bus-only lanes. As indicated in the Technical Report, centre and side running lanes are more costly than curbside lanes. Curbside lanes can be implemented in stages, for select periods and directions to ultimately becoming bus-only lanes throughout the day and week. Ultimately, centre and side running lanes will be required to accommodate long-term conversion to LRT. These laning configurations are illustrated in **Figure A.06.**

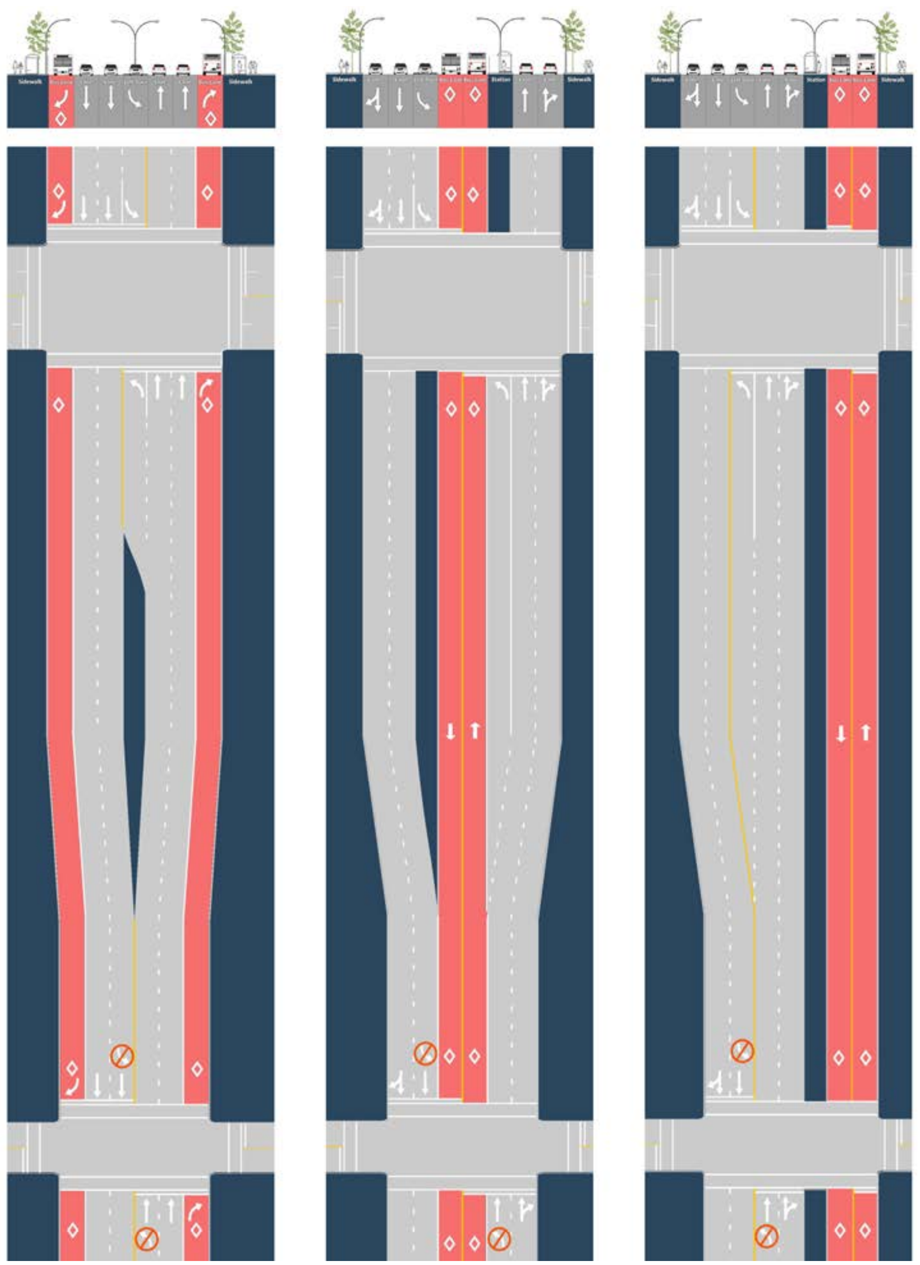


Figure A.06 - Alternative BRT Laning Configurations (6 Lane Road)

A high level evaluation framework is used to highlight and compare the qualitative and quantitative costs, impacts and benefits of each configuration for each corridor segment of the Red Line BRT. At this level, the evaluation framework is really intended to provide an overview of the requirements for each facility, to highlight the benefits and impacts and to provide stakeholders with a comparative evaluation of the dedicated bus lane options. Further planning and design will be required to implement specific configurations and station locations. In the long-term, the actual configurations may shift from curb to centre or side facilities as services and ridership grow and sufficient rights-of-way are acquired along each of the corridors (particularly at station areas).

The following section describes the three accounts examined within this review, along with related measures.

- The transport account considers the impacts and benefits of a proposed concept on the transportation system that include, but are not limited to, the transit system, traffic circulation and conditions, bicycle and pedestrian facilities as well as parking where applicable. The specific measures and assumptions are briefly summarized below:
  - Peak transit travel time reductions (minutes) relative to a business-as-usual condition using model conditions with half a million people.
  - Transit operation in terms of shared or exclusive bus only and traffic access.
  - Period of operation where bus only designation may either be flexible for peak periods only or permanent operation 24 hours a day, 7 days a week.
  - Roadway width change required to support bus only lanes.
  - Travel lane changes for general purpose traffic if impacted.
  - On-street parking impacts where removal / relocation of on-street parking may be required.
  - Side street and driveway access changes to adjacent properties where impacted.

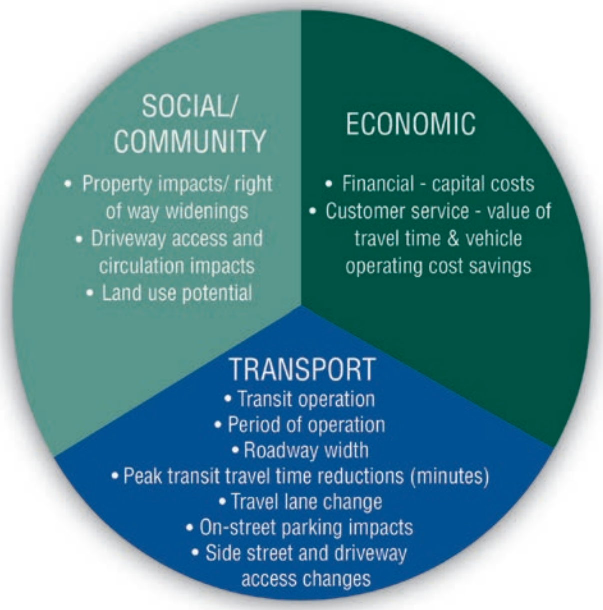


Figure A.07 - Evaluation Framework

- The social account including any impacts on right-of-way, driveway access, and any impacts or benefits to surrounding land uses along the corridor.
- The financial account highlights the overall monetary benefits and costs of each concept. Conceptual costs are estimated based on a linear estimate of the specific configuration based on industry experience in other cities ($2.0-$3.0 million per kilometre for curb bus lanes and $15-$20 million per kilometre for centre or side bus lanes). Structural works at interchanges or railroad grade separation are assessed at $35 million each. The travel time savings for transit passengers and transit operations with dedicated bus lanes are identified in comparison to a service level without dedicated bus lanes. The present values of the benefits and costs are calculated with the following standards generally used for business cases:
  - Travel time benefits are calculated based on a $19/hour value of time. This value of time figure is tied to an $80,010 average household income for Saskatchewan.
  - Transit operating savings are estimated based on a $90/hour value of time for the operator.
  - PM peak hour travel time savings are multiplied by a factor of 6 to represent weekday travel time savings. This approach accounts for two hours of peak conditions in the AM and PM periods as well as lesser degrees of travel time savings throughout the rest of the day. Regardless of configuration, dedicated bus lanes are assumed to ultimately be in operation all the time.
  - While it is recognized that travel time savings will likely occur on weekends as well as weekdays, to be conservative, annual travel time savings are calculated to reflect weekdays only (i.e. daily travel time savings are multiplied by 260 weekdays in a calendar year).
  - The economic evaluation is calculated over a 25 year term for the entire corridor from Blairmore to University Heights and Holmwood. The evaluation assumes an opening year of 2020. A discount rate of 6% is used for the purpose of the economic analysis.

A) 22ND STREET (BLAIRMORE TO 3RD AVENUE)

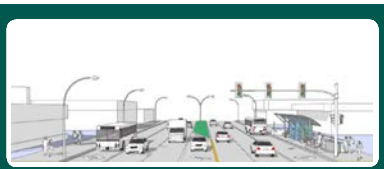
The segment of 22nd Street between Blairmore and 3rd Avenue extends approximately 6.6 km and includes both rural and urban roadway cross-sections (see **Figure A.08**, below). The 22nd Street corridor generally consists of three travel lanes per direction west of Confederation Drive and three lanes east through to 3rd Avenue. West of Circle Drive, the right-of-way ranges anywhere from 80 metres to 100 metres and connections to 22nd Street are limited to major roadways. East of Circle Drive, the right-of-way is approximately 30 metres to 32 metres with multiple side streets and driveway accesses throughout much of the corridor. On-street parking is limited to the north and south sides of 22nd Street between 1st Avenue to 3rd Avenue (approximately 40 stalls).

Table A.04 provides a comparative assessment of the feasible configurations for the 22nd Street corridor. As indicated, both curbside and centre bus lanes are feasible along 22nd Street. Side running lanes are not feasible as they would restrict driveway access along one side of the corridor.

Curbside lanes cost about $13.2 million to construct and reduce long-term transit travel times by 12 minutes in the peak direction, resulting in approximately $56.2 million of passenger travel time and system operation cost savings over 25 years. Curbside lanes broadly support current land use patterns and the potential for higher intensity uses along the corridor. It should be noted curbside bus-only lanes would generally be considered an interim condition, and that rail grade-separation along 22nd Street would not be a reasonable cost.

Figure A.08 - 22nd Street BRT Corridor

A

	Curbside Bus Lanes	Centre Bus Lanes
		
TRANSPORT	○	●
PEAK TRANSIT TRAVEL TIME	12 minute reduction	19 minute reduction
TRANSIT OPERATION	Some shared lane sections	Exclusive bus only lanes
PERIOD OF OPERATION	Flexible based on demand (peak/all day)	24 hours, 7 days a week
ROADWAY WIDTH	Widen shoulder and no urban road change	Widen shoulder and roadway
TRAVEL LANES	Remove 1 travel lane/direction east of Confederation	Remove 1 travel lane/direction east of Confederation
ON-STREET PARKING	On-street parking removed (1st to 3rd)	On-street parking removed (1st to 3rd)
SOCIAL/COMMUNITY	●	○
RIGHT-OF-WAY WIDENING	No change required	Widen near major intersections/ stations (through redevelopment)
STREET /DRIVEWAY ACCESS	No impacts	Driveways limited to right-in/ right-out
LAND USE POTENTIAL	Supports current land use patterns and potential for change	Promotes change to transit-oriented land use patterns
FINANCIAL	●	○
CLASS D CAPITAL COST	$13,200,000	$119,000,000
CAPITAL COST (PV)	$9,900,000	$88,900,000
TRANSIT TRAVEL TIME SAVING	$51,700,000	$88,900,000
TRANSIT OPERATING	$4,500,000	$8,000,000
SUMMARY	Short-term Potential	Long-term Potential

○ LOWER BENEFIT OR HIGHER IMPACT ◐ SIMILAR BENEFIT / IMPACT ● HIGHER BENEFIT OR LOWER IMPACT

Table A.04 - 22nd Street Bus Lane Configuration Assessment

Centre bus lanes cost approximately $119 million to construct, including allowances for grade-separation at the railroad crossing. Centre bus lanes would reduce future transit travel times through the segment by 19 minutes in the peak direction, resulting in $97.9 million of passenger travel time and system operation cost savings over 25 years (1.7 times the savings generated by curbside facilities). As permanent transit facilities, centre lanes promote an evolution to transit-oriented land use patterns along the corridor.

Inside Circle Drive, general purpose travel lanes would need to be converted to bus lanes for all running way configurations due to the constrained right-of-way and established land uses surrounding the corridor. Curbside bus lanes would operate with shared right-turn traffic and could potentially accommodate high-occupancy vehicles (HOVs) of three or more passengers as transit service and ridership grows. Additionally, curbside lanes could operate on a part-time or peak-only basis, allowing the lane space to revert back to general purpose or parking use during off-peak periods. As road widening and additional rights-of-way are required at station areas for centre bus lanes, this configuration could not be implemented without significant cost or redevelopment and is therefore considered a long-term possibility. Curb lanes may be implemented in the short-term in the areas of highest congestion. The right-of-way for a centre bus lane configuration and station areas should be preserved for the long-term provision of centre lane operations and possible conversion to LRT.

B) 3RD AVENUE (22ND STREET TO 25TH STREET)

This section of 3rd Avenue would accommodate most bus services through the Downtown area, including both the Red Line (east-west) and Blue Line (north-south service) rapid transit services. Unlike the DART routes and other bus services operating through the core area today, most city-wide services would travel through the downtown without a layover. In the long-term, it is anticipated that this section of 3rd Avenue could accommodate more than 50 buses per hour per direction in the peak. Stations may be equipped with significantly longer platforms to permit multiple or staggered stop areas along the curb or in the centre of the road in order to limit delays and queuing.

Figure A.09 - 3rd Avenue BRT Corridor

This candidate BRT corridor extends approximately 600m and would include two station areas at the south and north ends of the segment—north of 22nd Street and south of 25th Street. The 3rd Avenue corridor currently supports two travel lanes in each direction with turn lanes at intersections and parking on both sides of the street (approximately 70 stalls). The roadway is 23 metres wide within a 30 metre right-of-way.

Table A.05 (following page) provides a comparative assessment of the configurations for the 3rd Avenue corridor. Curbside, centre and side lane configurations are feasible along 3rd Avenue. Curbside lanes cost about $1.2 million to construct and are projected to reduce long-term transit travel times modestly, resulting in $10.7 million of passenger travel time and system operation cost savings over 25 years. Curbside lanes support Downtown land use patterns and allow buses to pass one-another in adjacent general purpose lanes.

Centre or side bus lanes cost about $9 million to construct. Centre or side lanes reduce future transit travel times through the segment by 2.5 minutes in the peak direction, resulting in $26 million of passenger travel time and system operation cost savings over 25 years. These savings are 2.4 times the savings generated by curbside facilities. As permanent transit facilities, centre or side lanes can be designed to support a pedestrian environment and to transform land use patterns in the immediate area.

Criteria	Curbside Bus Lanes	Centre OR Side Bus Lanes
		
TRANSPORT	◐	◐
PEAK TRANSIT TRAVEL TIME	1 minute reduction	2.5 minute reduction
TRANSIT OPERATION	^ Shared with right turning vehicles ^ Allows for bus bypass in general purpose lanes	Exclusive bus only lanes
PERIOD OF OPERATION	Flexible based on demand (peak/all day)	24 hours, 7 days a week
ROADWAY WIDTH	No change required	No change required
TRAVEL LANES	Remove 1 travel lane/direction	Remove 1 travel lane/direction
ON-STREET PARKING	On-street parking removed (2 sides)	On-street parking removed (2 sides)
SOCIAL/COMMUNITY	◐	◐
RIGHT-OF-WAY WIDENING	No change required	No change required
STREET /DRIVEWAY ACCESS	No impacts	^ **Centre**: Limited movement to right-in/right-out (laneways) ^ **Side**: Limited impacts if implemented on east side
LAND USE POTENTIAL	Supports Downtown land use patterns	Supports Downtown land use patterns and promotes increased focus near transit
FINANCIAL	◐	◐
CLASS D CAPITAL COST	$1,200,000	$9,000,000
CAPITAL COST (PV)	$900,000	$6,700,000
TRANSIT TRAVEL TIME SAVING	$9,100,000	$22,600,000
TRANSIT OPERATING	$1,600,000	$4,000,000
SUMMARY	Short-term Potential	Short-term Potential

○ LOWER BENEFIT OR HIGHER IMPACT ◐ SIMILAR BENEFIT / IMPACT ● HIGHER BENEFIT OR LOWERIMPACT

Table A.05 - 3rd Avenue Street Bus Lane Configuration Assessment

Each of the configurations would include converting one travel lane in each direction. Although minimal or no change would be required to the roadway or right-of-way width, some on-street parking would be removed to accommodate BRT station activity. A west side running lane configuration would impact laneway access along 3rd Avenue. Only one parking lot, which can be alternately accessed, is affected if side running lanes are implemented on the east side.

Although the impacts of each configuration are comparable, the curb lane BRT configuration allows for use of bypass lanes for buses around BRT stations in areas of the system where passenger boarding and alighting activity will be significant. A curb lane operation is the preferred technical option for a bus-based system in order to make best use of limited street space and to maximize capacity for the BRT operation.

C) 25TH STREET / UNIVERSITY BRIDGE / COLLEGE DRIVE

The 25th Street and College Drive portion of the Red Line BRT corridor through the Downtown and University areas is approximately 2.7 kilometres long as illustrated in **Figure A.10**. This section of the BRT system will accommodate 30 to 40 buses per hour in the peak direction and significant passenger activity at West Campus stations within the University area.

25th Street has two through travel lanes per direction and a centre median lane, with no parking on either side. Driveways and laneway accesses are restricted to right-in / right-out only movements today. Within the Downtown area, 25th Street is approximately 21 metres wide within a right-of-way of 30 metres. The University Bridge itself supports four travel lanes and is 13 metres wide. East of the river to Cumberland Avenue, College Drive widens to three lanes per direction and includes a centre median, with no on-street parking. Driveway and side street accesses are present, particularly along the south side of the street. The roadway width between Clarence Avenue and Cumberland Avenue is 25 metres and the right-of-way is 32 metres. Between Cumberland Avenue and Preston Avenue, the road width and right-of-way is anywhere from 30 to 60 metres.

Table A.06 and **A.07** provide a comparative assessment of the feasible configurations for the 25th Street / University Bridge as well as the College Drive corridor configurations, respectively. These results indicate that curbside and centre lanes are feasible along 25th Street and the University Bridge. Side running facilities are deemed unfeasible as bridge widening would be required to separate bus lanes for a side running configuration. The City's structural engineers indicated that the deck could not be widened to support the additional space required for separating bus only lanes. Additionally, side running facilities would also restrict driveway access to properties along 25th Street. All three configurations are feasible east of Clarence Avenue on College Drive.

Unlike centre or side running facilities which are permanent, curbside bus lanes operate with shared right-turn traffic and could potentially accommodate high occupancy vehicles (HOVs) of three or more passengers as transit service and ridership grows. Additionally, curbside lanes could operate on a part-time or peak-only basis, allowing the lane space to revert back to general purpose use during off-peak periods.

Between 3rd Avenue and Clarence Avenue, curbside lanes cost about $3.8 million to construct and reduce future condition transit travel times by 9 minutes in the peak direction, resulting in $57.7 million of passenger travel time and system operation cost savings over 25 years. By contrast, centre bus lanes cost $28.8 million, 7.5 times the cost of curbside lanes, and reduce future condition transit travel times by 13 minutes, resulting in 25 year travel time and operations cost savings of $93.1 million. Both curbside and centre lanes require the conversion of one general purpose travel lane per direction and do not require widening of the right-of-way. Both curbside and centre lanes are identified as long-term options that are dependent on the provision of additional vehicle capacity across the South Saskatchewan River.

Between Clarence and Preston Avenues, curbside lanes cost about $3.2 million to construct and reduce future transit travel times by 3 minutes in the peak direction, resulting in $20.6 million of passenger travel time and system operation cost savings over 25 years. By contrast, centre or side running lanes cost $24 million, 7.5 times the cost of curbside lanes, and reduce future transit travel times by 5 minutes, resulting

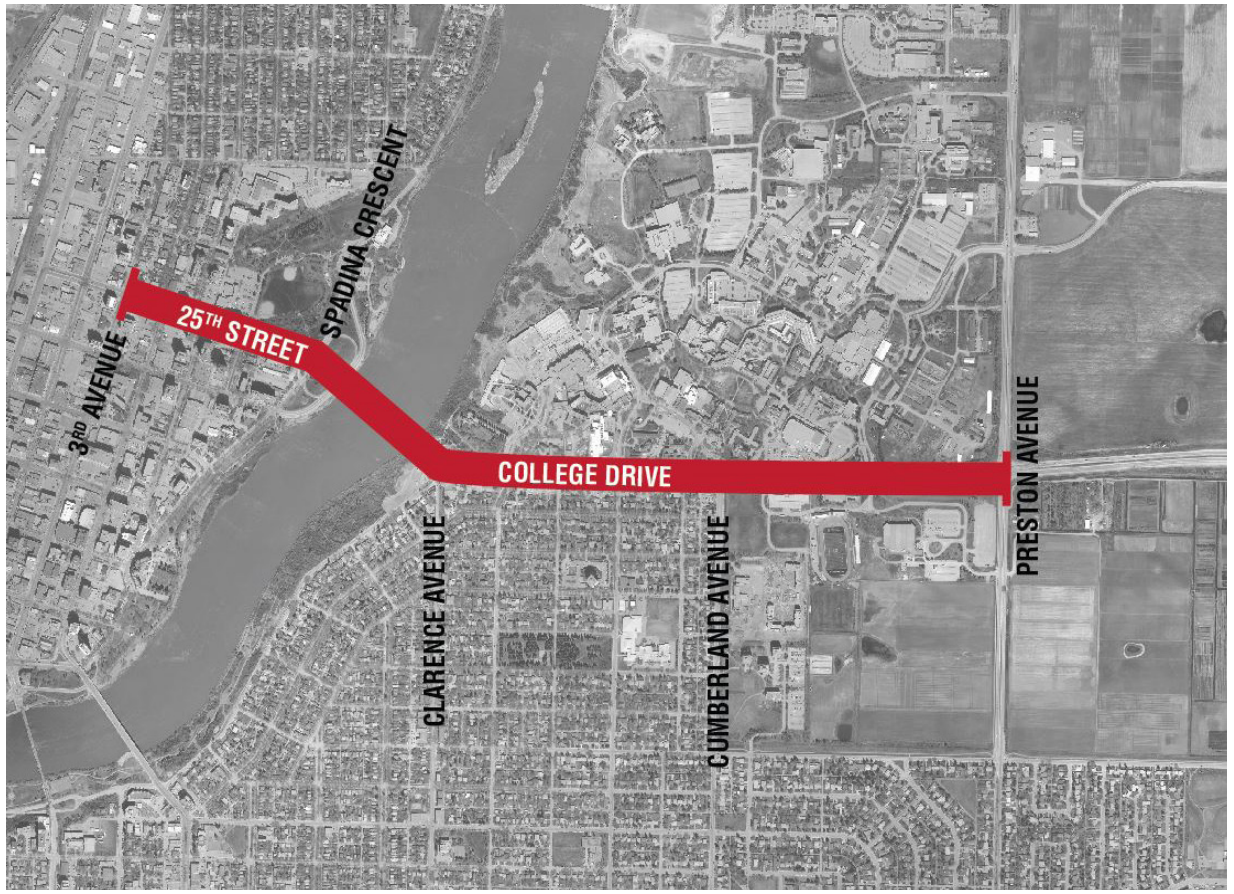


Figure A.10 - 25th Street and College Crive BRT Corridor

in 25 year travel time and operations cost savings of $47.7 million. North side running facilities require roadway modifications near stations and moderate right-of-way takings but fully integrate transit onto the University campus, separating transit passengers from busy College Drive and promoting the centrality of transit on campus. Because significant coordination with the University would be required, both centre or side bus lane configurations are considered medium-term possibilities. Curb bus lanes are considered a short-term option for implementation.

Criteria	Curbside Bus Lanes	Centre Bus Lanes
		
TRANSPORT	○	●
PEAK TRANSIT TRAVEL TIME	9 minute reduction	13 minute reduction
TRANSIT OPERATION	Shared with right turning vehicles	Exclusive bus only lanes
PERIOD OF OPERATION	Flexible based on demand (peak/all day)	24 hours, 7 days a week
ROADWAY WIDTH	No change required	No change required
TRAVEL LANES	Remove 1 travel lane/direction	Remove 1 travel lane/direction
ON-STREET PARKING	No on-street parking	No on-street parking
SOCIAL/COMMUNITY	◐	◐
RIGHT-OF-WAY WIDENING	No change required	No change required
STREET /DRIVEWAY ACCESS	No impacts	No impacts
LAND USE POTENTIAL	Supports Downtown land use patterns	Supports Downtown land use patterns
FINANCIAL	◐	◐
CLASS D CAPITAL COST	$2,200,000	$16,500,000
CAPITAL COST (PV)	$1,600,000	$12,300,000
TRANSIT TRAVEL TIME SAVING	$49,900,000	$80,600,000
TRANSIT OPERATING	$7,800,000	$12,500,000
SUMMARY	Short- and Long-term Potential	Short- and Long-term Potential

○ LOWER BENEFIT OR HIGHER IMPACT ◐ SIMILAR BENEFIT / IMPACT ● HIGHER BENEFIT OR LOWER IMPACT

Table A.06 - University Bridge / 25th Street Bus Lane Configuration Assessment

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Criteria	Curbside Bus Lanes	Centre OR Side Bus Lanes
		
TRANSPORT	○	●
PEAK TRANSIT TRAVEL TIME	3 minute reduction	5 minute reduction
TRANSIT OPERATION	Shared with right turning vehicles	Exclusive bus only lanes
PERIOD OF OPERATION	Flexible based on demand (peak/all day)	24 hours, 7 days a week
ROADWAY WIDTH	No change required	Moderate widening required at stations
TRAVEL LANES	Remove 1 travel lane/direction	Remove 1 travel lane/direction
ON-STREET PARKING	No impacts	No impacts
SOCIAL/COMMUNITY	○	●
RIGHT-OF-WAY WIDENING	No change required	Moderate widening required
STREET /DRIVEWAY ACCESS	No impacts	Driveway access removed
LAND USE POTENTIAL	Supports existing land use patterns	Fully integrates transit on the U of S campus
FINANCIAL	○	●
CLASS D CAPITAL COST	$3,200,000	$24,000,000
CAPITAL COST (PV)	$2,400,000	$17,900,000
TRANSIT TRAVEL TIME SAVING	$18,300,000	$41,900,000
TRANSIT OPERATING	$2,300,000	$5,800,000
SUMMARY	Short- and Long-term Potential	Medium- and Long-term Potential

○ LOWER BENEFIT OR HIGHER IMPACT ◐ SIMILAR BENEFIT / IMPACT ● HIGHER BENEFIT OR LOWER IMPACT

Table A.07 - College Drive Bus Lane Configuration Assessment

D) PRESTON AVENUE – ATTRIDGE DRIVE (COLLEGE DRIVE TO MCORMOND DRIVE)

The Preston Avenue – Attridge Drive portion of the BRT route (from College Drive through Preston Crossing to University Heights Suburban Centre at McOrmond Drive) is approximately 5.7 KM in length, as illustrated below in **Figure A.11.**

Both Preston Avenue and Attridge Drive support two through travel lanes per direction and a centre median, with no parking on either side. While the 36 metre to 50 metre rights-of-way generally support widening for transit lanes, the Preston Avenue segment is constrained by a significant above ground hydro corridor along the east side of the road to the south of 108th Street, and along the west side of the road south to the north of 108th Street. The most significant constraint for any BRT configuration in the corridor is the grade-separated interchange at Circle Drive.

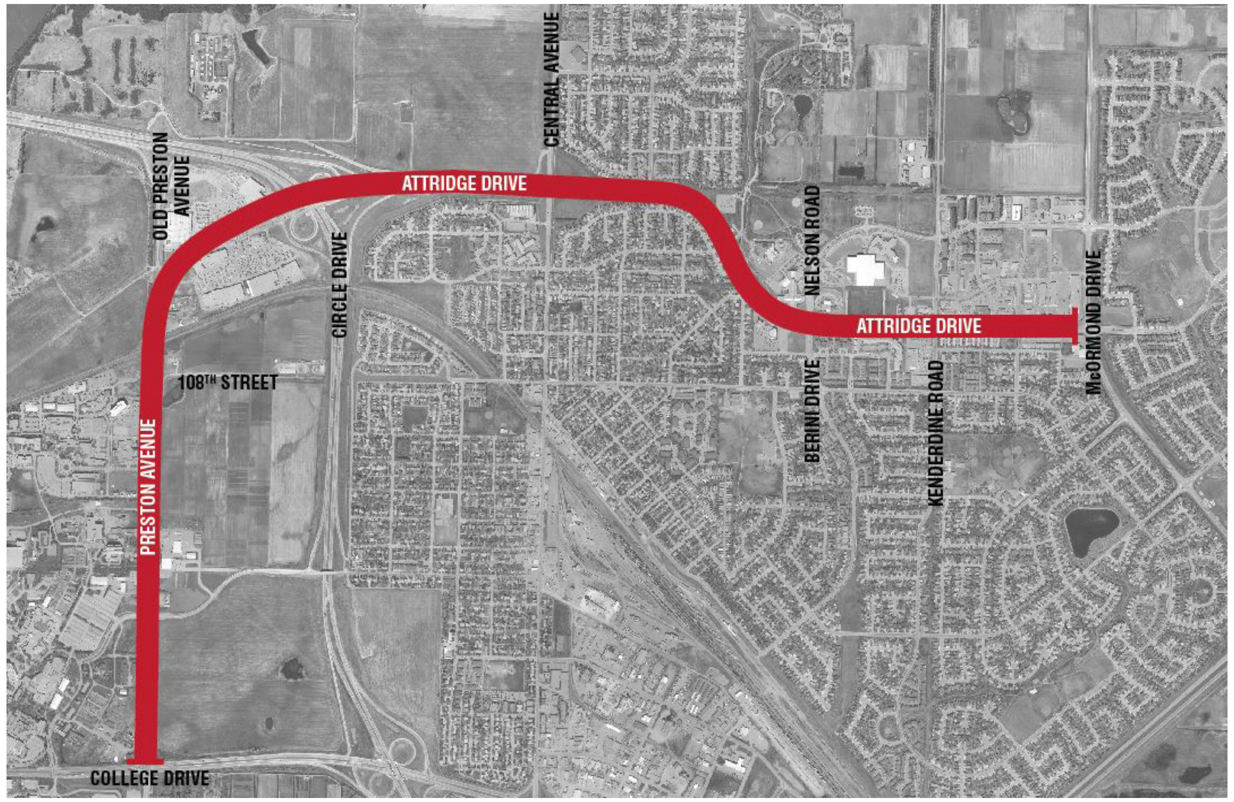

Figure A.11 - Preston Avenue and Attridge Drive BRT

As indicated in Table A.08, curbside lanes cost about $11.4 million to construct and reduce future transit travel times by 8 minutes in the peak direction, resulting in $16.1 million of passenger travel time and system operation cost savings over 25 years. Curbside lanes support current land use patterns and the potential for higher intensity uses along the corridor. It should be noted curbside bus-only lanes would generally be considered an interim condition, and that rail grade-separation along Preston Avenue would not be a reasonable cost.

Centre or side-running facilities cost about $125.5 million to construct, and include grade separation at the railroad crossing and allowances for structural modifications at the Circle Drive interchange. Centre or side running facilities reduce future condition transit travel times through the segment by 13 minutes in the peak direction, resulting in $27.9 million of passenger travel time and system operation cost savings over 25 years. These savings are 1.7 times the savings generated by curbside facilities. As permanent transit facilities, centre lanes promote an evolution to transit-oriented land use patterns along the corridor.

Criteria	Curbside Bus Lanes	Centre OR Side Bus Lanes
TRANSPORT	○	○
PEAK TRANSIT TRAVEL TIME	8 minute reduction	13 minute reduction
TRANSIT OPERATION	Some shared lane sections	Exclusive bus only lanes
PERIOD OF OPERATION	Flexible based on demand (peak/all day)	24 hours, 7 days a week
ROADWAY WIDTH	Moderate widening required	Significant interchange reconfiguration
TRAVEL LANES	^ Remove 1 EB lane Preston Crossing to Circle Drive ^ WB queue jumper lane at Circle Drive interchange	Remove 1 EB lane Preston Crossing to Circle Drive
ON-STREET PARKING	No impacts	No impacts
SOCIAL/COMMUNITY	○	●
RIGHT-OF-WAY WIDENING	No change required	No change required
STREET /DRIVEWAY ACCESS	No impacts	No impacts
LAND USE POTENTIAL	Supports current land use patterns and potential for change	Supports change to transit oriented land-use patterns
FINANCIAL	◐	◐
CLASS D CAPITAL COST	$11,400,000	$125,500,000
CAPITAL COST (PV)	$8,500,000	$93,800,000
TRANSIT TRAVEL TIME SAVING	$14,900,000	$25,800,000
TRANSIT OPERATING	$1,200,000	$2,100,000
SUMMARY	Short- and Long-term Potential	Long-term Potential

○ LOWER BENEFIT OR HIGHER IMPACT ◐ SIMILAR BENEFIT / IMPACT ● HIGHER BENEFIT OR LOWER IMPACT

Table A.08 - Preston Avenue and Attridge Drive Bus Lane Configuration Assessment

Each configuration would require moderate to significant road widening along the corridor and some lane reallocations between Preston Crossing and Circle Drive. Along Preston Avenue, all BRT configurations will require roadway widening. Both centre and side bus lane configurations involve significant geometric changes at the Circle Drive interchange including modified loop ramps and approaches. A new structure north of the existing bridge over Circle Drive would be required to accommodate a side bus lane configuration. Curb lanes could simply merge with general purpose traffic through the interchange so as to manage overall project costs. Because of extensive widening and costs at the Circle Drive interchange, both centre or side bus lane configurations are reserved as long term possibilities. Curb bus lanes are considered a short- to medium-term option for implementation.

E) PRESTON AVENUE (COLLEGE DRIVE TO 8TH STREET)

The Preston Avenue portion of the BRT route from College Drive to 8th Street is approximately 1.6 kilometres in length as illustrated in **Figure A.12**. Between College Drive and 14th Street, Preston Avenue supports two travel lanes per direction and a centre median, with no parking on either side or driveway accesses. The roadway is generally 24 metres wide within a 33 metre right-of-way. Widening the roadway for BRT lanes is constrained by a transmission corridor on the east side of the road. South of 14th Street, the character of Preston Avenue changes significantly with single and multi-family homes as well as driveways and on-street parking on both sides of the street. South of 14th Street, the transmission line shifts to the centre median area. Between 8th Street and 14th Street, Preston Avenue is slightly narrower, with 20 metre and 30 metre roadway and right-of-way widths, respectively.

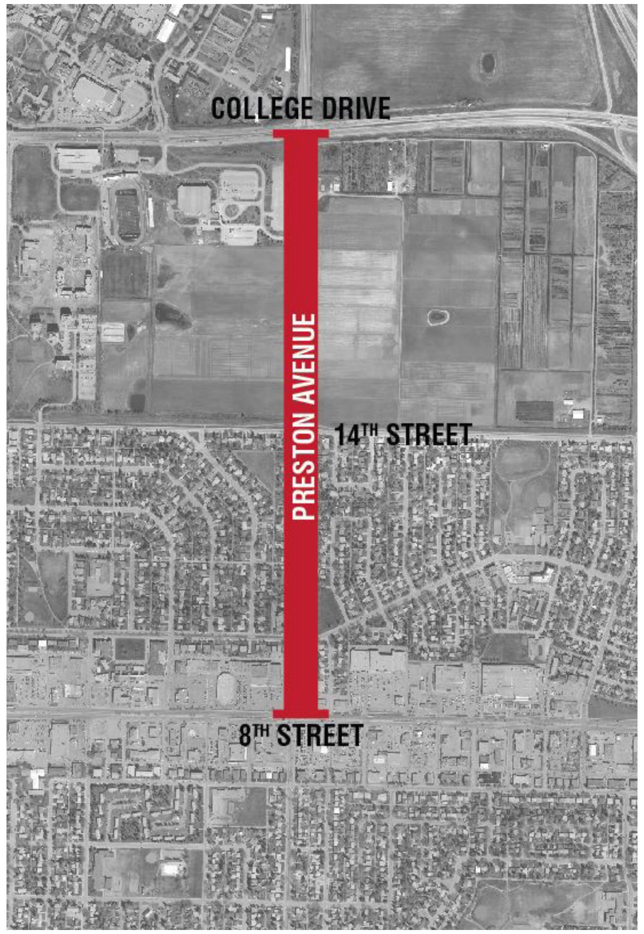

Figure A.12 - South Preston Avenue BRT Corridor

As summarized in **Table A.09**, only curb bus lanes are feasible through this section of the Red Line rapid transit corridor. Centre bus lanes are not feasible due to the transmission line, and side lanes would require the removal of driveway and side street access between 8th Street and 14th Street. Side running facilities can only be accommodated with changes to the adjacent land uses.

Curbside lanes cost about $5.6 million to construct and reduce future transit travel times by 7 minutes in the peak direction, resulting in $27.1 million of passenger travel time and system operation cost savings over 25 years. Curb lanes would require minor road widening and removal of on-street parking between 14th Street and 8th Street. Parking could be restricted in the peak directions only during the morning and afternoon, allowing for the retention of on-street parking between 14th Street and 8th Street during off-peak periods and directions. No change would be required to the existing right-of-way along the entire length of the segment. Curbside lanes are identified as the preferred short and long-term configuration for Preston Avenue.

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Criteria	Curbside Bus Lanes (Only Option)
TRANSPORT	
PEAK TRANSIT TRAVEL TIME	7 minute reduction
TRANSIT OPERATION	Some shared lane sections
PERIOD OF OPERATION	Flexible based on demand (peak/all day)
ROADWAY WIDTH	Moderate widening required between College Drive and 14th Street
TRAVEL LANES	No change required
ON-STREET PARKING	On-street parking removed south of 14th Street (peak or permanent)
SOCIAL/COMMUNITY	
RIGHT-OF-WAY WIDENING	No change required
STREET /DRIVEWAY ACCESS	No impacts
LAND USE POTENTIAL	Disrupts residential parking
FINANCIAL	
CLASS D CAPITAL COST	$3,200,000
CAPITAL COST (PV)	$2,400,000
TRANSIT TRAVEL TIME SAVING	$25,400,000
TRANSIT OPERATING	$1,700,000
SUMMARY	Short- and Long-term Potential

Table A.09 - Preston Avenue (College Drive to 8th Street) Bus Lane Configuration Assessment

F) 8TH STREET (PRESTON AVENUE TO McORMOND DRIVE)

The 8th Street portion of the Red Line BRT corridor from Preston Avenue to McOrmond Drive is approximately 4.7km in length, as illustrated below in **Figure A.13.** Between Preston Avenue and Boychuk Drive, 8th Street is a six lane roadway with centre median and no on-street parking. The roadway and right-of-way is approximately 28 metres and 40 metres, respectively. This segment of 8th Street has several driveways on both sides of the street, providing access to adjacent commercial properties. East of Boychuk Drive, 8th Street becomes a two lane rural roadway that will eventually serve the Holmwood suburban development area.

Figure A.13 - 8th Street BRT Corridor

Table A.09 provides a comparative assessment of the feasible configurations for the 8th Street corridor. While both curb and centre running lanes are feasible, side running facilities would restrict driveway access to properties along 8th Street as well as ramp access at Circle Drive; as such, side running lanes are not recommended.

Curbside lanes cost about $29.8 million to construct and reduce future transit travel times by 2 minutes in the peak direction, resulting in $4.4 million of passenger travel time and system operation cost savings over 25 years. Curbside lanes support current land use patterns and the potential for higher intensity uses along the corridor.

Centre-running facilities cost about $197.8 million to construct, and include grade separation of the railroad crossing east of Boychuk Drive. Centre running facilities reduce future condition transit travel times through the segment by 10 minutes in the peak direction, resulting in $12.8 million of passenger travel time and system operation cost savings over 25 years. These savings are three times the savings generated by curbside facilities. As permanent transit facilities, centre lanes promote an evolution to transit-oriented land use patterns along the corridor. The lower travel time savings relative to other corridors is a result of the higher travel speeds without any changes to the corridor today and forecast for the long-term.

If six general purpose lanes are maintained, curb bus lanes would require moderate roadway widening throughout, but could generally be accommodated within the existing right-of-way. Curb bus lanes would be shared with right-turn vehicles accessing side streets and driveways of adjacent properties. In order to maintain existing laning, significant road widening throughout and moderate right-of-way widening between Preston and Moss Avenue would be required for centre lane operations. In all cases, retaining walls are required at the Circle Drive interchange to increase roadway width under the structure. A wider 8th Street would further reduce the potential of transforming the automobile character and land use patterns of the corridor.

Because of the additional right-of-way required if six general purpose travel lanes were retained, a centre lane operation could not be implemented without significant redevelopment and is therefore considered a long-term possibility. As all facilities would be accommodated in new lane space, curb lanes are considered a medium-term implementation option. Short-term implementation possibilities may include localized transit priority improvements at select signals or short curbside lanes in areas of heavy congestion.

Criteria	Curbside Bus Lanes	Centre Bus Lanes
TRANSPORT	◐	◐
PEAK TRANSIT TRAVEL TIME	2 minute reduction	10 minute reduction
TRANSIT OPERATION	Some shared lane sections	Exclusive bus only lanes
PERIOD OF OPERATION	Flexible based on demand (peak/all day)	24 hours, 7 days a week
ROADWAY WIDTH	Moderate widening required	Significant widening required including below Circle Drive overpass
TRAVEL LANES	^ No change required ^ Lanes must accommodate merging traffic near Circle Drive	No change required
ON-STREET PARKING	No impacts	No impacts
SOCIAL/COMMUNITY	◐	◐
RIGHT-OF-WAY WIDENING	No change required	Moderate widening required between Preston and Moss Avenues
STREET /DRIVEWAY ACCESS	No impacts	Limited movement to right-in/right-out for minor streets and driveways
LAND USE POTENTIAL	Supports current land use patterns and potential for change	Supports change to transit oriented land-use patterns
FINANCIAL	◐	◐
CLASS D CAPITAL COST	$29,800,000	$113,500,000
CAPITAL COST (PV)	$22,300,000	$84,800,000
TRANSIT TRAVEL TIME SAVING	$3,800,000	$11,000,000
TRANSIT OPERATING	$600,000	$1,800,000
SUMMARY	Short- and Long-term Potential	Long-term Potential

○ LOWER BENEFIT OR HIGHER IMPACT ◐ SIMILAR BENEFIT / IMPACT ● HIGHER BENEFIT OR LOWER IMPACT

Table A.10 - 8th Street (Preston to Holmwood) Bus Lane Configuration Assessment

Preferably, curbside lanes or centre bus lanes could be accommodated by converting an existing travel lane in each direction to permanent or peak-period only bus lane operation. This would reduce vehicle travel lanes and support the goal of transforming the corridor character and land use patterns.

G) Overall Summary

Although the investments in dedicated bus only lanes along the Red Line BRT corridors are essential to support the projected demands, they also allow transit to bypass areas of recurring congestion and provide significant travel time savings to customers and the system. Depending on the configuration, transit customers could experience up to a 30 minute (curb lane) to 50 minute (centre or side lane) travel time savings in the long-term between Blairmore and University Heights. Reduced delays and increased system reliability on top of improved bus frequencies will dramatically improve the transit customer experience. Additionally, the travel time savings will also benefit the transit system operation with reduced delays and platooning of buses caught in congested areas.

Criteria	Curbside Bus Lanes	Centre or Side Bus Lanes
COST RANGES CLASS D		
CAPITAL COST	$44.2 M - $66.3 M	$387.3 M - $412.3 M
CAPITAL COST (PV)	$33 M - $49.5 M	$289.4 M - $308 M
MAINTENANCE COST	$3.5 M	$3.5 M - $3.6 M
SALVAGE VALUE (20%)	$(6.6 M) - $(9.9 M)	$(57.9 M) - $(61.6 M)
TOTAL COST	$30 M - $43.2 M	$235.1 M - $250 M
SAVINGS		
TRANSIT TRAVEL TIME SAVINGS	$173 M	$297.1 M
TRANSIT OPERATING	$19.7 M	$35.8 M
TOTAL BENEFITS	$192.8 M	$332.9 M
ECONOMIC		
NET PRESENT VALUE	$149.6 M - $162.8 M	$82.9 M - $97.8 M
BENEFIT-COST RATIO	4.5 - 6.4	1.3 - 1.4

Table A.11 - Summary Costs and Benefits of Alternative BRT Configurations

The overall economic evaluation of curb, centre or side running facilities is summarized in **Table A.11**. As indicated, both curb and centre/side BRT configurations will generate a positive net present value and a benefit-cost ratio of greater than 1.0 – meaning all configurations are attractive investments for funding partnerships with local, provincial and federal governments. Curbside lanes are estimated to cost approximately $44 to $66 million, while centre or side bus lane configurations could cost as much as $390 to $410 million.

With an investment period of 25 years, curbside lanes result in a net present value ranging between $150 and $163 million and a benefit-cost ratio ranging from 4.5 to 6.4. Alternatively, centre or side-running lanes have a total lifecycle cost ranging between $235 and $250 million and result in $333 million of travel time and operations benefits over 25 years. The implementation of centre or side lanes (wherever possible) results in a net present value of $83 to $98 million and a benefit-cost ratio ranging from 1.3 to 1.4 over a 25 year term.

A