Saskatoon BRT – A Catalyst for City Building

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Abstract

An economic and cultural hub in Saskatchewan, Saskatoon has become one of the most attractive places in Canada to live. In the next 25 to 40 years, Saskatoon's population is expected to double, from 250,000 to 500,000. Based on comprehensive visioning (*Saskatoon Speaks*), analysis, and planning (*Strategic Plan 2013-2023* and *Growth Plan to Half a Million*), the City recognizes that accommodating growth using a business-as-usual approach would be problematic if not unsustainable.

In order to enhance the quality of life and increase economic activity in Saskatoon, the Growth Plan identifies three interrelated strategies: corridor growth, transit and core bridges. Under the transit strategy, bus rapid transit (BRT) forms the backbone of a multi-modal transportation system supporting the movement of people along major corridors, to key destinations and development nodes.

Work related to the planning and design of the BRT is underway. The BRT concept, configuration, and preliminary design offers solutions that meets the needs of the Saskatoon transit market, Growth Plan objectives, scale of the community, and available funding. The implementation of the BRT will improve transit frequency, reliability, and customer experience, serving existing customers better and attracting new riders. BRT is also a catalyst for city building. BRT is the mobility backbone of several land use intensification initiatives including: Corridor Plans for 22nd Street, College Drive, 8th Street, Preston Avenue and three mixed use Transit Villages at established commercial nodes adjacent to the future BRT lines.

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Introduction

As an economic and cultural hub in Saskatchewan, Saskatoon has become one of the most attractive places in Canada to live. In the next 25 to 40 years, Saskatoon's population is expected to double, from 250,000 to 500,000. Based on comprehensive visioning (*Saskatoon Speaks*), analysis, and planning (*Strategic Plan 2013-2023* and *Growth Plan to Half a Million*), the City recognizes that accommodating growth using a business-as-usual approach would be problematic if not unsustainable.

In order to enhance the quality of life and increase economic activity in Saskatoon, the Growth Plan identifies several interrelated transportation and land use strategies. More specifically, under the transit strategy, also known as the Transit Plan, bus rapid transit (BRT) forms the backbone of a refreshed transit system supporting the multi-modal movement of people along major corridors, key destinations and significant development nodes.

BRT Background

Between 2009 and 2011, the City reviewed the planning and funding strategy for community growth, and conducted a visioning process, **Saskatoon Speaks,** to identify residents' expectations and aspirations for Saskatoon. The visioning processes determined that:

> *If trends continue, the costs required for growth would be 'extremely significant' and the future shape and characteristics of the city would not meet citizen expectations. The conclusion was reached that Saskatoon needed to consider 'fundamental changes' in our approach to transit, transportation and land use.*

In 2012, City Council adopted the **Strategic Plan 2013 – 2023** based on public feedback from the Saskatoon Speaks visioning process and initiated the **Growing Forward: Shaping Saskatoon** project to understand and address sustainable land use and transportation goal. The process cumulated in the development of the **Growth Plan to Half a Million** (Growth Plan) in 2016. The Growth Plan charts a path for how the city will develop and how people will move about based on the following key components:

Strategic Infill	Support development of Downtown, North Downtown and University of Saskatchewan "endowment lands" to accommodate more people and jobs within Circle Drive.
Corridor Growth	Encourage growth and redevelopment near existing major corridors.
Transit	Make transit more attractive to more people as the population increases.
Core Area Bridges	Make the best use the existing road capacity and planning for the future.

Employment Areas	Ensure the right amount of employment in the right areas.
Active Transportation Plan	Provide support for greater use of walking and cycling for work and personal use.
Financing Growth	Plan ahead for the costs of growth

The Growth Plan recognizes that without a new long-term plan for improving transit services and investing in transit infrastructure, services levels will continue to decrease over the next 30 years, putting Saskatoon well below service levels in other communities and making it difficult to attract and retain transit riders. A business-as-usual service model will spread transit resources thinly across the City, resulting in increased pressures on to the city's road network. By 2045, Saskatoon streets will attract more than 100,000 additional vehicle trips during peak hours alone and travel times will increase more than 300% (Growth Plan Summary page 27).

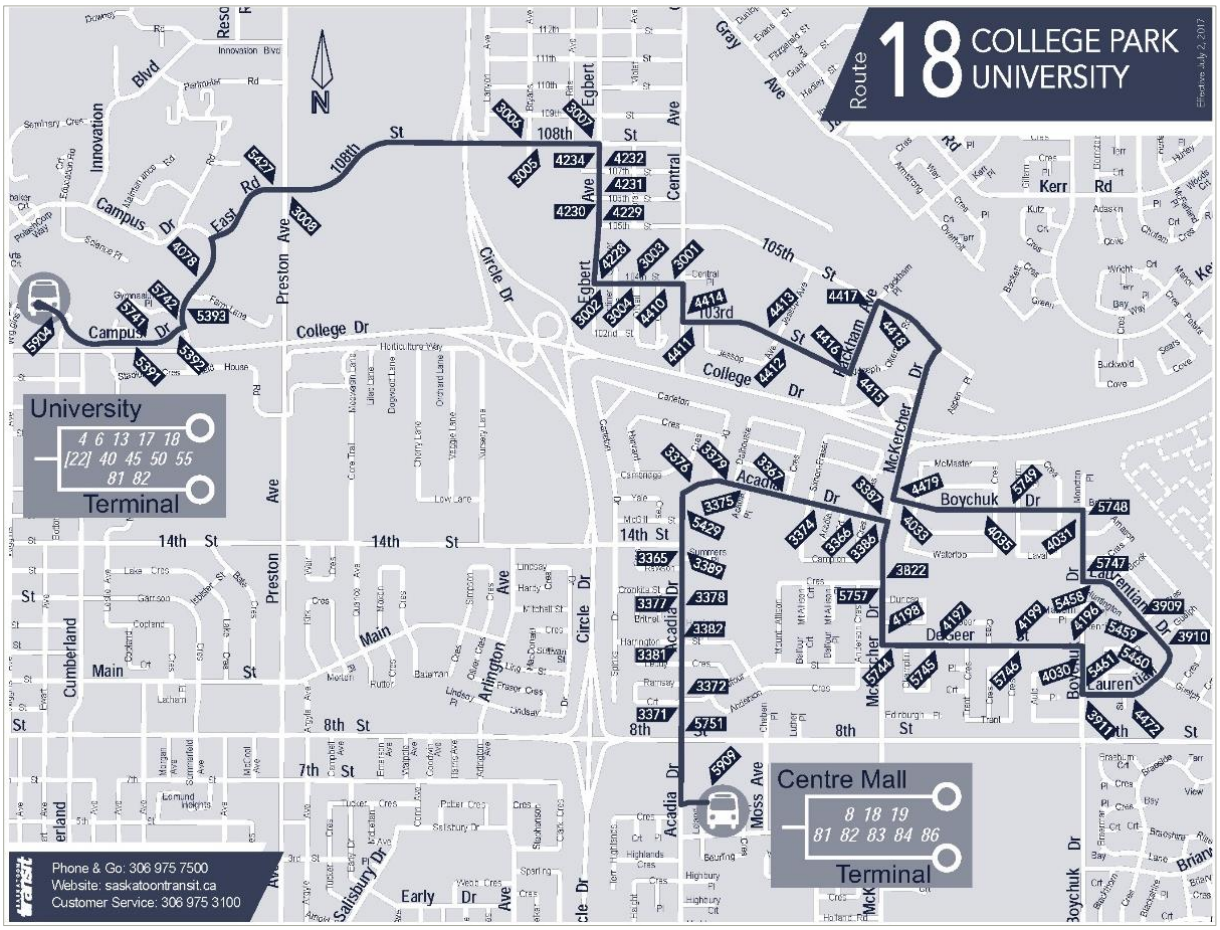
From a land use perspective, transit is also key to enabling and supporting sustainable growth patterns. The City's plan to support up to 50% of all growth within the core area inside Circle Drive depends on transforming major corridors, which relies on attractive transportation alternatives, such as rapid transit, walking, and cycling. Without significant investment in transit services and infrastructure, major corridors and the city's Strategic Infill areas will likely remain auto-oriented. Without higher quality multi-modal transportation options, the city may be unable to grow upward in a sustainable manner, and will instead face continued pressure to grow outward.

Transit in Saskatoon Today

Saskatoon Transit has been in operation for over 100 years, and now serves nine million rides each year. Despite serving all corners of the city, Saskatoon's transit mode share is only 4% which compares poorly with similar cities such as Victoria and Winnipeg, which have transit mode shares of 10% and 14% respectively (CUTA 2013). Of the nine million trips, 10% of all transit trips are made to Downtown, and 7% to 10% of all trips across Saskatoon's bridges are via transit. Ridership has grown marginally since 2008, yet service hours have not, with the gap widening each year.

Saskatoon's current transit system is a hub-and-spoke configuration that brings 28 routes to suburban transit terminals, the Downtown terminal, and/or the University of Saskatchewan terminal. The system provides excellent coverage and 95% of Saskatoon's population is within 400m of transit; however, the network lacks directness of travel. Many routes are circuitous or looping, as shown by the example in Figure 1. While circuitous or looped routes provide excellent coverage, the line of travel is indirect, resulting in long travel times for transit customers. As the city grows, it will become difficult to expand looped routes, and if expanded, the routes will have even longer trip distances and travel times as well as require additional transit terminals and multiple transfers for longer distance trips.

Figure 1. Example of a circuitous route in Saskatoon: Route 18 (Source: Saskatoon Transit)



During weekdays and Saturday afternoons, most routes have 30-minute frequencies. During weeknights, Saturday mornings, Saturday evenings, and all day Sundays and holidays, routes have 60-minute frequencies. During the BRT stakeholder engagement, many residents said that wait times were too long and transfers were difficult. When asked about the features that are most important for transit , most people identified increased frequency, improved reliability, enhanced customer service and reduced travel times between key destinations by giving transit priority through congested areas (Growth Plan, 2016).

In addition to the current route configuration, buses currently operate in mixed traffic with no transit priority measures. Without transit priority measures, transit will continue to appeal to a very small percentage of the population and increases in growth-related congestion will negatively impact transit customer travel times, transit operating costs, as well as private vehicle travel times and operating costs.

A New Direction for Transit: BRT

The Growth Plan sets new aspirations for transit in Saskatoon,

> *…to be an attractive customer-oriented service. A broader range of services will support varying travel demands. Rapid transit will complement the overall transit system and serve as the spine of the transit network. Rapid transit corridors and stations will enhance mobility for residents and visitors.*

Several long-term objectives for Saskatoon's transit system include:

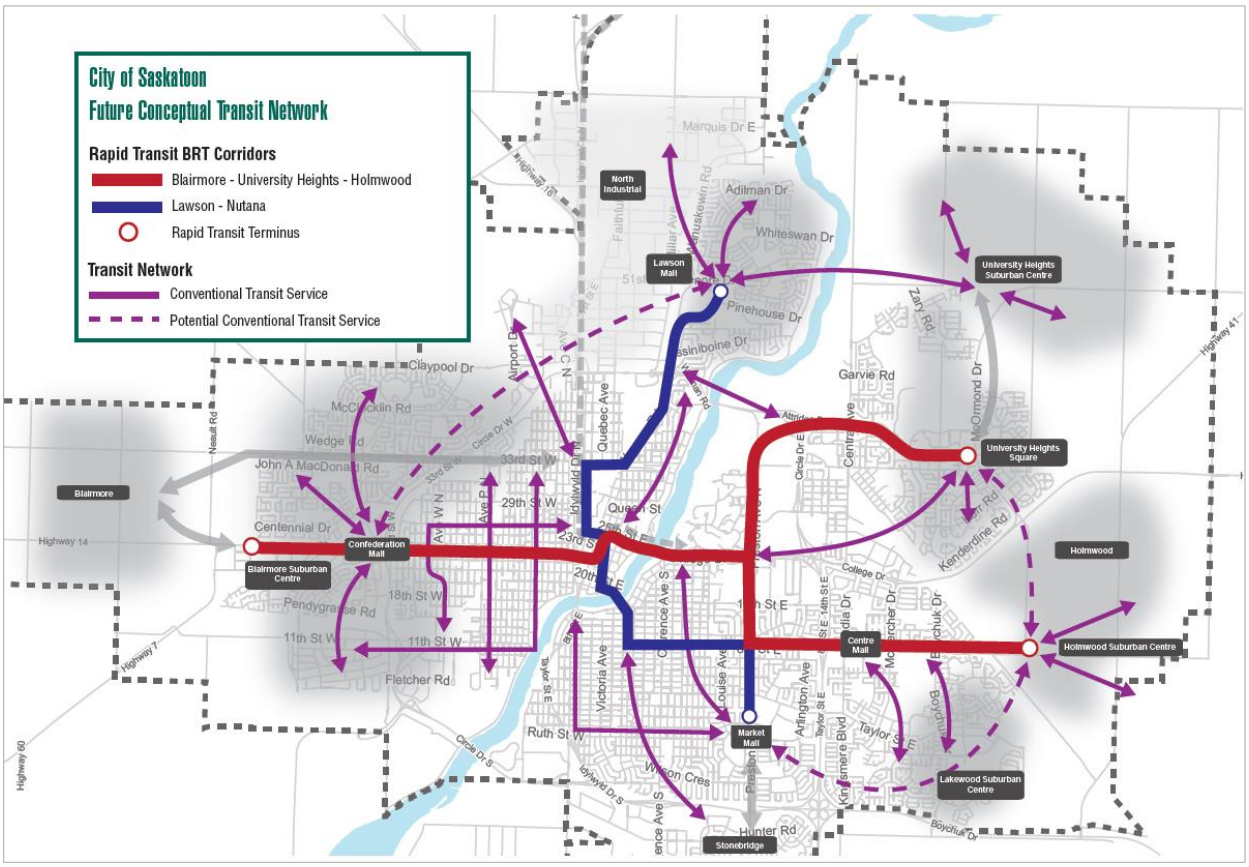
- Supporting and shaping growth and development within the city;
- Providing frequent, direct, reliable transit services for the most significant travel markets;
- Providing neighbourhood services that support local area travel and connections to primary corridors;
- Increasing daily city-wide transit mode share (proportion of people using transit) from 4% to 8% percent over the next 30 years, and peak period transit mode share to the Downtown and University areas from 10% to 25%;
- Providing facilities that enhance customer safety and comfort.

To achieve the long-term objectives, the Growth Plan includes a Transit Plan. The Transit Plan outlines three major areas to make transit an attractive choice: customer experience, servicing, and facilities. Recognizing that customer service is a cornerstone of transit, improving the customer experience includes the following measures: real-time bus information, mobile applications, universally accessible bus stops, community outreach, and customer satisfaction surveys.

Additionally, increasing the attractiveness of transit in Saskatoon requires improvements to the frequency, type, and quality of services. Service measures include shifting the structure of the transit system from an infrequent and indirect coverage model to a frequency model to serve the largest transit markets. New features of a future transit system include bus rapid transit (BRT) along major corridors, as shown in Figure 2.

Finally, the last major area focuses on improving or developing supporting transit facilities such as: replacing the bus fleet, transit priority treatments, BRT stations, and park-and-ride lots.

Figure 2. Future conceptual transit network (Source: City of Saskatoon Growth Plan)



Implementing the Growth Plan: the Transit Plan

In 2017, the City initiated the process of implementing the Growth Plan starting with a re-envisioned transit system based around bus rapid transit (BRT) and infill at strategic locations in the city including downtown (Transit Villages), the University endowment lands and along major transportation corridors (Corridor Planning).

The implementation of the Transit Plan includes:

- Confirming the routing, station locations, terminals, runningways, transit priority measures, active transportation connections, and traffic impacts;
- Identifying traffic and utility impacts, and any land use requirements;
- Developing cost estimates at the conceptual and detail design stages;
- Identifying station components and design;
- Engaging the public and stakeholders throughout the implementation process;
- Developing a Cost Benefit Analysis;
- Undertaking a Park and Ride Strategy;
- Reconfiguring the transit network;
- Developing an implementation plan; and,
- Coordinating with related Corridor Planning, Transit Villages, AAA Network projects.

Saskatoon BRT Configuration

While BRT system components vary from city to city and largely depend on the existing roadway network configuration, adjacent land uses, and levels and location(s) of traffic congestion, available funding, and overall system goals. Based on the studies completed for the Growth Plan and an analysis of existing conditions, five major components define Saskatoon's BRT system: transit signal priority (TSP), roadway geometric measures; stations; customer systems, and runningways.

Transit Signal Priority

Transit signal priority (TSP) measures are considered the foundation of a BRT system. TSP uses the existing traffic signal infrastructure, bus arrival detection and software logic to determine the optimum way to limit bus delay at traffic signals. TSP will be applied at all the intersections along the BRT corridors.

Roadway Geometric Measures

Congestion within the Saskatoon road network occurs primarily at major intersections and bridge approaches. Geometric improvements such as queue jump lanes, removal of bus bays, bus bypass lanes, and other similar measures will provide buses with a time advantage at the most critical points along the corridor. When used in conjunction with transit signal priority, the ability to bypass congestion at critical points will provide travel time savings and reliability improvements that are comparable with exclusive transit lanes. There are a handful of key locations where roadway geometric measures, primarily queue jumps, will be applied.

Stations

Stations are an integral part of the customer experience and can have a positive influence on the adjacent built form (including public space and private development). Stations components include: a curb, pad, identification pylon, shelter, seating, lighting, waste receptacle, bike racks, branding, security monitoring, and allowance for public art. A station concept is illustrated in Figure 3.

Figure 3. Station concept on 3rd Avenue. Source: HDR

Customer Systems

Customer systems include good destination, wayfinding, route, schedule, next bus information and security monitoring. Off-board fare processing could be added in the future and will be provisioned for in the design and construction of the BRT stations.

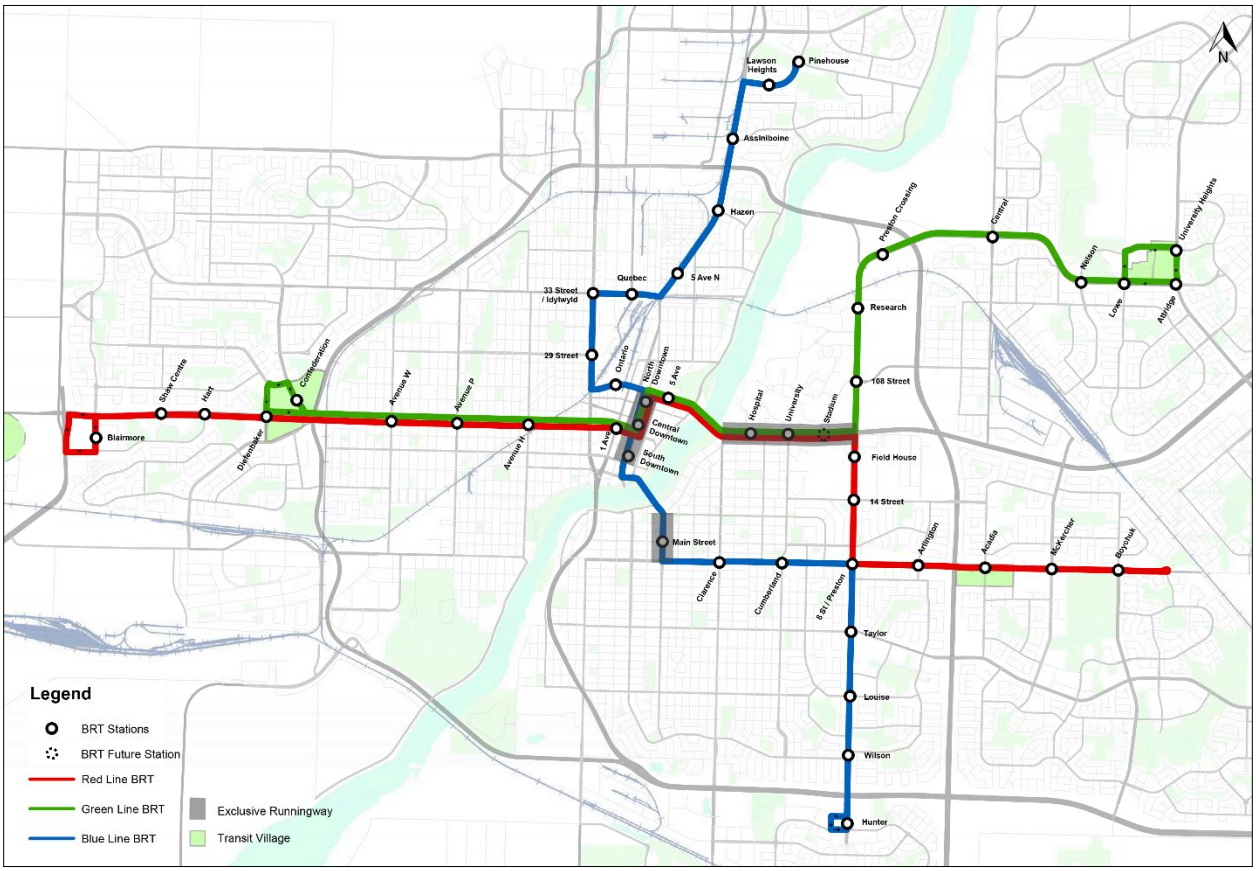
Exclusive Runningways

Runningways are the path that the BRT follows. For the most part, the BRT will run in mixed traffic since there is generally enough capacity in the existing travel lanes to allow transit vehicles to move without impediment; however, there are some critical sections of the inner city where exclusive lanes would provide advantage to travel time and compliment the adjacent community functions.

BRT Terminals and Stations

The Growth Plan recommended two BRT lines: the Red Line and Blue Line, as shown in Figure 2. as well as general routing and start/end points (terminals) for each line. Advancing the BRT functional planning resulted in the addition of a third line, the Green Line, as shown in Figure 4, which would mitigate the need for a split Red Line. The addition of the Green Line would also allow for greater bus frequencies along higher ridership areas such as: Confederation Mall, 22nd Street, Downtown, and the University.

Figure 4. BRT Route, Terminals, Stations, and Transit Village locations. (Source: HDR)



Other changes from the Growth Plan concept include the extension of the Blue Line to Stonebridge, instead of Market Mall. The Green Line terminates at Confederation Mall in the west and University Heights Suburban Centre in the northeast. The Red Line would terminate at Boychuk Drive, instead of extending to the Homwood Sububan Centre, an area that is currently developing and not yet fully established. The Blue Line, which was initially proposed to end at Market Mall, would be extended south to the community of Stonebridge, increasing the reach of rapid transit to the southernmost communities in the City. Each line could be extended in the future, as build out of greenfield communities and demand at the fringes of the City grows.

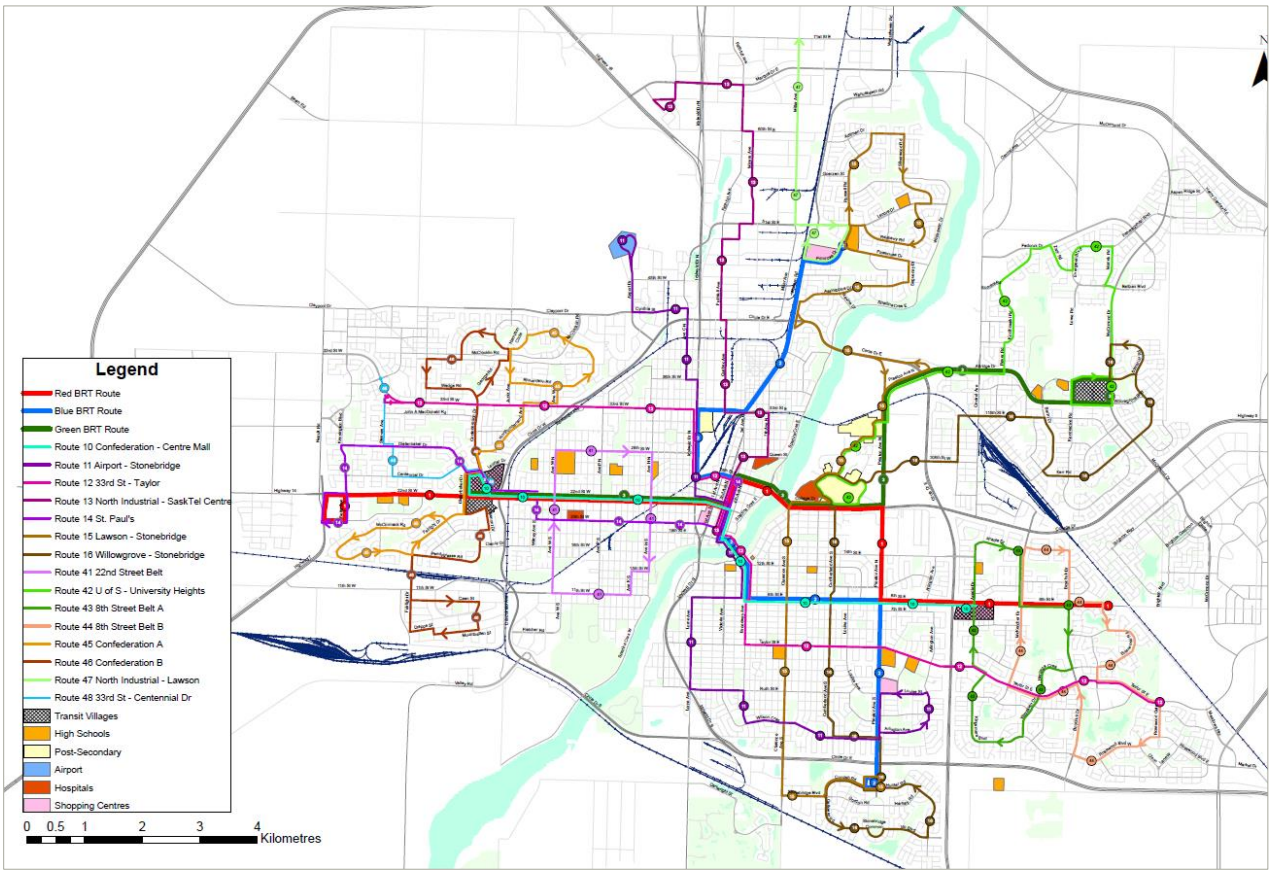
A total of 88 stations were identified based on practical station spacing, community connections, and destinations. Station platforms are generally located farside, allowing the vehicle to pass through the intersection before stopping and unloading. Other benefits of farside stations include maintaining existing right turn capacity, more effective transit priority measures and allowing passengers to cross behind the bus. Stations may be further integrated into the community as corridor and Transit Village redevelopment are realized.

Network Reconfiguration

Including the three BRT Lines, the reconfigured bus route network includes a total of 18 routes, as described in Figure 5. There are six main line and four crosstown routes, and in conjunction with the BRT, these routes form the principal arteries of the reconfigured system. Five suburban connectors link neighbourhoods to the rapid transit lines while providing local connections.

The new system is recommended to operate Monday through Saturday, 6:00am to 1:00am, and Sunday and Holidays from 7:00am to 10:00pm. The BRT would run every 10 minutes from 6:00am to 6:00pm on weekdays, and between 9:00am and 6:00pm on Saturdays. Outside of these core hours, the BRT frequency would be reduced.

Figure 5. Proposed network reconfiguration, including BRT. (Source: HDR)



BRT Benefits

The BRT meets the Growth Plan objectives in the following ways:

Supporting and shaping growth and development within the city:
The BRT forms the backbone of rapid transit service along Saskatoon's major corridors connecting current and future residential, retail, commercial, institutional, cultural, and industrial destinations. The BRT creates a positive image and research shows that BRT can be a catalyst for economic development, with increases to property values, employment, revenues, and redevelopment of land along BRT corridors and around stations.

The Corridor Growth component of the Growth Plan is a land use planning program for major corridors and key sites along the BRT lines based on Transit-Oriented Development principles. The intent of this program is to both support the City's infill growth objectives and investments in transit infrastructure through building in future ridership. BRT is also seen as key to the success of strategic infill growth areas like the Downtown, the North Downtown, and large tracts of university "endowment" land owned by the University of Saskatchewan. The implementation of BRT and the complementary land use planning is expected to support increased amenities through adding to the mixture of uses, present opportunities for public realm improvements, reduce on-site parking requirements, and spur redevelopment.

Providing frequent, direct, reliable transit services for the most significant travel markets:
Within 600m (roughly an 8 to 10 minute walk) of the 88 BRT stations are 52,000 residents, 33,000 post-secondary students, 3 major hospitals, and 44,500 jobs. The BRT will run every 10 minutes, and where the Red and Green Lines overlap there will be a bus every five minutes.

The BRT and local routes are reconfigured to provide direct service, eliminating many circuitous or looped routes, especially within the gridded road network within Circle Drive.

Travel times will improve, and BRT passenger travel times will decrease 8 to 15% compared to a bus route along the same corridor without transit priority measures. Transit signal priority, geometric roadway measures, and exclusive runningways ensure that the BRT moves through congested areas in Saskatoon and ensuring better schedule reliability for customers.

Providing neighbourhood services that support local area travel and connections to primary corridors:
The reconfigured network, as shown in Figure 5, continues to support local area travel, with route frequencies of at least 20 minutes during peak periods. All local routes, whether main line, crosstown, or suburban connectors, offer riders at least one transfer point to a BRT line. Most routes offer multiple connections to the BRT.

Increasing daily city-wide transit mode share (proportion of people using transit) from 4% to 8% percent over the next 30 years, and peak period transit mode share to the Downtown and University areas from 10% to 25%
Improved frequency, reliability, and directness of travel will provide current and prospective customers with greater confidence in the transit system, and the assurance that the bus (whether local routes or BRT) can get them to where they need to go, quickly, on-time, and with minimal effort. The modernization of the Saskatoon Transit system, and introduction of quality facilities (such as shelters and exclusive runningways) signals to potential users that transit and transit users are a valued and prioritized part of the transportation system.

Providing facilities that enhance customer safety and comfort:
At stations, shelters will be enclosed on three side, have two entrances/exists, and will include on-call radiant heat. Platforms and shelters will be highly visible. Stations and shelters will be well lit, ensuring that waiting passengers are able to see and be seen. Stations will also be equipped with security monitoring. Station pylons will include a visible beacon, enhancing the sightlines and locations of stations. Real-time monitors provide customers with next-bus information, reducing the need for customers to rely on checking smartphones or schedules. The reconfigured transit network is highly legible and intuitive, making it easier for customers to get to know and use the system.

Other benefits:

BRT IS A RESPONSIBLE INVESTMENT:
BRT is an appropriate rapid transit solution for the Saskatoon transit market, Growth Plan aspirations, and available funding. Investments in the reconfigured system will attract new riders, increasing farebox revenue in both the short and long term.

BRT GETS MORE OUT OF EXISTING ROADWAY INFRASTRUCTURE:

Generally, BRT increases roadway capacity without the need for widening roads and acquiring land, and maintains the scale and character of the built form along destinations streets like Broadway Avenue and 3rd Avenue downtown.

MULTIPLE ACCOUNT EVALUATION / COST BENEFIT ANALYSIS:

A multiple account evaluation showed that BRT benefits outweigh the capital and operating costs. The approach adopted for this study is the Multiple Account Evaluation (MAE), a type of socio-economic evaluation of investments that incorporates a wide range of user, financial, environmental, and broad socio-economic impacts that serve as evaluation criteria. The impacts include both quantitative and monetized impacts as well as qualitative impacts. The latter impacts are effects which can be considered important but which are difficult to quantify and monetize.

This cost-benefit analysis finds that the proposed BRT is expected to generate significant benefits to the City of Saskatoon that exceed total costs of the project at the discount rate of 3% and even at the conservative discount rate of 8%. The project can thus be considered economically worthwhile from the City's perspective. The benefit-cost ratio of 2.5 at the 3% discount rate and 1.7 at the 8% discount rate can be considered as very good outcomes.

Qualitative benefits of the project, essentially improved quality of transportation, convenience, greater mobility for a wide range of population groups (including persons with mobility challenges or limitations and for those who do not drive), further strengthen the business case.

Conclusion

With direction from the Growth Plan to Half a Million, Saskatoon is positioned for long-term growth and has set a new course for development and mobility patterns. Redevelopment and intensification along major corridors are supported by a backbone of frequent, reliable, and attractive bus rapid transit lines, improving transportation options for current and future residents. In an age where transit ridership is declining in many cities across Canada and in North America, Saskatoon has recognized that a business-as-usual model will fail to attract new riders, support significant infill development, or improve quality of life. The short and long term economic, environmental, and social benefits of investing in BRT largely outweigh initial capital investments. With BRT functional planning and detailed design underway, Saskatoon is ready to grow.