Edmonton
City Council

Urban Planning Committee - Agenda

Date: February 15, 2022
Time: 9:30 a.m. - 5:00 p.m.
Location: Council Chamber, 2nd floor, City Hall

Call to Order: 9:30 a.m.
Lunch: Noon - 1:30 p.m.
Recess: 3:30 p.m. - 3:45 p.m.
Adjournment: 5 p.m.

Chair: S. Hamilton Vice Chair: A. Paquette
Members: K. Principe, A. Salvador

Please note: City Hall is open to the public at reduced capacity for this meeting. Members of the public may choose to participate at Council and Committee meetings in person or remotely. Those participating in person are required to wear face coverings at all times while in City Hall, including while speaking (per Temporary Mandatory Face Coverings Bylaw 19408). You can request to speak up until your item has been dealt with. The public is invited to view in-progress meetings online via the Agenda, Council on the Web or City Council's YouTube Channel.

For additional information, contact the Office of the City Clerk at (780) 496-8178.

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None

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None

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None

10. Notices of Motion and Motions without Customary Notice

11. Adjournment

Edmonton
City Council

Urban Planning Committee Minutes

January 18, 2022
9:30 a.m.
Council Chamber, 2nd floor, City Hall

Present: S. Hamilton, A. Paquette, K. Principe, A. Salvador, A. Sohi

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1. Call to Order and Related Business

1.1 Call to Order and Land Acknowledgement

Councillor S. Hamilton called the meeting to order at 9:30 a.m., Tuesday, January 18, 2022, and acknowledged that Urban Planning Committee meets on the traditional land of Treaty 6 Territory. The Chair also acknowledged the diverse Indigenous peoples whose ancestors' footsteps have marked this territory for centuries such as: Cree, Dene, Saulteaux, Blackfoot, Nakota Sioux, as well as Metis and Inuit, and now settlers from around the world.

1.2 Roll Call

Councillor S. Hamilton conducted roll call and confirmed the attendance of Members of Urban Planning Committee.

**Mayor A. Sohi is a Committee Member pursuant to section 15(3), Council Committees Bylaw 18156*

Councillors T. Cartmell, M. Janz, A. Knack, J. Rice, E. Rutherford, A. Stevenson, K. Tang and J. Wright; and E. Norton, T. Orbell and C. Schlamp, Office of the City Clerk, were also in attendance.

1.3 Adoption of Agenda

Moved by: A. Salvador

That the January 18, 2022, Urban Planning Committee meeting agenda be adopted.

In Favour (5): S. Hamilton, A. Paquette, K. Principe, A. Salvador, and A. Sohi

Carried (5 to 0)

1.4 Approval of Minutes

Moved by: K. Principe

That the November 15, 2021, Urban Planning Committee meeting minutes be approved.

In Favour (5): S. Hamilton, A. Paquette, K. Principe, A. Salvador, and A. Sohi

Carried (5 to 0)

1.5 Protocol Items

There were no Protocol Items.

2. Items for Discussion and Related Business

2.1 Select Items for Debate

The following items were selected for debate: 6.1, 6.2 and 6.3.

2.2 Vote on Reports not Selected for Debate

All items were selected for debate.

2.3 Requests to Speak

Moved by: A. Paquette

That Urban Planning Committee hear from the following speakers, in panels when appropriate:

- 6.1 Financial Incentive Options for Non-residential Heritage Properties
- 6.2 Financial Mechanisms for Heritage Buildiings

1. J. Campbell
2. C. Klassen, Old Strathcona Business Association
3. D. Schamuhn, Edmonton Historical Board
4. C. Dulaba, Beljan Development
5. R. Hobson, Edmonton Heritage Council
6. W. Antoniuk, Old Glenora Conservation Association

- 6.3 Heritage Resource Managment Strategy

1. J. Campbell
2. D. Schamuhn, Edmonton Historical Board
3. C. Lefebvre, DC1 Working Group
4. D. Percy, DC1 Working Group
5. B. Finlay, Glenora Heritage Character Area Rezoning
6. R. Hobson, Edmonton Heritage Council
7. L. Odynski, DC1 Working Group
8. M. Samji, Infill Development in Edmonton Association

In Favour (5): S. Hamilton, A. Paquette, K. Principe, A. Salvador, and A. Sohi

Carried (5 to 0)

2.4 Requests for Specific Time on Agenda

There were no requests for items to be dealt with at a specific time on the agenda.

3. Councillor Inquiries

There were no Councillor Inquiries.

4. Reports to be Dealt with at a Different Meeting

There were no Reports to be Dealt with at a Different Meeting.

5. Requests to Reschedule Reports

There were no Requests to Reschedule Reports.

6. Public Reports

6.1 Financial Incentive Options for Non-residential Heritage Properties

Items 6.1 and 6.2 were dealt with together.

The following members of Administration's delegation made a presentation:

- S. McCabe, Deputy City Manager, Urban Planning and Economy
- S. Ashe, Urban Planning and Economy
- A. Szabo, Finance and Corporate Services

The following public speaker made a presentation:

- C. Klassen, Old Strathcona Business Association

The following public speakers made presentations and answered questions:

- C. Dulaba, Beljan Development
- J. Campbell
- D. Schamuhn, Edmonton Historical Board
- R. Hobson, Edmonton Heritage Council

The following members of Administration's delegation answered questions:

- S. McCabe, Deputy City Manager, Urban Planning and Economy
- S. Ashe, Urban Planning and Economy
- A. Szabo, Finance and Corporate Services
- C. Ashmore, Office of the City Manager (Legal Services)
- S. Padbury, Chief Financial Officer and Deputy City Manager, Finance and Corporate Services
- C. Watt, Finance and Corporate Services

- V. Ferenc-Berry, Office of the City Manager (Legal Services)

The following answered questions:

- A. Giesbrecht, City Clerk

Moved by: A. Paquette

That the January 18, 2022, Financial and Corporate Services report FCS00645, be received for information.

In Favour (4): S. Hamilton, A. Paquette, K. Principe, and A. Salvador

Carried (4 to 0)

6.2 Financial Mechanisms for Heritage Buildings

Items 6.1 and 6.2 were dealt with together (see item 6.1).

Moved by: A. Paquette

That the January 18, 2022, Urban Planning and Economy report CR_7701, be received for information.

In Favour (4): S. Hamilton, A. Paquette, K. Principe, and A. Salvador

Carried (4 to 0)

6.3 Heritage Resource Management Strategy

The following members of Administration's delegation made a presentation:

- S. McCabe, Deputy City Manager, Urban Planning and Economy
- K. Snyder, Urban Planning and Economy
- E. Backstrom, Urban Planning and Economy

The following public speaker made a presentation:

- L. Odynski, DC1 Working Group

The following public speakers made presentations and answered questions:

- C. Lefebvre, DC1 Working Group
- D. Percy, DC1 Working Group
- B. Finlay, Glenora Heritage Character Area Rezoning
- M. Samji, Infill Development in Edmonton Association
- D. Schamuhn, Edmonton Historical Board
- R. Hobson, Edmonton Heritage Council

The following members of Administration's delegation answered questions:

- K. Snyder, Urban Planning and Economy
- S. McCabe, Deputy City Manager, Urban Planning and Economy
- J. Haney, Urban Planning and Economy
- S. Kuiper, Urban Planning and Economy
- S. Ashe, Urban Planning and Economy

Moved by: A. Paquette

That Urban Planning Committee recommend to City Council:

That Administration resume work to prepare Direct Control (DC1) Zoning for the Glenora Heritage Character Area, in alignment with The City Plan goals of increased density while encouraging the retention of heritage resources and ensuring new development respects the form and massing of the Garden City Suburb.

Not put to vote

Councillors A. Paquette and S. Hamilton requested report UPE00724 be referred to City Council without a Committee Recommendation.

7. Responses to Councillor Inquiries

There were no Responses to Councillor Inquiries on the agenda.

8. Motions Pending

There were no Motions Pending on the agenda.

9. Private Reports

There were no Private Reports on the agenda.

10. Notices of Motion and Motions without Customary Notice

Councillor S. Hamilton asked whether there were any Notices of Motion. There were none.

11. Adjournment

The meeting adjourned at 3:40 p.m., Tuesday, January 18, 2022.

Chair	City Clerk

Requests to Reschedule Reports
Urban Planning Committee
February 15, 2022

5.1 Bus Network Redesign - Options for Expansion

City Operations- CO00606

Original Due Date: First Quarter 2022, Urban Planning Committee

Revised Due Date: March 23, 2022, Executive Committee

- Administration is requesting to reroute this report in order to combine with CO00803, Bus Network Expansion Opportunities, as both motions are best dealt with together as one report to avoid duplication.

Recommendation:

That Urban Planning Committee recommend to City Council:

That the revised due date of March 23, 2022, Executive Committee, for the City Operations report CO00606 Bus Network Redesign - Options for Expansion, be approved.

COUNCIL REPORT

MASS TRANSIT: PLANNING FOR 1.25 MILLION PEOPLE

RECOMMENDATION

That the February 15, 2022, Urban Planning and Economy report UPE00342, be received for information.

Report Purpose

Information only.

The intent of this report is to inform Urban Planning Committee of the mass transit network planning for a population of 1.25 million, as well as next steps for implementation.

Executive Summary

- The City Plan envisions a vibrant and prosperous city with an integrated transportation network, providing residents with convenient and equitable options.
- Foundational to this network is a robust transit system, including an evolved mass transit network that anchors an overall mobility system which connects all areas of the city.
- This report summarizes a critical implementation piece that advances The City Plan's Systems and Networks.
- Administration conducted a technical study to identify a mass transit network that supports The City Plan concept at a population of 1.25 million people.
- The findings of the mass transit technical study identify a network that includes the strategic expansion of LRT routes in consideration of additional mass transit options that include bus rapid transit, limited stop and frequent routes.

REPORT

The City Plan envisions a vibrant and prosperous city of two million people with half of future population growth occurring in established areas. The foundation of our future urbanized city is an evolved mass transit network which supports nodes and corridors. In turn, the nodes and corridors provide the necessary urban structure to direct future investment and manage ongoing change. Ultimately, these combine to support greater community equity, opportunity and connectedness. Building off of the Bus Network Redesign, a well-integrated mass transit network will provide Edmontonians with access to safe, convenient and reliable service with faster journey times, and contribute to reaching a target in which 50 per cent of all trips are made by transit and active transportation. The mass transit network for two million people is illustrated in Attachment 1.

The transit network will continue to adapt in response to emerging technologies and mobility services, and will increasingly move towards a low carbon operation. Investing in a complete transit network, with mass transit serving as the foundation of that system, will be an increasingly important tool for both city building and climate resilience as Edmonton grows.

As part of The City Plan implementation, Administration completed a mass transit technical study that identifies a mass transit network to support a population horizon of 1.25 million people. This mass transit technical study is the first step to identify opportunities and constraints for future mass transit development and is an important part of Edmonton's journey to achieve its goals for greenhouse gas emissions reductions.

Project Background

Success Factors for 1.25 Million Population Horizon

Critical success factors, identified from The City Plan mass transit study and incorporated into this planning work, are key to support the mass transit network at a population of 1.25 million:

- **Mass Transit Priority:** This refers to the reallocation of existing road right-of-way in order to create dedicated transit right-of-way. It also refers to the introduction of transit priority measures, including additional transit signal priority and semi-exclusive right of way. These measures represent a significant shift in approach that will help to increase capacity, improve reliability, reduce travel times, and provide opportunities for service to respond to ridership growth.
- **Future Development Opportunities:** Mass transit succeeds when it is supported by future land use development and intensification, particularly in priority growth areas. Transit-oriented development in nodes and corridors, supported by mass transit stops and stations, should influence when future mass transit extensions are built.
- **Filling Network Gaps and Parallel Corridors:** Parallel mass transit routes can balance passenger loads from overloaded mass transit routes. Mass transit routes can also fill network gaps and improve accessibility to transit.
- **Parking Policy and Mobility Hubs:** Parking pricing and availability, including strategic application of Park and Ride and the development of mobility hubs, will allow the mass transit network to be well connected with other travel options.

The scale with which these mass transit success factors are applied will have a direct effect on climate change goals given the impact of the mobility system on greenhouse gas emissions.

Mass Transit Network to Support 1.25 Million Population

This study identifies the mass transit network required to support The City Plan concept for 1.25 million people, as illustrated in Attachment 2. This network is based on the Bus Network Redesign and LRT expansion and aims to increase transit ridership and mode share in line with the City

Plan concept. Specific terms used to describe mass transit or the types of service are further defined in Attachment 3.

City-Wide Routes

City-wide mass transit networks include LRT and bus-based mass transit routes to provide the foundation of public transit and create city-wide mass transit circuitry connecting all quadrants. The LRT network provides key city-wide routes. High-floor LRT runs mainly along exclusive rights-of-way while the urban-style, low-floor Valley Line will operate in a dedicated right-of-way with more integration into the surrounding streetscape, communities, and destinations.

Bus rapid transit routes will provide new connections and alternatives to congested corridors, often at a lower capital cost. The development of these routes will be important to achieve the ultimate mass transit network envisioned in The City Plan. Bus rapid transit routes can be implemented through a cohesive, context-sensitive combination of dedicated travel lanes on key corridors and transit priority measures at key intersections. Bus rapid transit routes envisioned for a 1.25 million population involve the reallocation of space on existing infrastructure, and are not anticipated to require grade separations or new river crossings.

Bus rapid transit is not intended as a precursor to LRT but complements the LRT network. The mass transit planning technical study identifies alternative approaches to increase transit ridership through semi-exclusive, bus-based service, such as bus rapid transit and select limited stop rapid routes.

District Routes

District routes fill gaps in the mass transit network and provide connections to city-wide routes, nodes and corridors, and major employment areas. Many district routes will be an evolution of existing ETS bus routes, including new bus routes, with higher service levels. Growth and evolution of the bus network to respond to population growth, particularly in support of nodes and corridors, are necessary to realize these district routes to better serve 15-minute communities.

Limited stop rapid routes and urban frequent routes will make up most of the district route network. Limited stop rapid routes will evolve from the combination and/or upgrade of existing ETS bus routes, including new bus routes, through the use of key operational and infrastructure investments such as increased service and transit priority measures. Frequent urban district routes consist mainly of existing ETS bus routes, including new bus routes, and are expected to become increasingly important. Future service levels will respond to and facilitate the intensification of key nodes and corridors.

Supporting Service

The mass transit network will be supported by several additional types of non-mass transit service provided by the local transit network, including the new bus network, and our regional partners.

- **Local Transit Network** includes multiple layers of transit service including conventional bus, on demand transit and paratransit. The local transit network generally balances access with speed. These routes provide an alternative to driving for shorter trips within districts and create connection points to the mass transit network.

- **Regional Routes** will be integral to the continued prosperity and connectivity of the Edmonton region. These routes will be guided by regional partners and entities, such as the Edmonton Metropolitan Transit Service Commission. Pursuing opportunities associated with future regional routes will require continued connection and collaboration with regional partners.

Findings and Implications

Focused investment in strategic transit corridors will require a careful assessment of how Edmonton uses available transit funding to achieve The City Plan outcomes. Below are the key findings and implications outlined in the technical study.

- **LRT Network Plan -** Aligning future LRT expansion to high development potential will provide the most benefit to the overall mobility system. Based on the technical study, the 1.25 million population mass transit network includes the future Capital Line extension beyond Ellerslie Road but does not include the Metro Line extension beyond Blatchford. This finding differs from previous City Council priorities regarding the LRT network plan which were set prior to City Plan approval. Metro Line extension north of Blatchford was identified as the next priority after the Capital Line South extension to Ellerslie Road. Decisions related to future LRT expansion will be set by City Council as the availability of transit funding becomes clearer.

- **Bus Rapid Transit -** Creating new bus rapid transit and limited stop rapid connections will improve service to existing demand and provide alternative connections to key nodes and corridors. New dedicated bus right-of-way opportunities paired with transit priority measures at key intersections will allow these routes to operate more efficiently and reduce travel time. There are opportunities to create dedicated rights-of-way for transit in the 1.25 million population horizon through the redistribution of road space and allocation of travel lanes along major arterial roadways such as 97 Street, Whyte Avenue, Terwillegar Drive, Whitemud Drive and Gateway Boulevard/Calgary Trail. Additionally, incorporating bus rapid transit and rapid bus service as part of the mass transit network provides relief to capacity-constrained routes, such as the Capital Line, and extends mass transit service to key destinations that complement the LRT network.

- **Airport Connection -** An efficient and direct mass transit service to an airport is a key feature of world-class cities. The mass transit study recommends a connection to the Edmonton International Airport that does not consist of an extension of the LRT past city boundaries. As such, the initiation of a direct bus-based mass transit connection between downtown and the Edmonton International Airport has merit to explore with regional partners.

- **Benefits of Mass Transit Network -** The technical study found that the improvements to the mass transit network are expected to capture future travel demand, resulting in a modest increase to transit mode share and corresponding reduction of greenhouse gas emissions. Transportation is one of the four major sources of greenhouse gas emissions within Edmonton, making up approximately 30 per cent of all emissions. Transitioning towards zero emission mobility options, including a zero emission transit system that features a fleet of zero/low emissions vehicles, will significantly reduce greenhouse gas emissions. Greater benefit to transit mode share or greenhouse gas emissions could be achieved by applying additional levers of change identified in the February 2, 2021, Urban Planning and Economy report CR_7810, Transit Mode Share - Increase and Impacts.

The approval of The City Plan and associated technical studies, including the findings noted above, provide an opportunity to consider an overall assessment of mass transit network priorities. This could include a reassessment of future LRT expansions to consider them alongside mass transit routes serviced through bus rapid transit routes, and/or other mass transit options. The intent would be to implement and prioritize each component in a way that benefits Edmontonians and best contributes to The City Plan outcomes. It will be important to consider both upfront capital costs and overall operational costs associated with the specific type of service when determining future mass transit priorities. Further planning work is required to determine costs and benefits for prioritization.

Next Steps

The findings identified through the mass transit technical study are incorporated into the February 15, 2022, Urban Planning and Economy report UPE00491, Mobility Network Assessment. The Growth Management Framework, currently under development, will provide a lens to evaluate mass transit investments that support growth in consideration of priority growth areas.

Future planning work for implementing the mass transit network for 1.25 million people includes:

- Define types of mass transit for future consideration
- Operational study to identify conflicts and opportunities, including consideration for emerging technologies
- Complete technical studies related to
  - Development potential along mass transit routes
  - Impacts to the mobility system
  - Equity and inclusivity considerations
  - Impacts to climate strategy goals
- Assess and evaluate mass transit route alignments and design
- Identify mass transit network staging plan for 1.25 million people

Addressing needs identified in the February 15, 2022, Urban Planning and Economy report IIS00416, ETS Fleet Storage and Maintenance Facility Project and the upcoming City Operations report CO00607, Mass Transit System - Sustainable Funding and Service Growth, will be critical to the growth and implementation of The Mass Transit network. Interim enhancements to the existing ETS network through service enhancements and stand-alone transit priority measures will be presented as part of the upcoming City Operations report CO00803 Bus Network Expansion Opportunities. These interim measures can reduce travel times and improve existing transit service levels. Opportunities to evolve these interim enhancements will be considered as part of the mass transit implementation noted previously.

BUDGET/FINANCIAL IMPLICATIONS

Further planning and design work is required prior to providing an accurate assessment of implementation costs. Additionally, future technologies can affect the implementation and costs of building out the mass transit network envisioned in The City Plan.

COMMUNITY INSIGHT

The mass transit planning technical study did not include any direct input from the community. However, the project relied on the direction provided in The City Plan and other strategic documents that included robust public engagement with, and listening to, Edmontonians. Additional research and/or conversations with Edmontonians and other stakeholders would be included as part of the project development process for mass transit projects that proceed to planning and design.

GBA+

Inequities and exclusion for marginalized people can result from mass transit networks when equity and inclusion lenses are not applied intentionally or consistently. An extensive GBA+ process will ensure that the work does not create inequities or contribute to the further marginalization of diverse individuals.

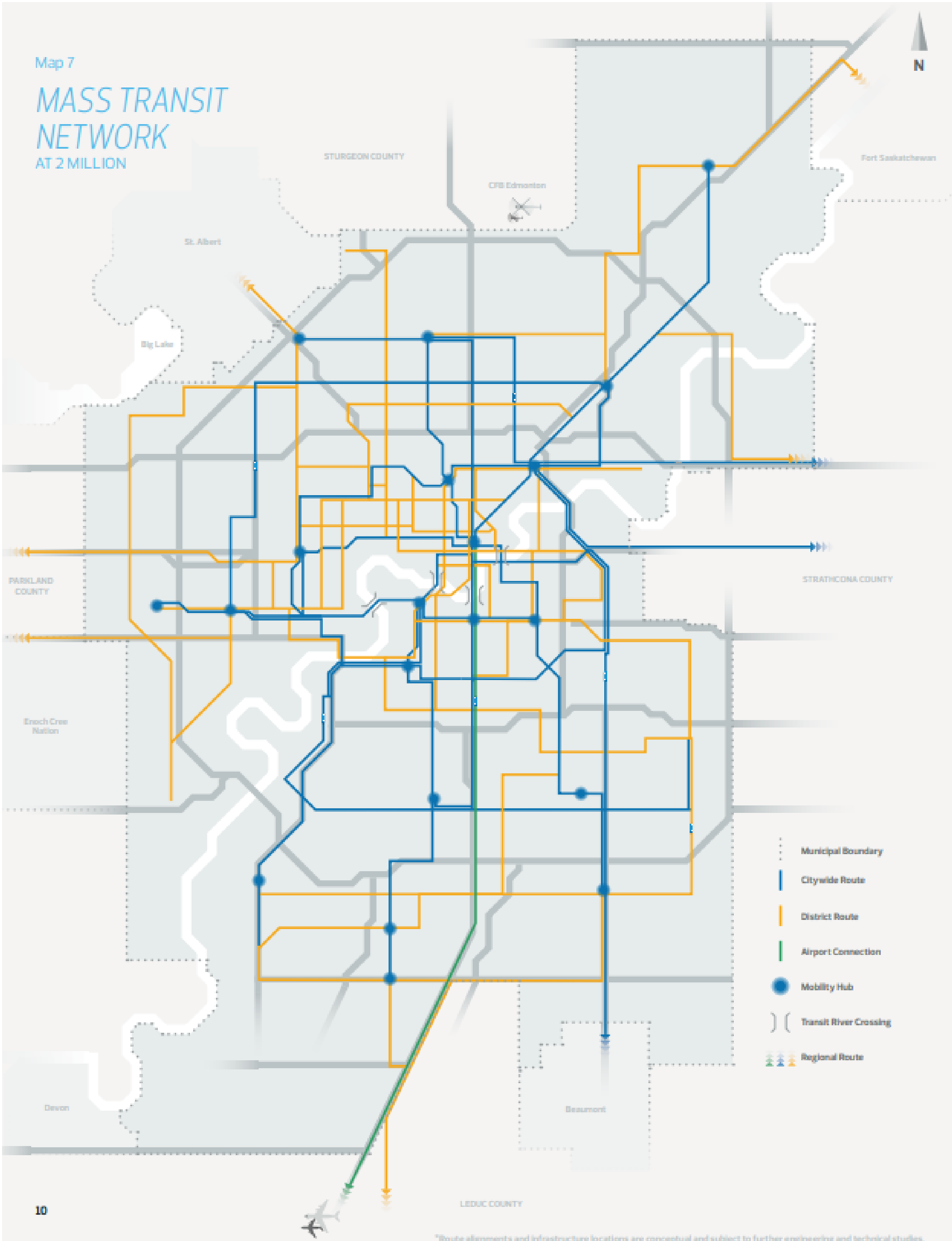
As part of implementing the 1.25 million mass transit network, Administration plans to complete the following in 2022:

- Complete a literature review to identify inequities, exclusion and unsafe conditions that result from transit systems.
- Complete a review of transit agencies in Canada and around the world to identify potential equity and inclusivity measures, to understand the challenges faced and successes achieved, and how successful they proved to be.
- Engage with marginalized populations of Edmontonians to ensure research findings reflect diverse experiences and perspectives of individuals in Edmonton.
- Use quality of service models and neighbourhood demographic data to identify inequities experienced by users of the mass transit network at 1.25 million.
- Select equity measures to monitor the effectiveness in achieving equality of outcomes throughout network implementation.

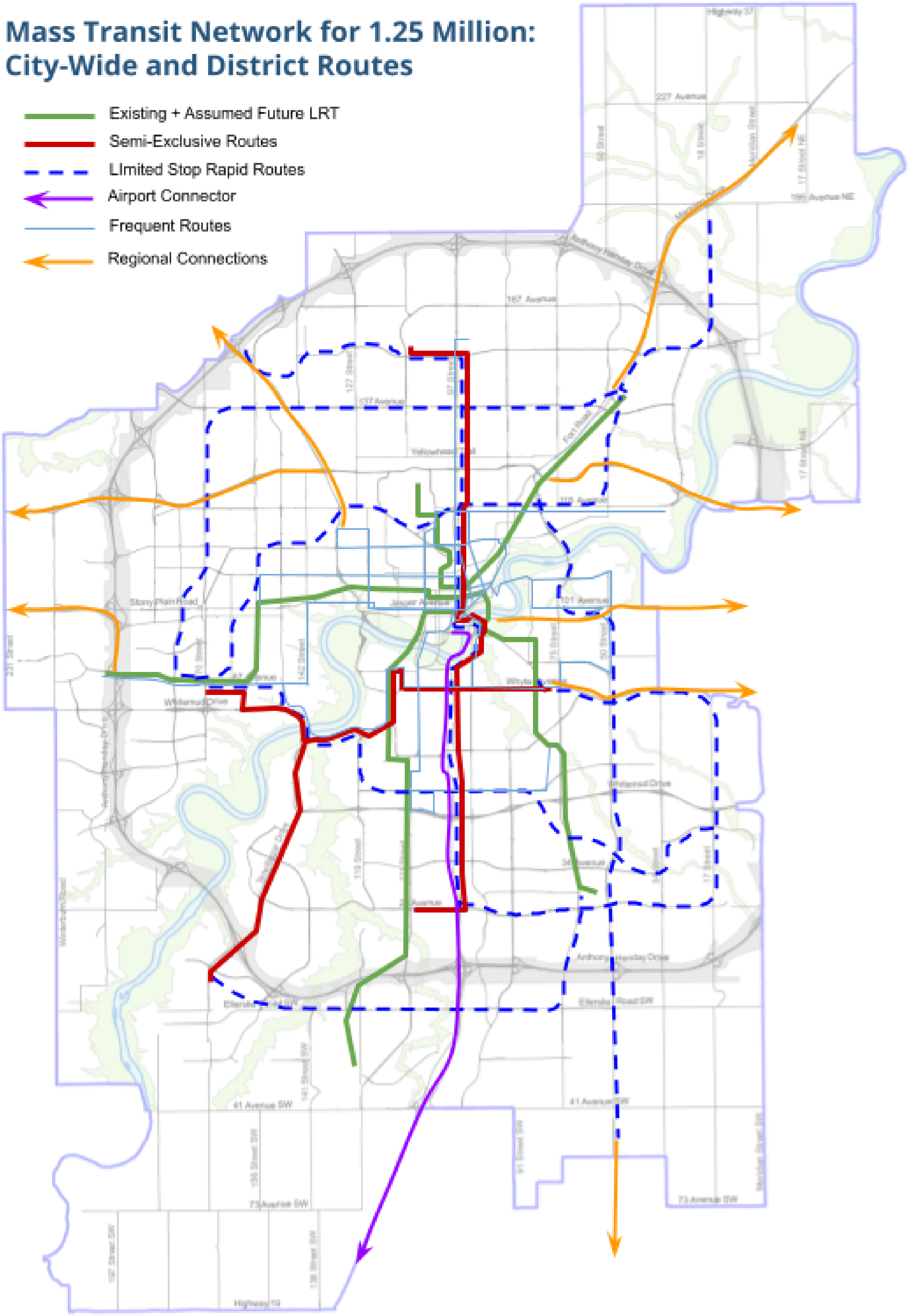
ATTACHMENTS

1. City Plan Mass Transit Network
2. Mass Transit Network for 1.25 Million: City-Wide and District Routes
3. Glossary of Terms and Mass Transit Service Definitions

City Plan Mass Transit Network



Attachment 2



Attachment 3

Glossary of Terms

Bus Rapid Transit (BRT)

The term "BRT" tends to be used inconsistently across jurisdictions and municipalities. BRT generally refers to enhanced bus service that typically includes dedicated transit infrastructure. The most common definitions typically include (but may not be limited to) the following features:

- Dedicated right-of-way
- Busway alignment away from the curb lane
- Off-board fare collection
- Intersection treatments
- Platform-level boarding

Bus based mass transit systems in Canada and around the world are identified as BRT by incorporating differing levels and combinations of these features. Defining what constitutes BRT in Edmonton will be part of the continued work associated with implementing the mass transit network for 1.25 million people.

Mass Transit

A broad family of strategic public transit services that carry higher volumes of passengers within urbanized areas.

Regional Connections

Regional connections operate partly or entirely outside of Edmonton. Most regional connections operate as rapid transit routes between municipalities in the Edmonton Metropolitan Region.

Road Right-of-Way (ROW)

Road right-of-way defines the use of public property designated for people walking, rolling, biking, using transit and driving.

Transit Priority Measures (TPM)

Traffic management tools that give public transit priority over other vehicle traffic to improve speed and reliability of transit service. Transit priority measures fall into three categories, although they are often used together:

Regulatory Tools: Regulations applied to roadway operations to improve performance of the transit system while making use of the existing roadway. Examples include parking bans and restricted left turns for other vehicles.

Transit Signal Priority: The use of traffic signals to reduce delays for transit vehicles. Examples include transit-only signals and coordinated signal timing that favors transit.

	Roadway Design Elements: Includes improving transit operations through roadway design including dedicated lanes and queue jumps.
Transit Right-of-Way	In the context of transit routes, right-of-way describes how a transit vehicle interacts with other vehicles along the roadway or corridor. Generally, transit routes operate in one of three right-of-ways: **Mixed Traffic:** Transit vehicles operate in travel lanes used by other vehicles. **Semi-Exclusive:** Transit vehicles operate in a separate lane from other vehicles for parts of the corridor and are mixed with other vehicles for other parts (i.e., at intersections, driveways and/or turn lanes). **Exclusive:** Transit vehicles operate entirely separate from other vehicles within their own lane and crossings or within their own dedicated corridor.

Mass Transit Service Definitions

Frequent Transit	Frequent transit provides high service frequencies to serve busy routes and minimize waits and transfers. Stops along frequent transit corridors tend to be spaced closely to reduce walking distance for people and to make transfers more practical. Because of this, frequent transit routes tend to be slower than rapid routes but can potentially move high volumes of people along densely populated corridors.
Light Rail Transit (LRT)	A family of urban rail-based passenger services which can provide high capacity and speed, but typically travel slower and use smaller vehicles than long distance rail services. In Edmonton, LRT includes High Floor LRT (Capital and Metro Lines) and Low Floor LRT (Valley Line).
Limited Stop Rapid Transit	Limited stop service allows faster travel than local and frequent bus routes by stopping at strategic locations and bypassing intermediate stops. These routes may include higher capacity vehicles and some transit priority.
Local Transit	Local transit routes serve neighbourhoods and local destinations, and connect to other local routes and/or higher orders of transit (i.e., mass transit).

Report

Mass Transit Planning for 1.25 Million Population

Mass Transit Component of Mobility Network Assessment

Prepared for City of Edmonton
by IBI Group
December – 2021

Prepared by IBI Group

BY

PROFESSIONAL ENGINEER
BLAIR K. S. SMITH
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#223764 Dec. 15, 2021

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PERMIT TO PRACTICE
IBI GROUP PROFESSIONAL SERVICES (CANADA) INC.

RM SIGNATURE:

RM APEGA ID #: **33758**

DATE: December 17 2021

PERMIT NUMBER: P013381

The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

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Glossary and Abbreviations

AM	The early morning (7am to 8am) weekday peak hour.
BNR	Bus Network Redesign
BRT	Bus Rapid Transit
CBD	Central Business District (Edmonton City Centre Node)
CL	Capital Line (LRT)
EIA	Edmonton International Airport
ETS	Edmonton Transit Service
HOV	High Occupancy Vehicles (can include carpools, transit and taxis)
IRTMP	Integrated Regional Transportation Master Plan (developed for the Edmonton Region with City participation)
LRT	Light Rail Transit
MD	The typical midday (9 am to 3:30pm) weekday time period. Statistics are usually for one hour.
ML	Metro Line
MTN	Mass Transit Network
PM	The late afternoon (4:30pm to 5:30pm) weekday peak hour.
RTSC	Regional Transit Services Commission
ROW	Right-of-Way
WEM	West Edmonton Mall (in the context of this report, the Transit Centre and future LRT stop)
VL/VLSE	Valley Line/Valley Line Southeast

Airport Connection	Airport service within the City-wide network with direct connection to the Centre City node with connections at key nodes along the way
Corridor	A place for movement, living and commerce that is anchored by key mobility networks and well connected to surrounding communities.
Design Capacity for LRT	High Floor LRT (Capital and Metro Line): 150 passengers per car, and 750 passengers per 5-car train. With the Capital Line running at 5 min headway and Metro Line running at 10 min headway during the morning peak hour (for the 1.25 Million horizon), the total capacities will be 9,000 passengers per hour per direction (pphpd) for the Capital line and 4,500 passengers per hour per direction (pphpd) for the Metro Line. Low Floor LRT (Valley Line): 225 passengers per car, and 450 passengers per 2-car train. With 5 min headway during the morning peak hour, the total capacity for Valley Line will be 5,400 passengers per hour per direction.
District	A grouping of neighbourhoods with diverse amenities that support living more locally.
Edmonton Metropolitan Region	The geographical area that is home to more than one million people, has a diversified economy, and surrounds several municipalities and three first nations 24 municipalities and three First Nations. The City of Edmonton is continuously working with its regional partners to help the Region thrive and prosper while also addressing the challenges of rapid growth.
Future Growth Area	Lands south of 41st Avenue SW for which substantial completion of developing areas is required before authorizing the preparation of statutory plans.
Mobility Hub	A place for trip origins, destinations, and transfer points to allow people to seamlessly move from one travel option to another as needed. Mobility hubs are typically located in nodes and centred at cross sections of mass transit routes to create connections within Edmonton and the region.
Networks	Networks are spatial representation of physical or conceptual elements that link together or are related.
Nodes	Centres of activity of different shapes and sizes that feature a variety of housing types, gathering places, a mixture of land uses and varying tenures and affordability. There are three types:
Passenger Boardings	The number of passengers that get onto (board) transit vehicles. It is a measure of how many people use a transit route or transit system.
Passenger Volumes	The number of passengers on board a transit vehicle at a specific point on the route. At any given time, this is how many people boarded the vehicle since the start of the route, minus the number who have already left the vehicle at an earlier stop.
Peak Hour Passenger Volumes	The total number of passengers travelling in the peak direction on one or more transit routes, operating in the same direction, during a one-hour period. This value is the sum of the passenger loads on the individual vehicles during that hour. It indicates how busy the route (or corridor) is during the time period.
Critical/Maximum Load Point	This is the location or segment of a route where the highest passenger loads are experienced in one direction during the time period in question. It is also referred to as the maximum passenger load or volume. This number is often compared with the capacity of a transit route to assess if the right amount of service is being provided.
Passenger Loads	Synonymous for passenger volumes.
Directional Peak Load	This is the passenger load at the critical load point, only counting the peak (higher value) direction.
Peak Hour Capacity	This is the theoretical number of passengers that can be carried on a transit route or transit mode past a single point or location, in one hour. It is a function of vehicle space

	× number of vehicles per hour. The peak capacity assumes that vehicles arrive as scheduled and counts all passenger spaces (seated or standing) that are provided in the peak direction of a transit service. It is challenging to achieve peak capacity because passengers are not evenly distributed throughout transit vehicles, and when vehicles are fuller, slower passenger alighting and boarding can end up delaying service.
Service Planning Capacity	This is a lower threshold for transit route capacity where the density of standing passengers is lower than the design load for that type of vehicle. It implies greater ease of passengers circulating on board, alighting and boarding the vehicle. This planning capacity is used to estimate how many vehicles a transit route should be allocated, with a safety margin built in for extra demand.
Transit Facilities	A location where residents can access public transit. Includes bus stops, train stations and transit centres.
Transit Vehicle Capacity	This is the number of passengers a transit vehicle can carry if full. It counts the seats on a transit vehicle plus an estimated number of people standing, assuming ‘x’ people per square metre of floor space in the vehicle. Since the ‘x’ value for number of people depends on operational needs and practices, there can be a range for this capacity value. (Please see Peak Hour Capacity and Service Planning Capacity)

Executive Summary

The City of Edmonton recently approved The City Plan, a long-term plan developed for the future growth of the city to 2 million people. The City Plan contains policies and outlines the systems and networks including a set of planning and design, mobility, and growth management systems. An Ultimate Mass Transit Network was defined, which included several major elements:

- Continued expansion of the ‘conventional’ bus network to serve all areas of the city;
- Frequent bus services operating on major arterials and passing through the central neighbourhoods of the city;
- Limited-stop (or rapid) bus services operating in mixed traffic but at higher speeds than conventional routes;
- Semi-exclusive transit routes where the service operates in dedicated lanes in the middle or alongside major corridors. These also operate with more limited stops and the separation from other traffic, allows these routes to run faster and more frequently across the city.
- Exclusive ROW routes, which includes existing and future LRT lines. While some sections of the LRT operate in semi-exclusive sections, all parts of the LRT benefit from signal priority and pre-emption to allow for high frequency, longer vehicles, and high capacities.
- The long-term vision also includes a connector from the airport to downtown, either by rail or semi-exclusive bus.
- Regional services were assumed to ensure connectivity with the Edmonton Metropolitan Region; the long-term form of these services rests with the Regional Transit Services Commission.

The elements of the ultimate mass transit network for 2 Million population were the starting point in defining network options for 1.25 Million, nominally 10-15 years in the future.

Future Base and Options A/B

Major considerations in defining the future base transit network (Base) and two evaluation options (A and B) included:

- Continued expansion of the LRT network as committed, and of the bus system into growth areas;
- The expected staging of population and employment growth;
- Interpolation of additions in service between today and the ultimate mass transit network;
- The operational and physical constraints, challenges and opportunities for transit identified by stakeholders.

These were evaluated using the travel demand model as the principal tool, along with GIS analysis of corridor characteristics. An evaluation was carried out to assess which routes from these future options appeared to be stronger choices for implementation in the 10-15-year time frame. This largely links back to the land uses and destinations being served and the resulting ridership on transit. There is also a logic in building up the transit network where parallel routes can offer alternative paths for passengers, and relieve pressures on more crowded parts of the transit system.

When comparing the more robust mass transit option with the 1.25 million base network, the results of the technical analysis project an increase in mode share. The resulting 9.3% weekday transit split considers all trips in Edmonton. The increase from the transit share of 8.2 percent recorded in the 2015 household travel survey should be analyzed in the context of a much higher population basis for the future mode share results. The number of transit riders will not only have kept pace with growth of the city but is also forecast to make additional gains.

Recommended Interim Network for 1.25 Million population

Based on the performance of the mass transit routes modelled and the success factors considered for mass transit, the following elements are **recommended for an interim 1.25 million population mass transit network**:

- The Heritage Valley Major Node extension of Capital Line is more likely to occur, ahead of the Metro Line extension beyond Blatchford due to the expected development to occur at this Major Node.
- Several infill LRT stations are possible as development opportunities arise. Business cases should be created to validate their potential. are needed as opportunities arise.
- B1 (part BRT/ part rapid bus) replaces and expands on existing routes, operating from Century Park to Campbell Road connecting Whyte Avenue, the Centre City Node with the north and south sections of the city and Castle Downs
- B2 (part BRT/ part rapid bus) will connect from West Edmonton Mall to Bonnie Doon through the University of Alberta and Whyte Avenue. The balance of service levels and stopping patterns on B2 and existing routes warrant further study.
- B4 and B5 will initially begin service as rapid bus - to build demand.
- Terwillegar Bus Lanes will be implemented and converted to the “BRT” B6 with a rapid bus extension to University station. This will help avoid a forced transfer and provides additional capacity parallel to the peak load point on the LRT network.
- RapidBus routes R3, R12, E2 (110X); and R6 are recommended to provide a consistent spacing across the city of limited-stop bus routes. The higher achievable speeds attract additional future passengers. R9 and R109 are recommended to provide peak rapid service and connections to LRT from outlying development.
- Initiation of the Airport Connection using Hwy QE2 and follow the B1 routing.

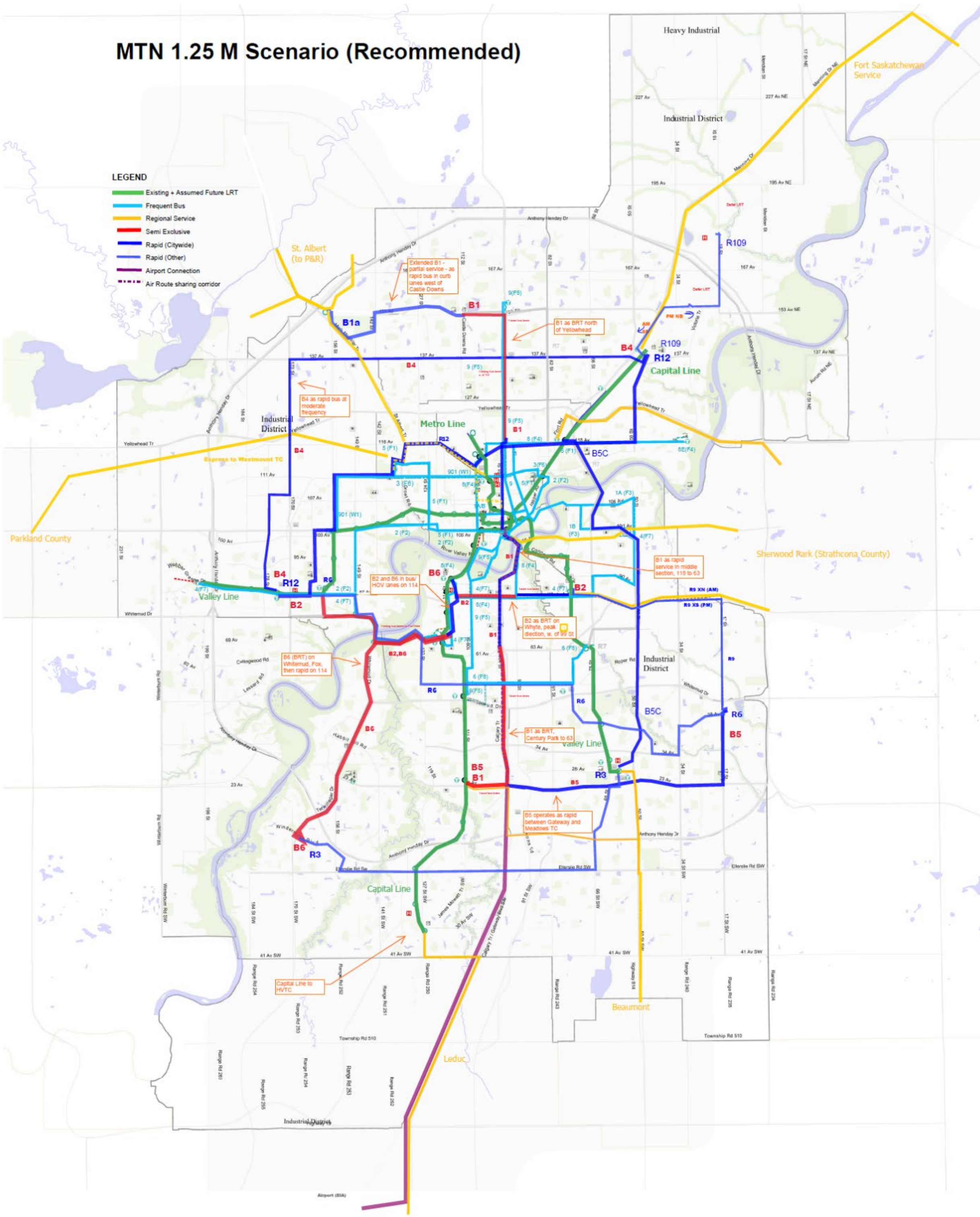
Exhibit ES.1 illustrates the recommended network.

The **order of magnitude costs** to construct these lines and procure vehicles are estimated at $595 Million in current dollars, when comparing the recommended network to the future base. This includes $325 Million for LRT expansion, $220 Million for BRT and $50 Million for rapid bus. These are planning-level costs and in particular the BRT and rapid bus costs are subject to a -50%/+100% uncertainty depending on the project scopes that get developed.

This figure does not include the costs of the future base. The background growth to 1.25 Million population will require additional buses, stops, garages and other amenities. The committed construction of the Valley Line, Terwillegar bus lanes, and the pending extensions of the Metro Line and Capital Line (by two stops apiece) are also excluded from the costs cited above.

Next steps to implement the network will include additional route-level planning and evaluation to further define the services, updating and expansion of design standards to encompass new forms of transit, and monitoring how other initiatives such as SmartFare and Transit Priority Measures could complement this. More broadly, the planning for these routes needs to be linked to land use planning and staging, including the planning and implementation of **Mobility Hubs** at key locations around the **Mass Transit Network**.

Exhibit ES.1: Mass Transit – Recommended Elements – 1.25 Million Population Horizon



Introduction

The City of Edmonton recently approved The City Plan, a long-term plan developed for the future growth of the city to 2 million people. The City Plan contains policies and outlines the systems and networks including a set of planning and design, mobility, and growth management systems. This includes high level direction on the form that municipal infrastructure and services will take. As the city physically grows, this increases the needs for community connections, jobs, housing, amenities and services such as transit. The plan broadly defines built physical spaces, options for how to get around, new connections to support businesses, and more lifestyle choice.

The mass transit study was one of several studies looking ahead at the “2 million people” horizon and working towards building a future vision. The strategic outcomes of The City Plan and of the ultimate mass transit network were developed in parallel, and each will support the other.

What Is Mass Transit?

A broad family of strategic public transit services that carry higher volumes of passengers within urbanized areas, such as the Edmonton Metropolitan Region.

Includes rapid and/or frequent transit for faster trips of varying lengths within the urban area to cross the city and provide reliable local connections.

Also includes regional scale services for longer trips within the city, and to and from surrounding areas.

As the next step in advancing the network envisioned in The City Plan, work has been carried out to develop options that build incrementally towards the 2-Million-person horizon, considering two interim stages: 1.5 Million population, and 1.25 Million population. These have nominal date ranges of 2045/2050 and 2030/2035 respectively, but it is the matching of transit services to the growth horizon that is important. The nominal dates are ‘shorthand’ for when the future population (and associated employment) thresholds could be reached, and it is against those targets that the transit analysis has been carried out for the interim stages.

The City of Edmonton is contributing to the Edmonton Metropolitan Regional Board’s Integrated Regional Transportation Master Plan (IRTMP), which was also under study in 2020-2021. To ensure some consistency between base assumptions, this study developed a proposed Mass Transit Network for the 1.5 Million horizon by working back from the ultimate network envisioned for 2 Million, and assuming approximately half the investments in service and infrastructure would be achieved by that time. This considered the broad implementation phasing of the land uses in The City Plan to help guide where most of the new mass transit would be focused.

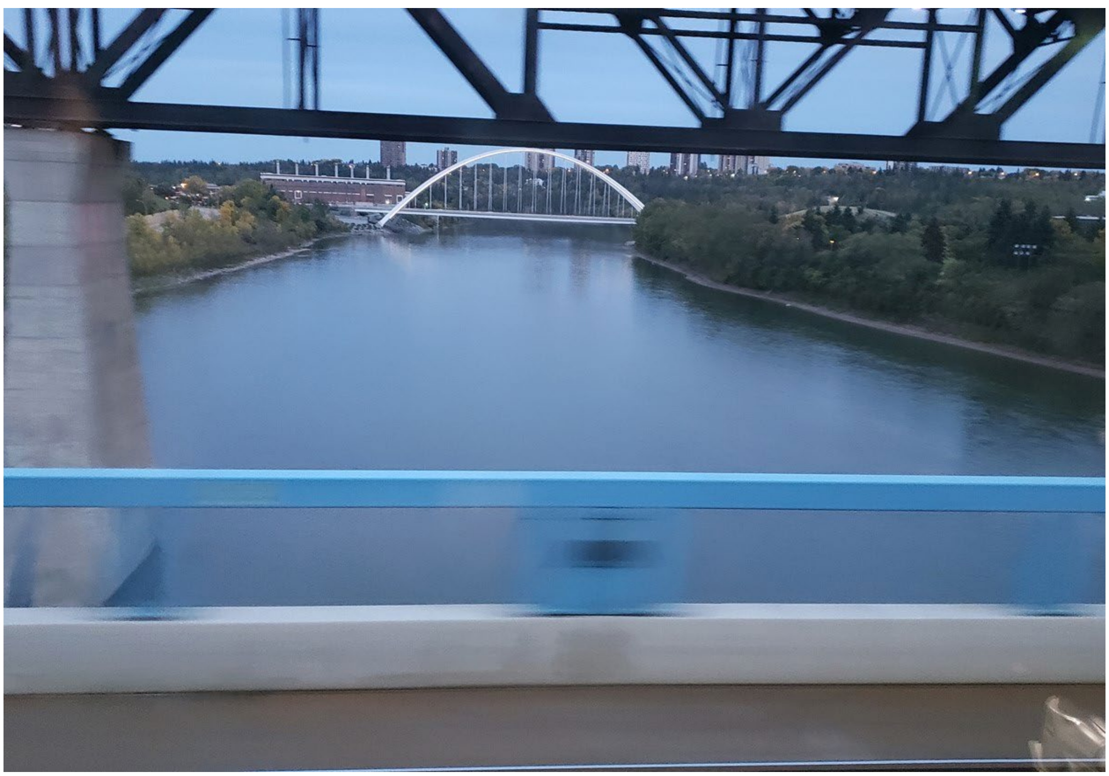
Within that context, a review of opportunities and constraints for mass transit projects was carried out to identify where there were near- to medium-term issues to be explored while developing options for the 1.25 Million horizon. These issues touched on LRT extensions, planned and proposed rapid bus services, general expansion of transit service coverage as the city grows, and the potential to increase service rail and bus service frequency within the financial and technical capabilities of the system.

The assessment of transit services in this technical report compares a future Base scenario and two options where additional mass transit services are overlaid, with differences in the combinations of routes that were included. The results of the evaluation are being used to inform an initial recommendation for the interim Mass Transit Network for the 1.25 Million population horizon.

The remaining sections of this report explain:

- the development of the mass transit network, the categories of mass transit service, and the considerations in defining modelling options.
- the overall performance of the options in attracting passengers, and the associated fleet requirements
- route-specific comparisons of performance to determine which elements are the most promising for implementation during the planning horizon;
- A description of the recommended interim network, including a discussion of each of the major elements;
- Implementation considerations, including service design and creation of mobility hubs.

It is intended that these routes (as well as local transit, first-km and last-km services, and mobility hubs) will provide high quality, reliable and efficient service allowing Edmonton residents to live and move within their community and connect to other communities thereby transforming Edmonton into a true community of communities.



High-Level and Walterdale Bridges, as seen from the Capital Line LRT crossing of the North Saskatchewan River. These all have a role in the future Mass Transit Network.

2. Mass Transit Options Development

The development of the ultimate mass transit network was carried out in parallel and in conjunction with The City Plan. The study process, major assumptions related to the transit networks, and the proposed network are described in the following sections. This includes maps and descriptions of the proposed routes forming the longer-term mass transit network, and several options defined for interim stages.

2.1. Development of the Mass Transit Network for 2 Million Population

The mass transit scenarios were developed through an iterative and consultative process, with the following main steps in compiling and applying the relevant input:

- The ***Mass Transit Backgrounder*** provided background on the current context and some of the future (Bus Network Redesign, LRT Network Expansion) plans already in place for Edmonton's transit network. It also looked at how different travel markets respond to the transit service on offer, and reviewed several cities in Edmonton's peer group to draw out lessons about coordinated transit and land use planning.
- The ***City Plan Mass Transit Scenario Analysis*** documented the transit-focused evaluation results for the refined versions of a future base (referred to as Business As Planned for 2065) and evaluation concept cities I, II and III. The intent of the evaluation was not to choose a scenario, but to identify which network elements worked together better than others, and the reasons why – such as how they connected and how they interfaced with the land use.
- Since the analysis results were driven more by the service assumptions rather than the technology used for modelling purposes for routes, the recommendations are mostly technology-neutral, except for approved and committed LRT extensions.

The ***Mass Transit Network*** report, issued February 2020, documents the proposed long-range network, and forms the basis for the current work presented in this report. The City Mass Transit Plan reports have links to the documents provided in Appendix B.

For the purposes of the ongoing study, some assumptions regarding technology type and specific route alignment on corridors were made to carry out the technical analysis. **It is critical to recognize that these assumptions should not be interpreted as final decisions on technology, alignment or station locations**. Furthermore, the network was not aligned with preliminary discussions around a proposed Regional Transit Services Commission (RTSC) network although similar desire lines have been identified by both studies.

Exhibit 2.1 shows the structure of the network, including the rail elements (LRT in green), semi-exclusive transit (shown in red), Airport Connection (in purple) and routes operating in mixed traffic (rapid bus in dark blue, frequent bus in light blue, and major regional routes in yellow). The following are the main highlights of the network:

- **Frequent**. These include 'F' routes carried forward from the future base, with some refinements to service levels. Buses in these routes operate in mixed traffic, make all local stops, and operate at least once every ten minutes in the AM and PM peak and 15 minutes in the midday and early evening. The mass transit network includes more emphasis on denser areas, and several brand-new routes were added to intensify central area service. This approach was based on peer examples in other cities where the spacing of the frequent network was as close as 400 metres in denser areas. The routes encompassed mainly the central areas of the city.

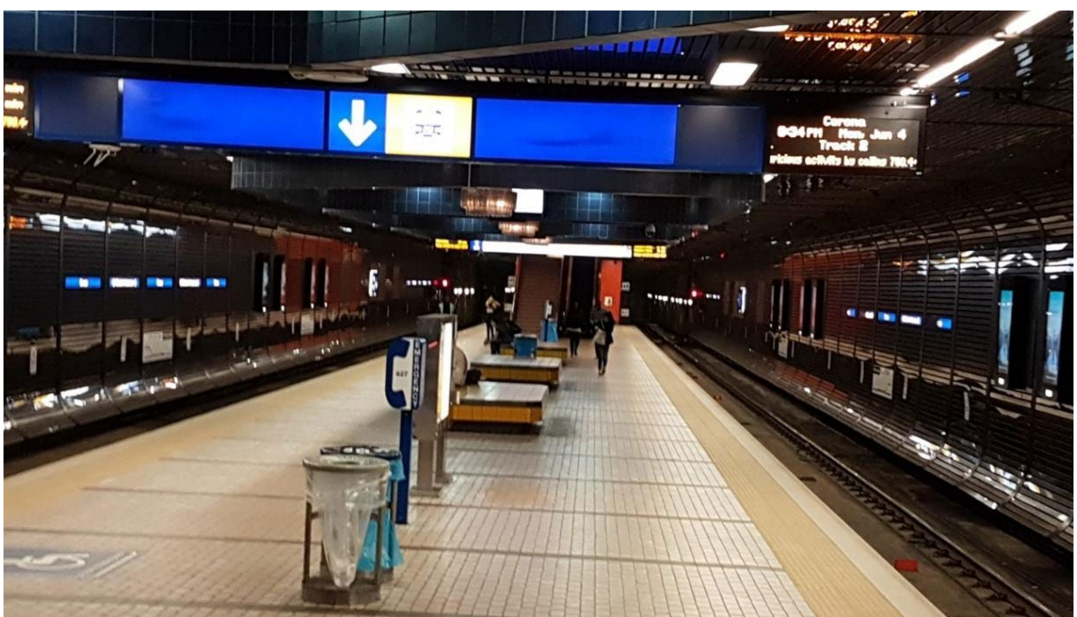
- **Limited Stops**. These are limited stop routes, serving transit facilities, mass transit stations, activity nodes and other transfer points. They function as feeder routes but also support corridors. Buses on these routes are often larger and while they may operate in mixed traffic they run faster than typical buses because of the stop spacing. They are also sometimes sped up by providing transit priority measures (including HOV lanes, dedicated transit lanes, queue jumping) in busy corridors where these routes operate.
- With the introduction of electronic fare collection to the ETS (SmartFare), all-door boarding will be theoretically possible on all transit routes, assuming each bus doorway would be equipped. Many transit operators around the world have tested their own local set of policies and customer service approaches to this option, often with a pilot phase followed by selective deployment. This usually occurs on higher-volume bus routes (and rail-based services if not already in practice). Limited stop and semi-exclusive bus operations usually benefit more from allowing use of all doors to reduce dwell times at busier stops. Over time, ETS may elect to apply this on other or all routes as well.
- **Semi-exclusive** - The network includes five semi-exclusive transit routes (red on the map). The transit vehicles on these routes can operate at the full posted speed of the corridor between traffic signals, as they run in dedicated/segregated lanes (or on tracks), and are not in mixed traffic. They do cross other traffic at intersections; however, these services are often sped along by transit priority measures and by having off-vehicle fare payment at the platform, to reduce dwell times. The latter may be facilitated with the introduction of Smart Fare. The mass transit network includes the following semi-exclusive routes:
  - A north-south route running between Castle Downs and Century Park District Nodes. This would use dedicated ROW (except for strategic segments where Bus/HOV lanes could be more appropriate) and would include a new direct connection (bridge) across the river between Downtown and Whyte Avenue.
  - An east-west route operating between West Edmonton Mall/Misericordia Major Node and Bonnie Doon District Node. This would include a new direct connection (bridge) across the river west of the University.
  - Three routes using a mix of dedicated and shared lanes in the north and west (B4), south (B5), and southwest (B6) parts of the city. Each of these connects to the other mass transit lines (such as the LRT lines) in at least two places. Where these operate in shared lanes, the design would be context-sensitive, and transit priority measures would be applied to produce fast travel speeds.
- **Exclusive ROW** – The network includes four exclusive transit routes encompassing mainly current and proposed LRT alignments and extensions (green) and a proposed airport connector (purple). Transit vehicles may operate at the full posted speed of the corridor between traffic signals, as they run in dedicated lanes or on tracks and are not in mixed traffic. A combination of infrastructure upgrades (grade separation) and technology (pre-emptive and priority signalling) are used to cross at traffic intersections. These services have off-vehicle fare payment at the platform, to reduce dwell times. The mass transit network includes the following exclusive ROW (as defined in this report) routes:
  - Capital Line LRT operating from Heritage Valley Major Node to the Edmonton Energy and Technology Park.
  - Valley Line LRT operating from Lewis Farms to Ellerslie.
  - Metro Line LRT operating between Campbell Road (St. Albert Park and Ride) and South Campus. The mass transit network assumes measures such as

grade separation are in place to permit 24 trains per hour, per direction, to cross University Avenue. (This extension adds service capacity at the busiest point in the LRT system and is discussed later in the report)

- **The Airport Connection** is assumed to operate between a grade-separated station downtown – with walk connections to mass transit lines nearby – and an elevated station at the airport terminal entrance. This line is proposed to ultimately follow the CP railway corridor and remain east of Calgary Trail/Gateway Boulevard until near the Airport. Intermediate stations would allow for connections to other bus routes. Of special note, stations would be included at 23 Avenue and Whyte Avenue. (Alternatively, this service may evolve into a semi-express
- **Regional bus services** were carried over from the future base, representing future versions of existing services. Three new express services have also been defined based on future demand patterns. Two connect the Sherwood Park and Bremner areas to Exhibition District Node and Gorman; and a third running on 50 Street, connecting Exhibition District Node and Beaumont. Several other regional connections to Stony Plain/Spruce Grove, Fort Saskatchewan, St. Albert and Leduc have also been identified.

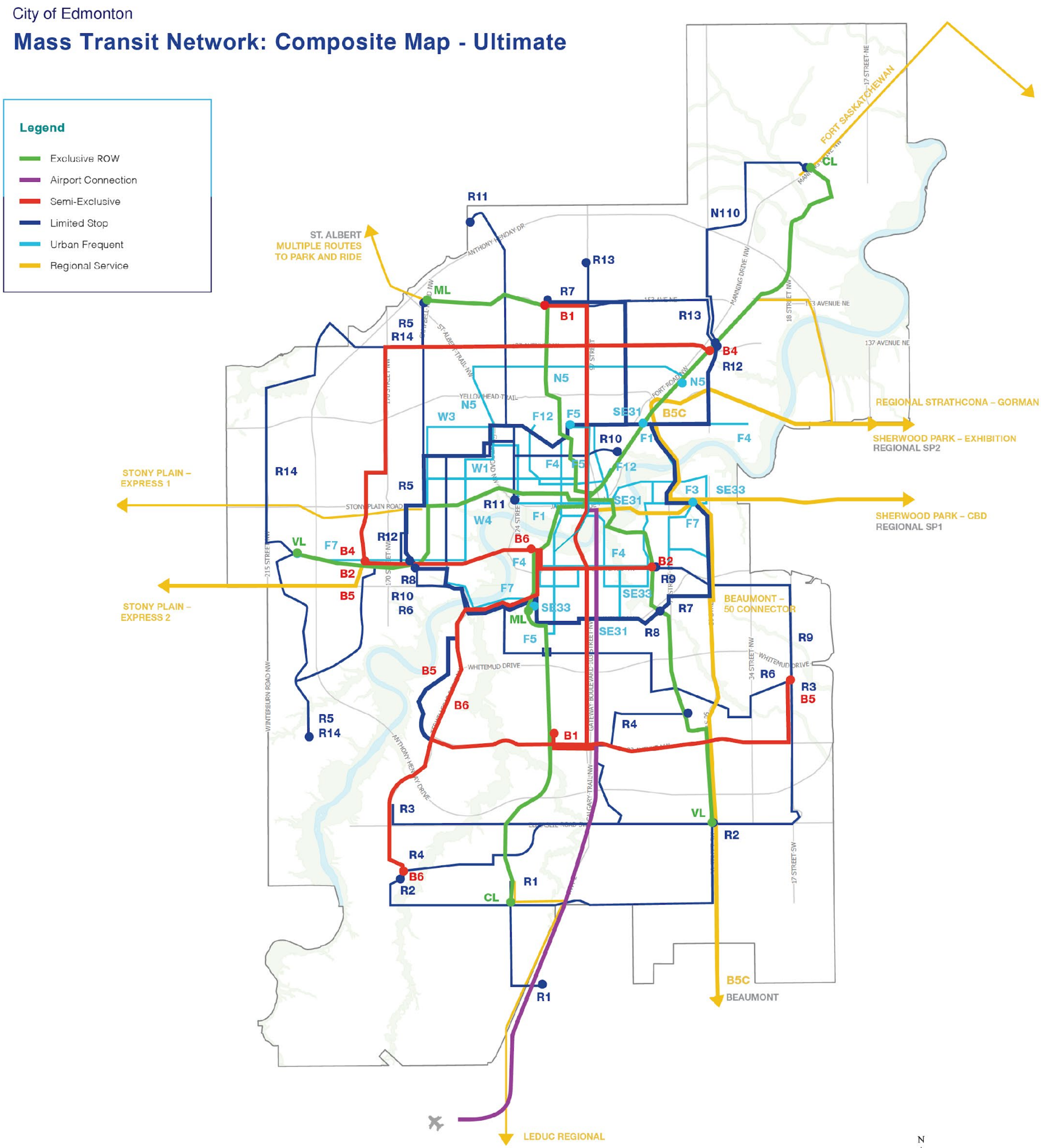
In addition to the services identified in the ultimate mass transit network, local and other regional transit services within Edmonton and in the surrounding municipalities were considered as part of this study. These were carried over from a future base scenario, with some adjustments to service levels to meet projected future demands. Routes in this group would provide first-last mile and connective functions to local destinations that are not situated in the major nodes and corridors and therefore not part of the mass transit network.

Please note that the route naming system used for the planning of the **Ultimate Mass Transit Network** uses conventions from the planning and consultation stages of the Bus Network Redesign (e.g. F1, N1, E1). This continues through the report for ease of comparing proposed transit routes at different future planning horizons. Since a numbering system has recently been created by ETS for the routes in the Fall 2021 service plan, those ETS route numbers are cross-referenced in later sections of this report.



Platform at Corona LRT station, on the Capital and Metro Lines.

Exhibit 2.1: Map of Edmonton Mass Transit Network (MTN) for 2 Million Population



2.2. Interim 1.5 Million Network Assumptions

While the focus of this report is the network analysis for the 1.25 Million population horizon, defining a reasonable network assumption for 1.5 Million was an important building block, as it represents a potential "halfway point" between the near-term (2021) network and the Ultimate Mass Transit Network for 2 Million residents.

With the understanding that approximately half of the infrastructure and service levels would be in place, there were several major inputs considered in developing the network. These included:

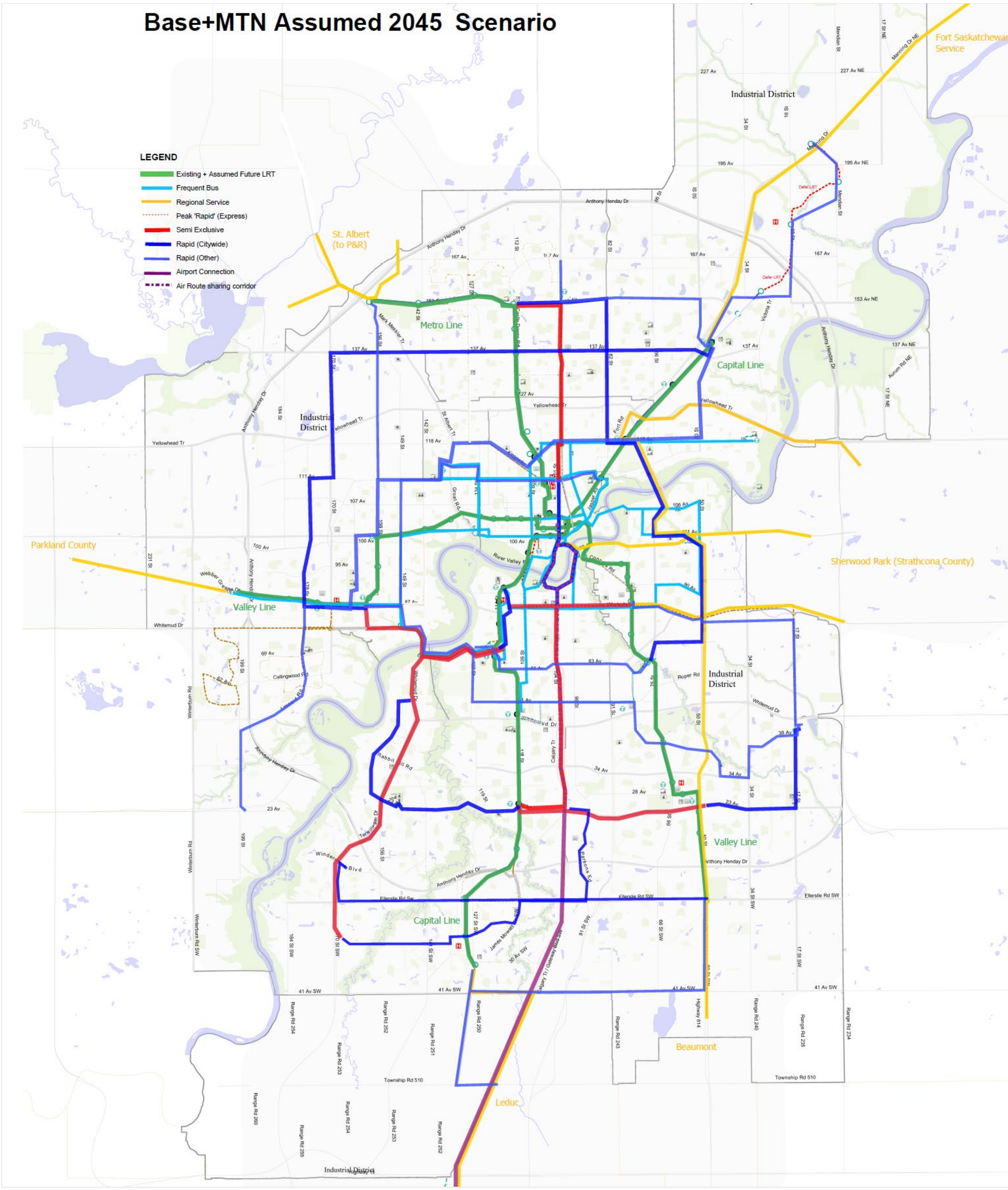
- City Plan interim growth targets at 1.5M population horizon, as allocated to modelling zones;
- The City Plan Implementation Staging;
- Hypothetical demand estimates (testing the Ultimate Mass Transit Network against the 1.5 M population to see where demand emerges sooner); and
- Potential to phase in service types and increase frequency over time.

Exhibit 2.2 illustrates the 1.5 Million network, representing an initial projection of which new transit services would be implemented by a 2045/2050 time frame. This is significant for the 1.25 Million network since any routes not assumed for 1.5 Million are less likely to be included in the 1.25 Million network.

Some of the major assumptions reflected on the map include:

- Metro Line extended northwest to Campbell Road;
- Valley Line completed;
- Capital Line extended southwest to the Heritage Valley Major Node. A future extension to Allard/Desrochers is assumed to depend on growth sometime after the 1.5 Million threshold. The planned extension northeast to Energy Park is also deferred, since much of the development (including parts of Horse Hills) that would support such an extension is now planned to occur post-1.5 Million.
- Frequent bus services carried forward from today; with additional routes outside the specific category also increasing in frequency where warranted by density and demand;
- Regional services being provided by the RTSC and/or surrounding municipalities, depending on how those services are structured in the future. (Any decision on this is outside the scope of this current study.)
- Implementation of major north-south (B1) and east-west (B2) semi-exclusive transit routes to add capacity to the network. Due to uncertainty over feasibility and timing of new river crossings, these routes would borrow from existing crossing capacity.
- An Airport Connector service from downtown, but likely as a highway-based connection, or if rail, using existing rail corridors and deferring construction of a new river crossing;
- Completion of the Terwillegar bus lanes and operation (as B6) from the southwest corner of the city to the University Station area;
- Operation of an east-west crosstown B5 service, with the busiest portion on semi-exclusive right of way. The rest of B5, and the B4 crosstown route in the north and west parts of the city, would operate as rapid bus with conversion to follow later.
- Many of the proposed rapid bus lines in the ultimate network would start operations, but at frequencies matching demand at the 1.5 Million population threshold. In more mature areas these services would operate more frequently and in newer areas the emphasis would be on introducing a fast variant of bus service at a more modest frequency to begin with.

Exhibit 2.2: Edmonton Assumed Interim Transit Scenario – 1.5 Million Population Stage



2.3. City Plan Interim Target Growth Distributions for 1.25 Million Horizon

Exhibits 2.3 and 2.4 illustrate the target distributions of total population and employment by model zone, as allocated for an interim growth target of 1.25 Million population in the city, and employment of approximately 700,000. The City Plan's anticipated growth at this horizon is estimated to have 65% of new dwelling units in the developing area with 35% in existing areas.

The areas with existing and planned development are the focus for the transit service proposals in the rest of Section 2. Most elements of the longer-term network south of 41 Av SW or in the Horse Hills and Riverbend areas are not required within the shorter timeframe.

Exhibit 2.3: Edmonton City Plan Target - Total Population Distribution for 1.25 Million Population Horizon

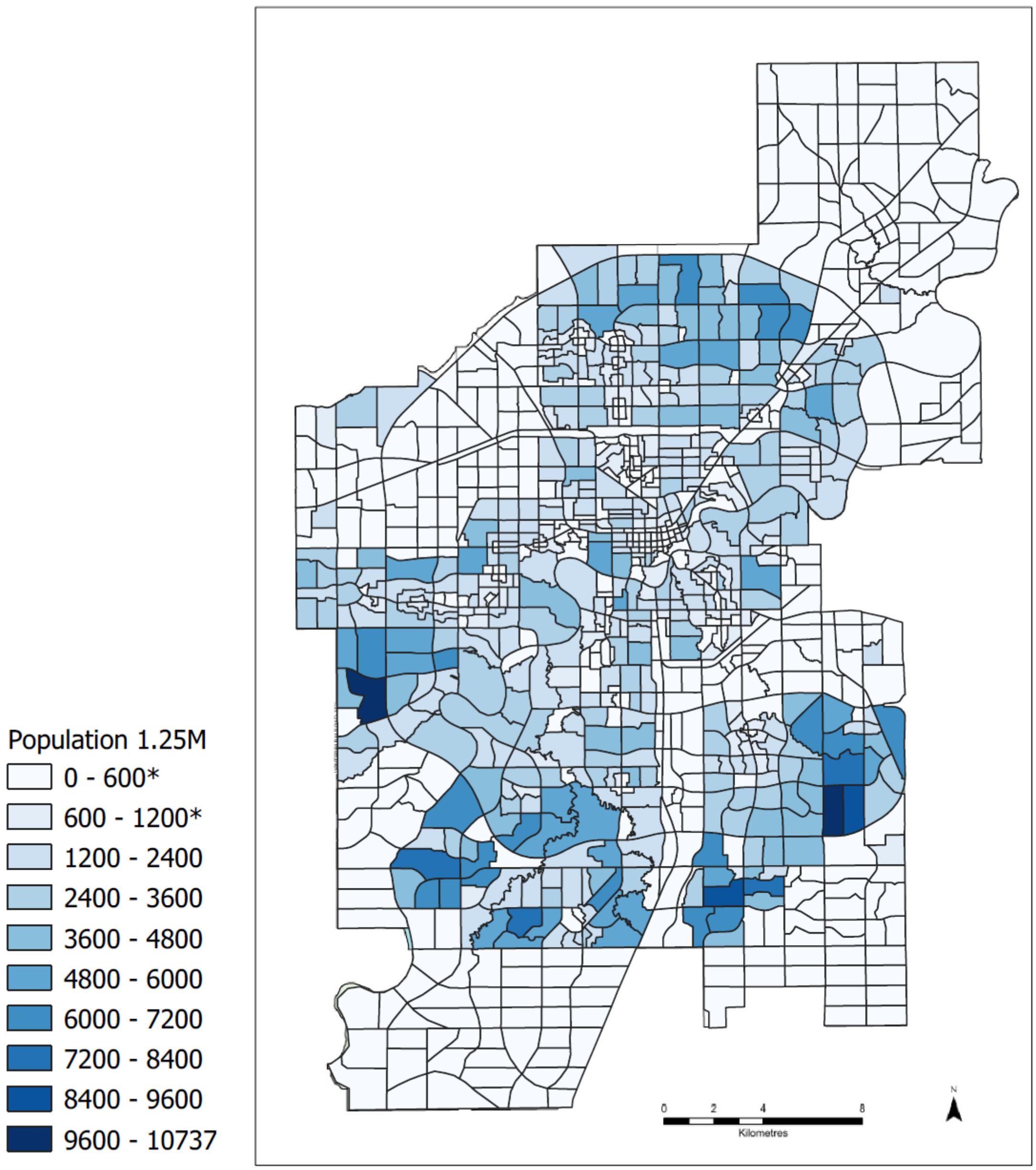
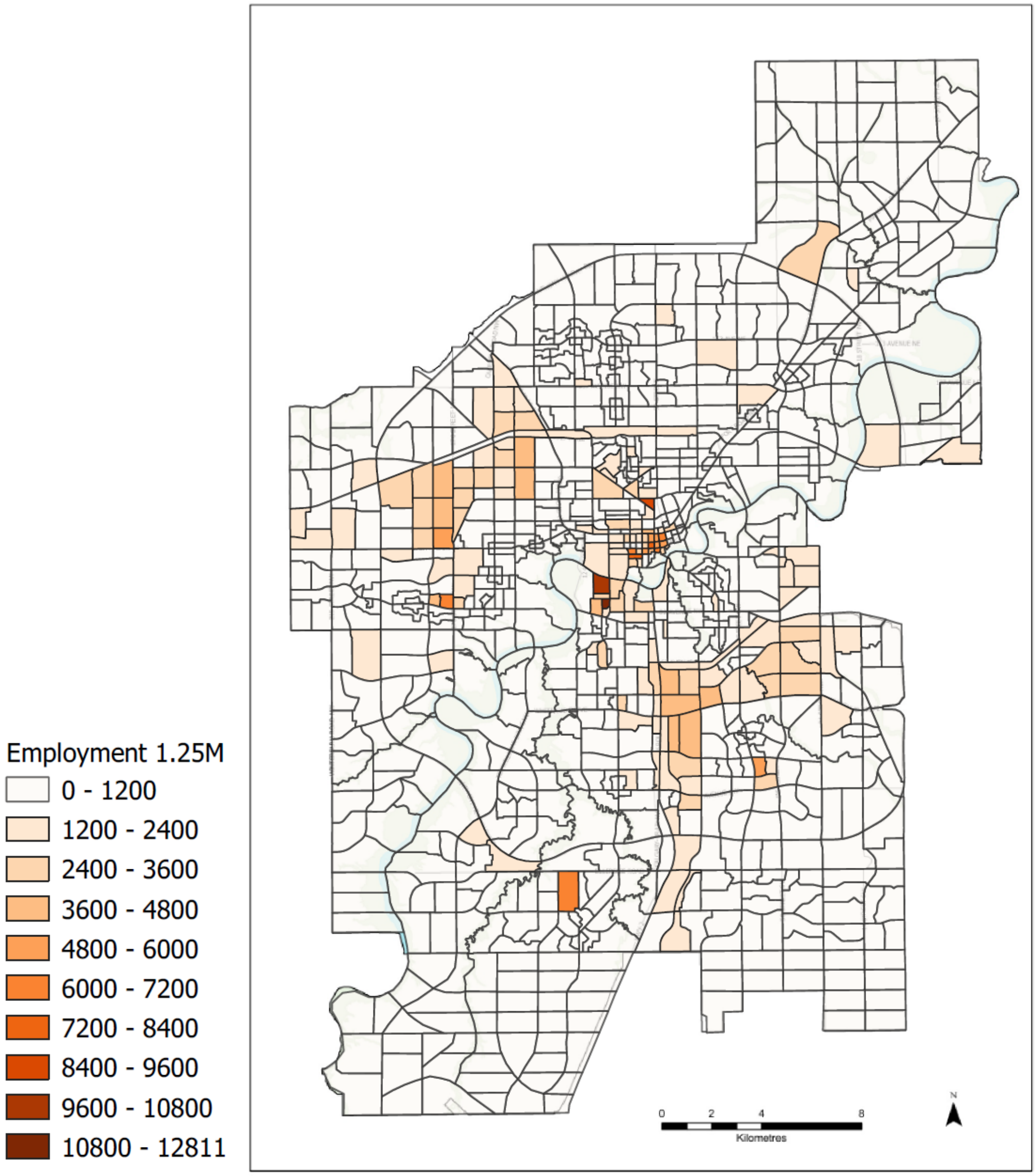


Exhibit 2.4: Edmonton City Plan Target - Total Employment Distribution for 1.25 Million Population



A caution: Due to the modelling zones being of unequal sizes, the colour scale represents absolutes per zone rather than density. Therefore, some neighbourhoods comprised of many smaller zones on the map are more built up (particularly for population) than the colours suggest. Refer to Appendix A for a dot density map, which demonstrates that most large outer zones are of similar density to many established areas – for this planning horizon.

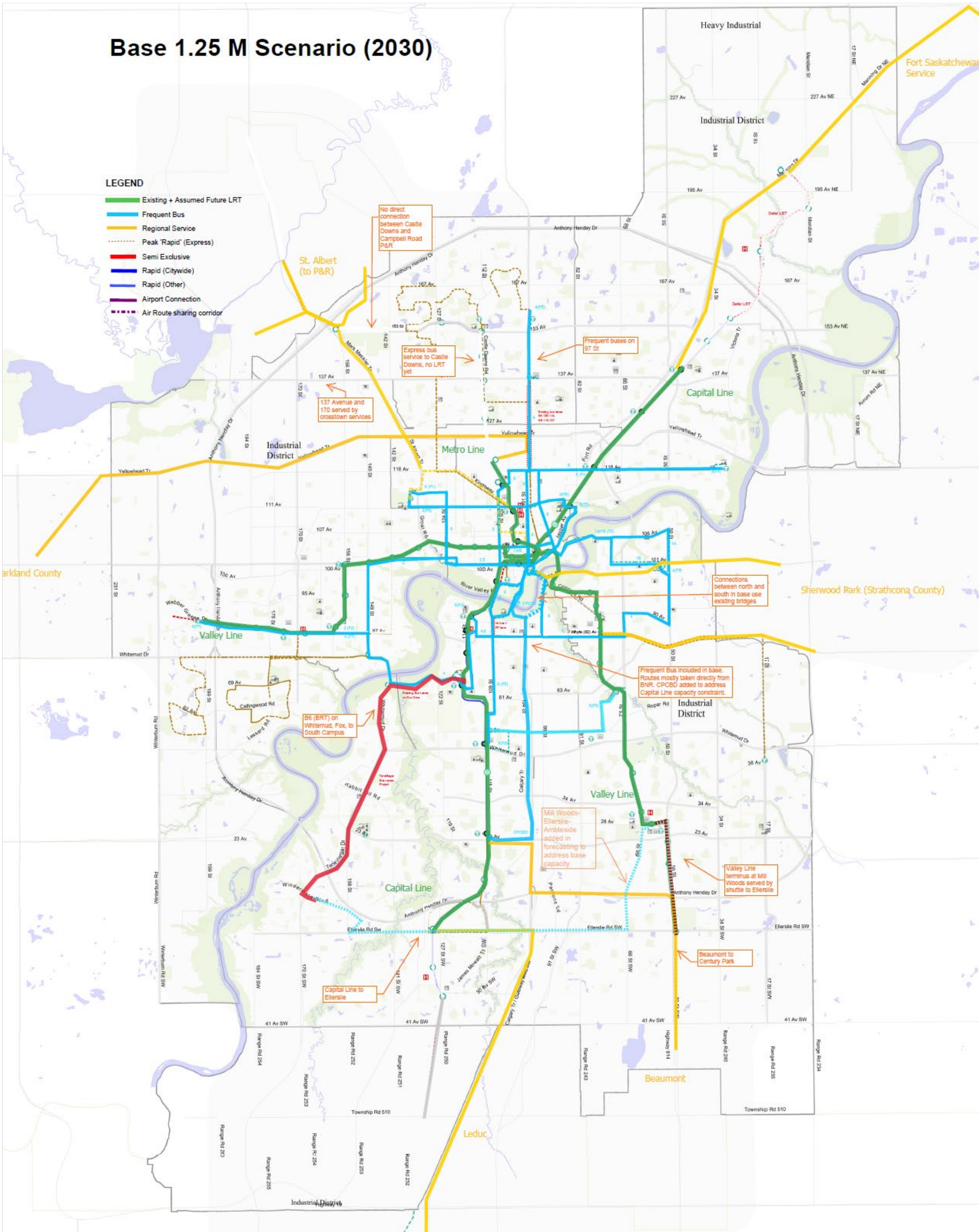
2.4. Base Scenario for the 1.25 Population Horizon

The 1.25 million (2030 for modelling purposes) Baseline includes:

- The **Bus Network Redesign** (BNR) network is included, plus future extensions of service into anticipated growth areas up to 1.25 Million. Consistent with 2021 plans, this future version of the BNR system also includes several types of services: Frequent, Crosstown, Rapid (all-day and peak-only), Local and Circulator routes.
- The Frequent services from 2021 (F1 to F9, also referred to as ETS routes 1A through 9) continue in the future base. Some of these services are assumed to operate every 20 minutes in the off-peak, and it would be expected by future horizons that these would be 15 minutes or better. Peak service is typically every 15 minutes or better.
- The all-day rapid services in the BNR (E1 and E2, or ETS routes 110X and 120X), continue into the 2030 base. These routes connect downtown to Eaux Claires (via 101 and 97 Street) and a second route from downtown to the Castle Downs area (via 109 Street, then 97 Street). The segment of 97 Street north of 118 Avenue has peak-period bus lanes in place. Peak-only rapid services were as defined by ETS, and connect outlying parts of the city with downtown or intermediate LRT stations.
- Terwillegar bus lanes (providing an early version of proposed route B6, on a semi-exclusive alignment). In the base scenario, a pair of bus routes operates between Ambleside and South Campus Station, and use the bus lanes on Fox Drive.
- Modifications to some bus service headways for Edmonton routes were modelled to provide a better demand to capacity balance (based on unconstrained demand versus constrained capacity of the assumed LRT and bus services).
- Several routes were added to the model to address capacity pinch points in the system identified through demand model tests by forecasting staff. The addition of these routes to the base assumption was confirmed with the project team. These included:
    - A frequent shuttle between the Mill Woods LRT /TC and a planned park and ride at 50 St and Ellerslie SE.
    - Frequent service on Ellerslie Road between Mill Woods, the Heritage Valley park and ride/LRT at Ellerslie SW, and Ambleside.
    - Peak-only relief service from Century Park to downtown using Gateway Boulevard/ Calgary Trail and the existing river crossings.
- **LRT network** expansion is assumed to continue, with service as follows:
    - Capital Line LRT extended from Century Park to Ellerslie SW
    - Metro Line LRT extended from NAIT to Blatchford
    - Valley Line LRT operating from Lewis Farms to Mill Woods.
- **Regional services** based in the surrounding municipalities, including St. Albert, Fort Saskatchewan, Sherwood Park, Beaumont, Leduc County (Nisku), Devon, Leduc, Parkland County, Stony Plain and Spruce Grove. In all future scenarios, the assumed regional routes are subject to change once the RTSC agrees on and adopts a future service plan.

Exhibit 2.5 shows the assumed LRT (dark green), regional routes (yellow), frequent bus (turquoise), and peak rapid express routes (brown) that form the backbone of the future base transit network. In addition, the entire built-up area of Edmonton (by ~2030) and the surrounding municipalities is served by local routes and regional connections. These routes were considered as part of the modelling analysis but are not shown in detail by the exhibit.

Exhibit 2.5: Edmonton Future Base Transit Scenario for 1.25 Million



2.5. Opportunities and Constraints

The Edmonton Transit Service (ETS) and LRT Expansion & Renewal departments were consulted to gain an understanding of the near- to medium-term opportunities and constraints for the transit system. The intent was to confirm what proposals and plans were already in place to expand service, and how the mass transit elements might form a part of those plans. In several areas, there were questions as to what order certain elements would be implemented, due to financial and technical constraints.

Capital Line Extent

In 2020, Council directed staff to prepare a business case for the extension of the Capital Line south from Century Park to the Ellerslie (SW) Park and Ride location. This is included in the Baseline and both options. A further extension to Heritage Valley Major Node, which would also include a station at the SW Hospital, is under consideration and could potentially be implemented in the next 10 to 15 years.

There is some impetus to extend beyond Ellerslie to the SW Hospital by 1.25 million, since it is expected to open by then. A more logical interim extension would take the line to Heritage Valley Major Node, which would provide a better location for a transit centre, and would support surrounding development. Funding has not been confirmed for this extension. The ultimate terminus of the Capital Line is at Allard/Desrochers, which will be triggered by future development of lands south of 41 Avenue SW, expected to occur by the 1.5 Million growth horizon (or later).

Extensions northeast to Gorman and beyond are not as high on the LRT priority list and not expected by the 1.25 Million horizon; this is also consistent with planned land development in the northeast being at a slower pace than the southwest.

Any Capital Line extension may produce two pressures on the system: 1) equitable distribution of investment throughout the city; 2) peak demands along the Capital Line, specifically on the segment of the line between South Campus and Health Sciences stations. There will be a need to further evaluate the best solution to Capital Line capacity issues – refer also to the discussion of capacity issues on the following pages.

Capital Line Infill Stations

There has been past discussion of interim 'infill' stations being constructed along the existing Capital Line to provide better access to areas that may start to develop in the planning horizon and are worth testing now to gain insight. Examples of these stations include the 92 Street area (midway between Churchill and Stadium stations) and at 40 Ave NW (the 'Harry Ainlay' location between Southgate and Century Park). There may also be interest in other locations at a future time, such as a 'south Exhibition lands' station; if this were to proceed, the concept would be developed in accordance with Exhibition Lands Planning Framework.

Metro Line Extent

Over the longer term, construction of the Metro Line northwest to Campbell Road is one of the priorities for LRT implementation, once funding becomes available. The line is assumed to be completed at some time prior to the 1.5 Million horizon. Council has identified this line as the next priority following the extension of Capital Line south.

Currently, the next major LRT project is the westward extension of the Valley Line, which has commenced the design and construction stage. The Valley Line West is assumed to be completed by the time of the 1.25 Million growth horizon. It was assumed to be less likely that the Metro Line could also be completed all the way to its planned terminus (at Campbell Road) within 10 to 15 years.

Phase 1 construction to build a new station at Blatchford and construction of the permanent NAIT station have commenced. Therefore, the next extension of Metro Line would be a new bridge over the Yellowhead Trail and CN Calder railway yard as part of Phase 2, which would take the Metro Line as far as Castle Downs. This has been identified as a next priority for LRT extension by Edmonton City Council. This bridge was estimated to have a capital cost of over $200 Million, and a detailed design and final agreement with CN would be required to proceed. The third phase will extend the line to Campbell Road.

Valley Line Extent

The SE portion of this route is planned to open in 2021, as far as Mill Woods. Proposed extensions beyond this to Ellerslie Road are at the concept level only and not identified as a higher priority at this time. As noted above, the western extension of Valley Line to Lewis Farms is the next major LRT project. Design is currently underway with construction expected to soon.

Capacity Constraints on LRT

The LRT system's capacity depends on several factors including the size of the vehicles, and the frequency at which they can operate. In turn, the practical size and frequency of trains usually depends on the size of the stations, the power and signal systems, and safety considerations.

Platform lengths at the stations limit the length of high-floor LRT trains on the Capital and Metro Lines. Extending tunnel stations would be particularly expensive and a more practical way to increase capacity would be to tighten the frequency between trains on the combined routes.

Within the tunnel, the primary constraint is at the junction point of the two routes immediately north of Churchill Station, due to safety requirements for separation between trains. It is expected that more trains per hour will be operable in the future with signalling, communications and control upgrades.

The governing limitation on LRT capacity is currently at the grade crossings, where it is considered impractical to operate more than 12 trains per hour in each direction. Otherwise, impacts to other traffic and pedestrians would exceed local acceptance. Operational review is required to test near-term approaches that might trade off operating speeds and dwell times to make a higher frequency practical. A longer-term approach would be to grade separate any critical locations to permit more trains per hour. The location at University Avenue/114 Street is the most significant currently, as it is the peak load point on the LRT network and the place most in need of more capacity, which depends on headway and train size. In the future, trains on the Metro Line will be the same as the Capital Line (5 cars) and headway will remain as the limiting factor.

The assumed design capacities (refer to glossary) are 9,000 per direction for the Capital Line; 4,500 for the Metro Line; and 5,400 for the Valley Line.

Bus Fleet Reallocation and Expansion

Current planning indicates that over the next 10 to 15 years, approximately half of all fleet purchases will be replacing older vehicles, while the other half will be to address headway maintenance and allow for service expansion. Some near-term pressure on the size of fleet will be alleviated by reallocating service to the Bus Network Redesign (BNR) structure when VLSE starts operating in 2021.

An expanding fleet needs new bus garages, with a new garage planned for 2026-7 to accommodate 350 buses. The next garage after that would be needed in 2033, which coincides approximately with the 1.25 Million population horizon. Allocations of buses are expected to be shuffled among existing and new garages, so there is room for growth in each area of the city.

Terwillegar/Whitemud Bus Lanes

Terwillegar is a related project that is proposed to transition towards BRT. The alignment was initially assumed to be a combination of Whitemud/122 Street and Fox Drive, possibly one-way on each leg. However, with recent funding announcements, these assumptions may need to be revisited and an alignment using only Fox Drive is more likely.

2.6. Mass Transit Options for 1.25 Million Horizon

Options A and B overlay elements of the emerging Mass Transit routes on top of the 2030 base, with some variations in the specific elements to test the response to different infrastructure and service investments. The rationale for these major elements follows these summary listings and reference maps.

2.6.1. Option A

- BNR bus route structure
- Route B6 (the Terwillegar BRT), extended from South Campus to University LRT station.
- Capital Line LRT further extended beyond Ellerslie Road to Heritage Valley Major Node
- Introduction of routes B1, B2, B4, and part of B5, mostly as rapid bus, but with several segments using dedicated lanes
- New rapid bus services B5C, R3, R6, R7, R12, and R109
- A ‘ridership builder’ local connector (RB2), anchored by the Heritage Valley LRT station at one end, and the Mill Woods LRT station at the other end.

Exhibit 2.6 shows the route structure for the major elements of Mass Transit ‘Option A’ for the proposed 1.25 Million horizon, referred to as a nominal ‘2030’ modelling horizon.

2.6.2. Option B

- BNR bus route structure
- Route B6, extended from South Campus to University
- Metro Line LRT further extended to Castle Downs (testing the Metro Line Phase 2 extension to assess its effects)
- Infill stations tested on Capital Line; without any extension of the line
- Introduction of routes B1, B2, the short version of B5, and a greater amount of dedicated bus lanes than in Option A
- A shorter version of route B4
- New rapid bus services B5C, R3, R9, and R12
- A ‘ridership builder’ local connector (RB5), anchored by the Lewis Farms LRT station at one end, and the West Edmonton Mall LRT station at the other end.

Exhibit 2.7 shows the route structure for the major elements of Mass Transit ‘Option B’.

Exhibit 2.6: Edmonton Future Mass Transit for 1.25 Million Horizon – Option A

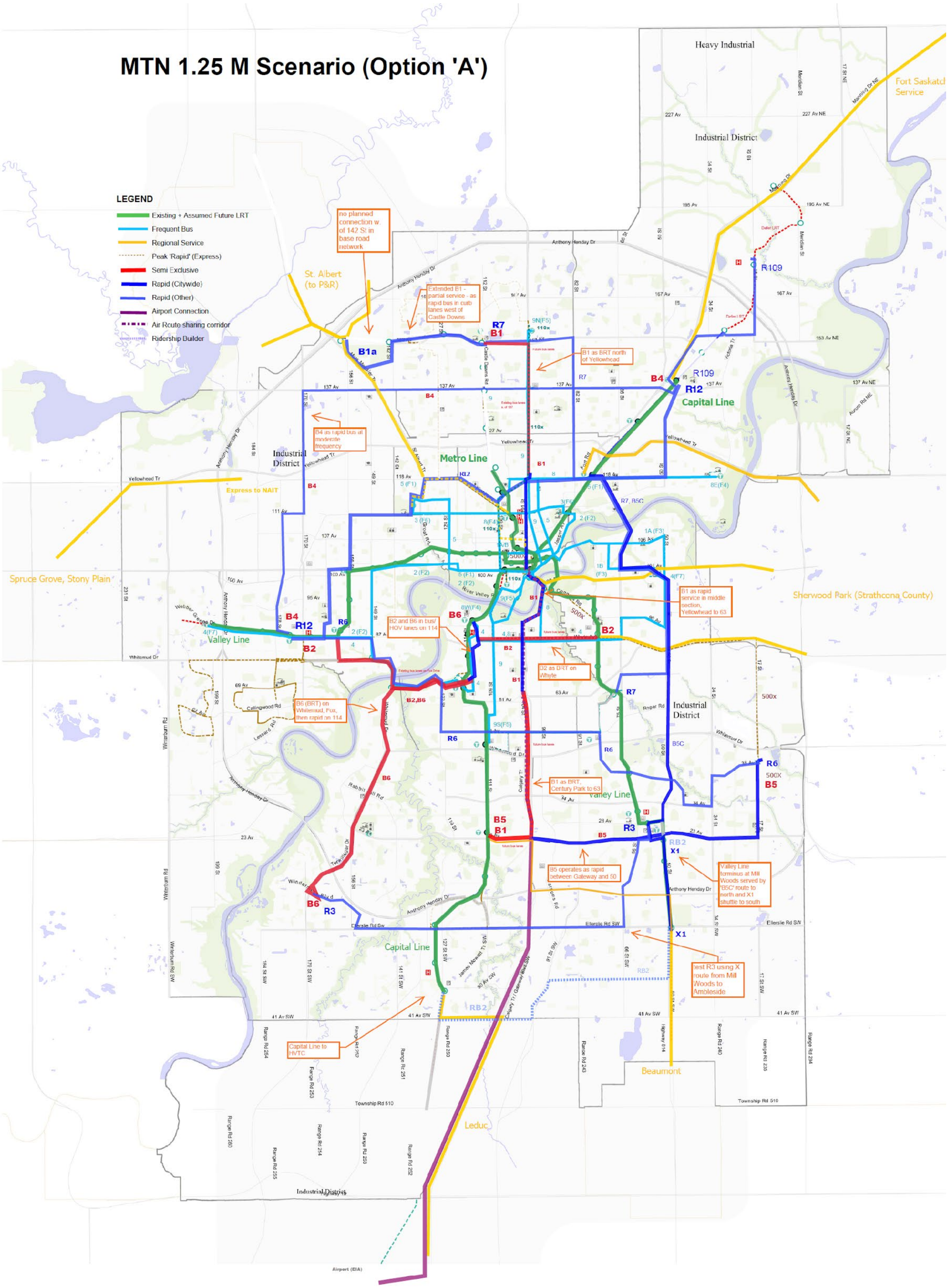
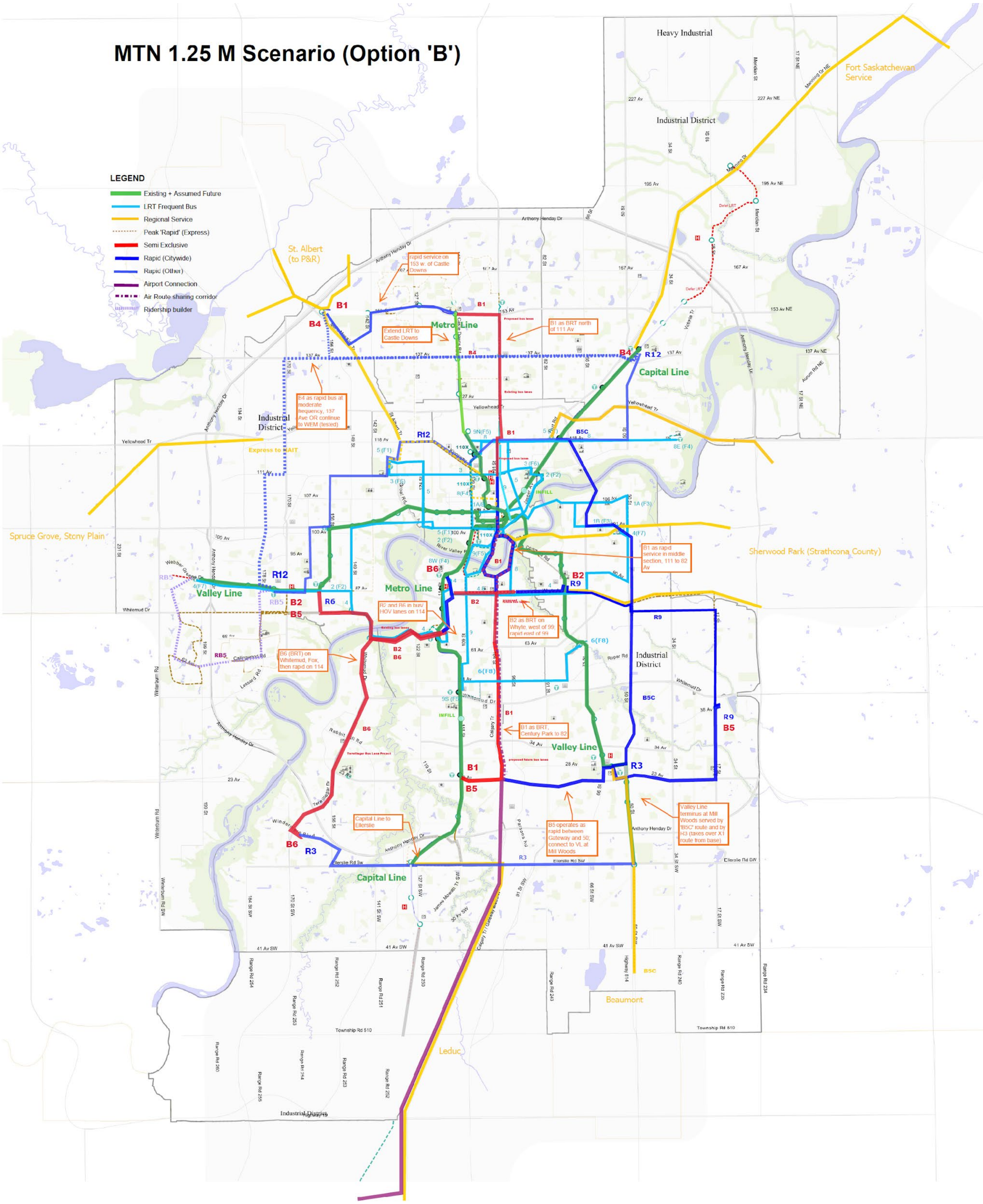


Exhibit 2.7: Edmonton Future Mass Transit for 1.25 Million Horizon – Option B



2.6.3. Options Being Tested by the 2030 modelling Base, Options A and B

The differences between Options A and B and from the 2030 modelling baseline reflect several factors:

- The expected staging of population and employment growth;
- Interpolation of additions in service between today and the 1.5 Million horizon that was previously defined;
- The constraints, challenges and opportunities identified by stakeholders;
- Opportunities to test different combinations of routes to see what the costs and benefits are projected to be. This will allow the team to propose a hybrid of the Base, Option A and B as the staging recommendation once analysis has been carried out.

The following points provide an overview of the rationale for Options A and B.

Capital Line Extent. An extension of the Capital Line south from Century Park to the Ellerslie (SW) Park and Ride location is included in the Baseline and both options. A further extension to Heritage Valley Major Node, which would also include a station at the SW Hospital, is under consideration and could potentially be implemented in the next 10 to 15 years. This potential extension is included within Option A. It is not included in Option B, which addresses other potential LRT modifications.

Capital Line Infill Stations. Examples of these stations include the 92 Street area and at 40 Ave NW. Given that Option A already includes an extension of the line, the effect of adding these stations is expected to be more apparent if analyzed as part of Option B.

Metro Line Extent. The baseline and both options include an extension to Blatchford and construction of the permanent NAIT station. The next logical extension would be a new bridge over the Yellowhead Trail and CN Calder railway yard. Similar to the 2030 base, Option A will terminate at Blatchford. Option B will test an extension as far as Castle Downs/153 Avenue as a potential next segment.

> The 153 Avenue corridor would be served by rapid bus services prior to completion of the Metro Line. For passengers at Campbell Road, both Options A and B would provide B1 connecting service, with a higher frequency provided by Option B in anticipation of greater demand (since it would also be possible to transfer to the Metro Line at Castle Downs).

LRT Frequencies and Capacities. The Capital and Metro Lines will continue to deploy high-floor LRT, which has longer trains, and a higher per-train capacity. The Capital Line is assumed to operate every 5 minutes in both directions during peak periods. Due to existing operational challenges – including overlapping use of alignment between Churchill and Health Sciences - and lower passenger loads, the Metro Line is assumed to operate every 10 minutes during the peak. By the 1.25 Million horizon, the Capital Line and Metro Line are assumed to have five (5) cars per train.

The Valley Line will use low-floor LRT that can be more directly integrated in urban streets, and will have shorter trains. It is also assumed to operate every 5 minutes during peak periods. Valley Line trains are assumed to operate with two (2) cars per train.

The off-peak frequencies are less than the peak: 10 minutes for Capital Line and Valley Line, and 15 minutes for Metro Line.

Semi-Exclusive Routes. The grouping of routes B1 through B6 fall into this category. For the planning horizon, only partial implementation of semi-exclusive right of way is assumed, with differences between all three scenarios.

- **B6**. This route includes the planned bus lanes on Terwillegar and consequently, a shortened variant of this route, running from Ambleside to South Campus, is effectively included in the baseline. For both Options A and B, the route is extended north to University LRT station using 114 and 112 Avenues without dedicated lanes (operating in mixed traffic for this time horizon).

- **B1.** This route extends from Century Park to the Campbell Road, with the segment west of Castle Downs operated as rapid bus. The route includes semi-exclusive lanes along its route to the north and south of the city centre. In Option A, these lanes are less extensive and would operate north of 118 Avenue and south of 61 Avenue. In Option B, they would be north of 111 Avenue and south of 82 Avenue, providing additional speed benefits. Both options expand on the existing bus lanes between 118 Avenue and 137 Avenue on 97 Street.

- The crossing of the North Saskatchewan River uses existing bridges. In Option A, NB and SB buses would use the Low Level Bridge. In Option B, NB will operate via Walterdale while SB will use Low Level. The distances are similar but allow a different combination of bus stops to be compared.

Several precursor rapid/express routes assumed in the 2030 base are modified for Options A and B. These changes include the replacement of 120X and CPCBD (Century Park-downtown peak-only) routes by the B1 route.

- **B2**. This route would operate between West Edmonton Mall and Bonnie Doon LRT station. In both options, it would use the bus lanes on Fox Drive, sharing this section with B6. Option A includes semi-exclusive treatment on 82 Avenue from 112 Street to Bonnie Doon, while Option B tests a shorter extent, from 112 Street to 99 Street, since 82 Avenue becomes more residential to the east.

- **B4**. This route runs from Clareview to West Edmonton Mall in Option A. Option B shortens the route and serves the busier part of the line on 137 Avenue only, and terminates at Campbell Road. In the 2030 horizon, this route uses existing lanes with some priority assumed, but is not a semi-exclusive operation.

- **B5**. Due to higher demands on the eastern portion of this route, an initial segment from Century Park to Maple TC is included in both Options A and B. The segment from Calgary Trail to 111 Street, shared with B1, would be semi-exclusive. The future western part of the B5 route (from 87 Avenue to Century Park) is also served by a crosstown route, which will have its frequency slightly increased to address peak demand.

Rapid Bus. The set of routes proposed for implementation focuses on those serving growth areas and corridors designated for investment in the 1 to 1.25 Million planning horizon. Details of the routes are indicated on the maps and summary table. In general, the frequency assumed in 2030 is less than the ultimate, since population and employment along most routes will be at an interim state, beginning to increase but not at the so-called 2065 levels.

- **R3** is included in Options A and B, and replace a frequent service identified in the refined base network, due to high demand on Ellerslie Avenue. Option A tests a direct replacement of the route from Mill Woods to Ambleside, which follows part of 66 Street.

In Option B, R3 follows 50 Street, also replacing some of the shuttle service between Mill Woods LRT and the Ellerslie SE Park and Ride. These two variations in R3 will have different operating costs and boardings.

- **R6** is a crosstown service from Meadowlark to Maple, including service on 51 Avenue. It is introduced as a medium frequency rapid bus to build ridership, in Option A.

- **R7** is another crosstown service, connecting Castle Downs, Exhibition LRT station, Capilano and Davies LRT station. It is being tested as an element of Option A. (It is not included in Option B, which instead sees LRT service to Castle Downs, and assumes more frequent service on route B5C on 50 Street as an alternative).

- **R9** provides a connection from Maple TC to Bonnie Doon LRT, with intermediate stops in the employment district. It is included as an element in Option B. The level of service on a parallel express route (500 X) is adjusted for Option B. 2030 Base and Option A assume route 500X only with no R9.

- **R12** operates between Clareview TC and West Edmonton TC, with connections to Exhibition LRT, NAIT, Westmount, and West Jasper Place. This route demonstrated some of the highest rapid bus demand in the ultimate City Plan network, and the interim 1.5 Million network, and so it is also included in Options A and B.

- **R109** is included in Option A in a truncated form to provide a connection from Clareview to the future Gorman station and Alberta Hospital station locations. This route is expected to become more significant by 1.5 Million, and it is included in Option A only, to assess its potential demand.

- **B5C – Edmonton Portion**. Options A and B include implementation of the B5C service from Mill Woods to Exhibition LRT via 50 Street, operating much like a rapid bus. The frequency of this assumed service is less for Option A, due to overlap with part of R7.

- In two emerging areas where future rapid buses are planned in later planning horizons, the ridership builder routes RB2 and RB5 (identified previously) are being tested to see how much demand there is by the 1.25 Million horizon. These are being operated similar to local routes for the 2030 scenarios.

Airport Connector. This service is included in both Options A and B, but with variations in travel time. It is assumed to follow Highway QE2 and then use the same route as B1 between 23 Avenue NE and downtown. The differences in the assumed extent of bus lanes for B1 would also affect the travel time of the AC service in Options A and B.

Frequent Bus. The frequent bus services largely come directly from the BNR and on the map and tables, the functional name used (e.g. F1, F4) is also accompanied by the proposed route numbering that ETS plans to use when the route restructuring is implemented in 2021. In Options A and B, some of the frequent routes carry forward as assumed in the base (e.g. 1A, 1B, 2), where no semi-exclusive or rapid service is being introduced. Other routes (e.g. 4, 5, 6) assume a modest reduction in local service frequency in Options A and B, where some of the demand would be picked up by proposed new routes in the same corridors.

Regional Bus. These are largely carried forward from the revised ‘2030’ base without further modification. A previous memo identified the refinements made to ensure the current RTSC proposals for regional coverage were reasonably reflected in the travel model.

2.6.4. Bus Lanes and Transit Priority

The semi-exclusive routes noted above proposed to evolve over time, with some segments operating in mixed traffic with spot treatments to address delays, segments with dedicated bus lanes in peak periods, and other areas where the transit service would eventually be segregated except at intersections. For the early horizon of 1.25 Million, portions of B1, B2, B4, B5 and B6 will operate more like rapid bus, with limited stops and some strategic use of transit priority at delay locations. There are also areas in the 2030 Base, Options A and B where existing (2020) bus lanes continue to operate and new ones are assumed or proposed.

The bus lane elements in the **Future Base Scenario** include:

- Peak direction bus lanes on 97 Street between 118 Avenue and Yellowhead, SB from 135 to 125, and NB at 137 into Northgate TC. There is also a peak direction lane reversal south of Yellowhead Trail. (Used by BNR routes and by B1 in options A and B)
- A combination of NB bus lanes on 109 Street operating in peaks and all day. (Used by BNR routes)
- Bus lanes on Fox Drive and connecting through to South Campus. (used by BNR routes, the SWBRT in the base scenario, and B2 and B6 in Options A and B)
- Peak period bus lanes on Jasper Avenue between ~120 Street and ~110 Street.
- Bus lanes on Whitemud and Terwillegar Drive between Fox Drive and Windermere Blvd (used by the SWBRT in the base scenario and by B6 in Options A and B).
- Several dedicated bus lanes on various downtown blocks – because of high volumes of buses stopping – and at approaches to various transit centres around the city.

These elements are the starting point for Options A and B. **Both options include**:

- Peak direction, peak period lanes extended on 97 Street to Eaux Claires TC, converted from existing lanes;
- Bus lanes added to 153 Avenue from just east of 97 Street to Castle Downs;
- NB bus lane converted from an existing lane on Gateway Boulevard, from 23 Avenue to 63 Avenue;
- SB bus lane conversion on Calgary Trail from 63 Avenue to 23 Avenue;
- Peak direction, peak period bus lane on 82 (Whyte) Avenue from 99 Street to 112 Street;
- Peak direction, peak period bus lane on Whitemud from 159 Street to Fox Drive; and
- Peak direction, peak period bus lane on 23 Avenue from Calgary Trail to 111 Street.

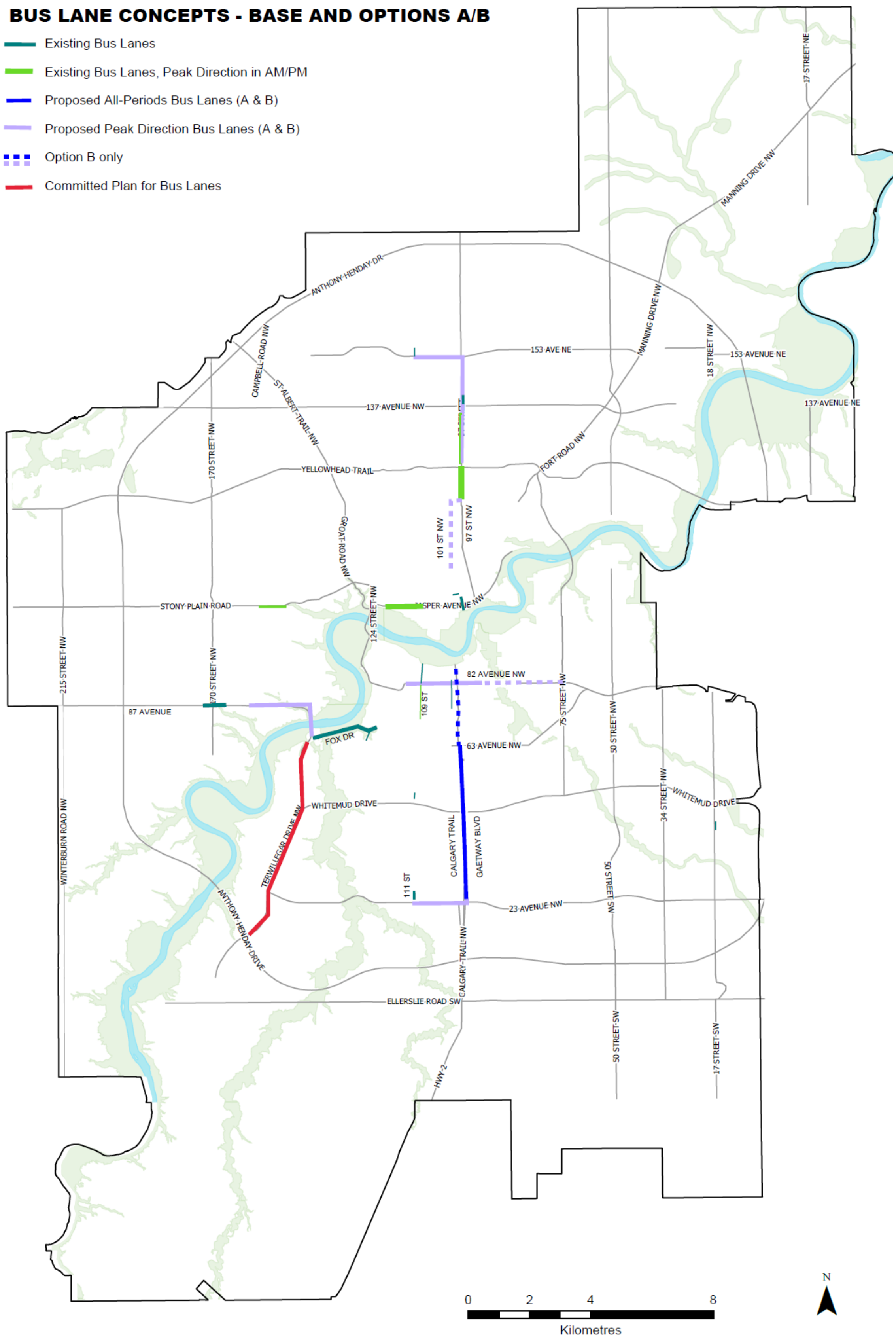
Bus lanes tested in the model generally assumed reallocation of existing street space rather than widening.

Option B extends several bus lanes further:

- Peak direction, peak period lanes on 101 Street, converted from existing lanes, from 118 Avenue to south of 111 Avenue;
- Peak direction, peak period bus lane on 82 (Whyte) Avenue from Bonnie Doon to 112 Street;
- Extended NB bus lane converted from an existing lane on Gateway Boulevard, from 23 Avenue to 83 Avenue; and
- Extended SB bus lane conversion on 104 Street and Calgary Trail from 83 Avenue to 23 Avenue.

The existing bus lanes and those proposed lanes tested in the model are illustrated conceptually in Exhibit 2.8.

Exhibit 2.8: Future Mass Transit for 1.25 Million Horizon – Proposed Bus Lanes



3. Network Options Performance

The ultimate mass transit network was developed in conjunction with the Edmonton City Plan, and as such, was intended to enhance future transit network performance in addition to several broader goals. These include supporting future land use plans and policies by serving and shaping travel demand, acting as a catalyst for development at nodes and corridors, and helping the city to be more sustainable (financially, environmentally and socially). The evaluation of interim options for 1.25 Million scenarios has been carried out to help prioritize elements of an incremental build-up of that long-term network.

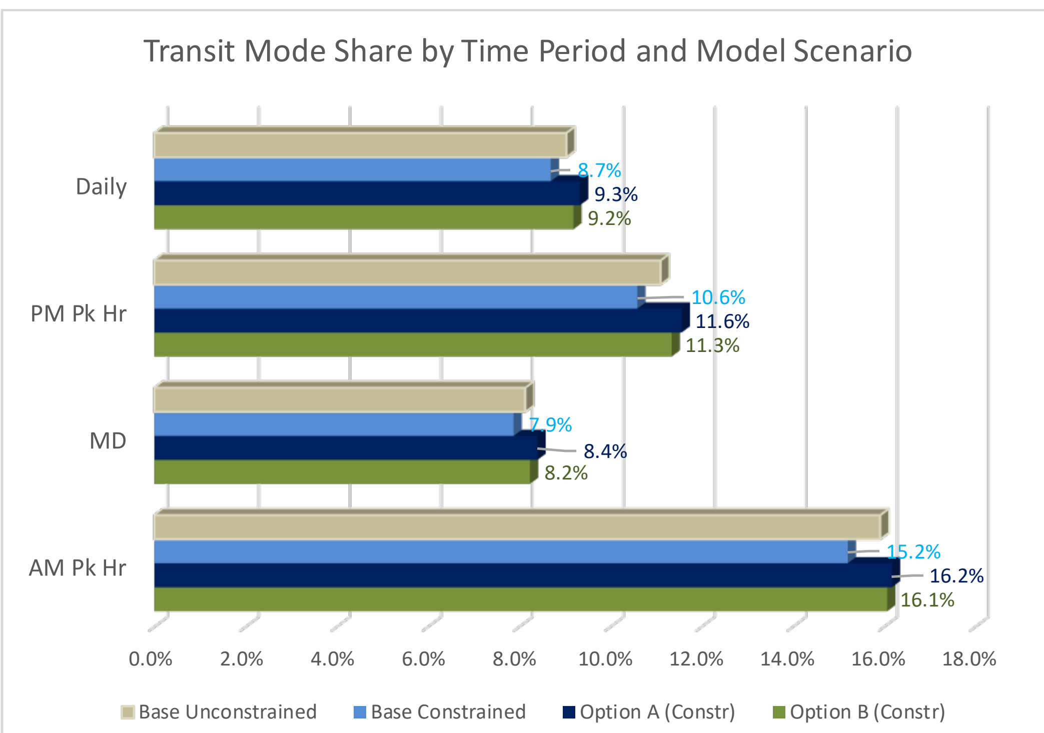
It is important to note that the demand modelling has been carried out using the City's calibrated travel demand model, which is partially based on the 2015 Household Travel Survey and on network-level counts of traffic and transit passengers. These trends were representative through to early 2020, prior to the pandemic. There is some uncertainty about the timing of future travel demand since there may be lasting legacy effects of the past year.

3.1. Transit Mode Share Comparison

The mass transit options are built upon the Base scenario with the objective of aligning with the land use patterns proposed for 2030 modelling base analysis. It is important to improve performance of the interim 1.25 M network options during the AM peak for work and school commute trips, in the midday for personal business, shopping and recreational travel, and in the PM peak for a broad combination of different trip purposes.

Exhibit 3.1 summarizes the mode choice results for the 2030 modelled horizon (used as the approximate time horizon to reach 1.25 million people) for two variations of the Base scenario, in addition to mass transit options A and B.

Exhibit 3.1: 2030 (1.25 M Population) Transit Mode Shares – Base Scenarios, Options A and B



The 'unconstrained' Base reflects potential demand for transit, whereas the 'capacity constrained' scenario reflects additional time transit passengers would require waiting for additional transit vehicles or taking different routes where on some routes, space becomes limited. This produces a lower level of ridership. Options A and B use the same constrained capacity, so the transit mode choice increases are relative to the Base constrained.

These results all reflect the mode choice for residents of Edmonton, as output by the regional demand model. Option A outperforms B, but this was expected as it contained a larger extent of mass transit routes. Both options increase transit mode choice relative to the constrained future base, because they add capacity and speed between key origins and destinations.

Transit Mode Share Compared to Recent Performance

The projected increases in future mode share include a 1% increase in each of the peak periods and 0.6% over the course of a full day when comparing the most robust mass transit option with the future base network. These percentages are for ALL trips in Edmonton. Focusing just on the implications for transit, these projected AM and PM increases would result in nearly one-tenth (9-10%) *more transit passengers* on ETS.

When comparing these results to recent transit usage (8.2 % in the 2015 travel survey), it is important to remember that the higher mode share is also based on a much higher population. Therefore, the mode share gains in the analysis indicate that the number of transit riders will not only have kept pace with growth of the city (nearly 30%) but also forecast to make additional gains, resulting in 50% more transit riders between 2015 and the 1.25 Million horizon

Mode Choice by Time Period

Exhibits 3.2 through 3.4 show the percentages of travel choice for transit and other modes of personal travel, for the AM peak hour, the average midday, and the PM peak hour. The auto mode share is expressed in terms of drivers and passengers. The transit share is split into 'walk access' (people board at a nearby stop or station, reached on foot) and Park and Ride/Kiss and Ride access (passengers drive to a parking lot near a transit stop or station, or are dropped off/picked up by someone).

- In the AM peak, the mass transit options can build on the base scenario, increasing mode share for transit from 15.2% to 16.2% (Option A) or 16.1% (Option B). This is the percentage of AM trips by city residents that select transit as the primary mode. The transit shares are highest in the AM peak because the focus of AM travel is work and school-related, which lend themselves well to transit.

Exhibit 3.2: 2030 (1.25 M Pop) AM Peak Mode Shares – Constrained Base Scenario, Options A and B

AM Peak Hr (7-8)	Driver%	Passenger%	Walk Access Transit%	PNR/KNR%	School Bus%	Walk%	Bike%
Base Constrained	58.7%	15.9%	12.3%	2.9%	2.9%	5.5%	1.9%
Option A	57.8%	15.8%	**13.2%**	**3.0%**	2.8%	5.6%	1.9%
Option B	57.9%	15.8%	13.1%	3.0%	2.8%	5.6%	2.0%

- In the MD typical hour, transit mode choice increases from 7.8% to 8.4%/8.2% for trips in Options A and B respectively. This increase reflects higher speeds provided by the additional services, which help to attract additional passengers relative to the Base. These trips appear to be drawn away from auto drivers and passengers.

Exhibit 3.3: 2030 (1.25 M Pop) MD Peak Mode Shares – Constrained Base Scenario, Options A and B

Midday 9 - 3:30	**Driver%**	**Passenger%**	**Walk Access Transit%**	**PNR/KNR%**	**School Bus%**	**Walk%**	**Bike%**
Base Constr	54.3%	21.0%	7.4%	0.4%	1.1%	14.3%	1.4%
Option A	53.9%	20.9%	**8.0%**	**0.4%**	1.1%	14.3%	1.4%
Option B	54.1%	20.9%	7.8%	0.4%	1.1%	14.3%	1.4%

- In the PM peak, transit mode choice increases from 10.6% in the Base to 11.6% in Option A and 11.4% in Option B. These all fall into a lower percentage range than in the AM, due to the number and complexity of trips being higher in the PM. The reverse commute from the AM is part of the PM pattern, but there are additional discretionary trips such as personal business and shopping, and commute times in the afternoon and evening are more dispersed due to school ending at a generally different time from the end of the working day. Auto passenger and walk trips both increase as a percentage of PM peak trips compared to the AM.

Exhibit 3.4: 2030 (1.25 M Pop) PM Peak Mode Shares – Constrained Base Scenario, Options A and B

PM Peak Hr (4:30-5:30)	**Driver%**	**Passenger%**	**Walk Access Transit%**	**PNR/KNR%**	**School Bus%**	**Walk%**	**Bike%**
Base Constr	59.1%	18.5%	9.1%	1.5%	0.03%	9.8%	2.0%
Option A	58.3%	18.4%	**10.0%**	**1.6%**	0.04%	9.8%	1.9%
Option B	58.4%	18.5%	9.8%	1.6%	0.03%	9.8%	2.0%

3.2. Fleet Requirements

Based on the estimated running times for the range of transit services, and the service frequencies at different time periods, one may estimate the number of buses and LRT trains in operation. ETS uses the AM peak to define the service fleet requirements for most routes, which combines the morning commute demand with school trips, resulting in the largest number of buses in service. Community circulator routes are an exception to this, and run more frequently in the midday.

Exhibit 3.5 shows the calculation for the size of the bus fleet based on the combined AM/MD peak vehicles, as described above. The numbers of buses vary between the base and options due to new services being added, and to replacement or reduction of some base services by the new routes. For the two options, the incremental number of buses is 60 to 95 vehicles more than the future base fleet.

Exhibit 3.5: Transit Vehicle Fleet - Buses - Constrained Base Scenario, Options A and B

SCENARIO	BASIC BUS REQT (AM PEAK)*	COMMUNITY BUSES (MIDDAY)	RED ('BRT')	TOTAL BUSES IN PEAK SERVICE**	TOTAL BUS FLEET	SPARES
BASE	832	12	15***	**859**	**1075**	216
OPT. A	848	12	74	**934**	**1170**	236
OPT. B	824	12	71	**907**	**1135**	228

Notes:
* AM Peak number = regular buses in peak service, 10% allowance for extra buses for school-related peak loads (this is in addition to the regular service one would estimate based on travel times divided by nominal headway), and rapid bus fleet.
**Includes buses estimated from modelled run times and headways, allowance for school services, and shuttle services (which are higher midday).
***SW 'BRT' using Terwillegar and Fox Drive bus lanes, is in the base network and counted as BRT.

In Exhibit 3.6, the numbers of LRT indicated are trains in service, then the totals with spares, and the resulting number of individual LRVs. For planning purposes, and for setting capacity in the demand model, 5-car high-floor LRT and 2-car low-floor LRT is assumed. A spare ratio of 25% was assumed for LRVs.

The high-floor numbers increase slightly for Options A and B due to the proposed alignment extensions being assessed in each. For the two options, approximately 15 high-floor LRT cars and no additional low-floor cars are assumed relative to the future base network.

Exhibit 3.6: Transit Vehicle Fleet - LRVs - Constrained Base Scenario, Options A and B

SCENARIO	HIGH FLOOR LRT	WITH SPARES	HIGH FLOOR CARS	LOW FLOOR LRT	WITH SPARES	LOW FLOOR CARS
BASE	20	25	**125**	27	34	**68**
OPT. A	22	28	**140**	27	**34**	**68**
OPT. B	22	28	**140**	27	**34**	**68**

4. Performance of Network Element Options

In this section, the performance of the individual network elements is presented in order to identify key areas of interest within the network. This section builds upon the broader network considerations discussed in Section 3.

4.1. Measures/Definitions

The following measures are used in this section to better articulate the performance of individual routes and normalize them against each other.

- Average Hourly Boardings – AM and PM peak hour passengers getting onto a route, added in both directions, expressed as a per-hour average. It is a measure of how many people **use** (demand) a transit route or transit system.
- AM + PM Boardings per km – Total passengers boarding a route in the AM and PM peak hours, divided by the length of a round trip on that route (this distance is also known as the total directional route-km). This measures the **attractiveness** of a route and its assumed stops. It is divided by distance to allow us to compare routes with different lengths. This value is sensitive to land uses, destinations, and service assumptions.
- Boardings per service hour. This measures how many passengers board a route, divided by the amount of service being provided over a period. The total service hours on a transit route is the sum across all vehicles operating on that route. If 'N' buses each operate for a full hour on one route, then 'N' service hours have been provided. This is also a measure of attractiveness because it relates boardings to the amount of service. Boardings/hour is the main productivity measure in many Transit Service Standards, including ETS. This measure can be sensitive to stop spacing, and as such it is most applicable comparing transit routes within the same category, for time series monitoring, and system-wide statistics.
- Hourly Volume – Number of passengers on board transit vehicles, passing a location in a one-hour period, in one direction, on one or more routes. Maximum volume is the highest of these values along a route or corridor. This measures how **full** the service gets, which is both a measure of its attraction and an indicator how much service is needed to meet the maximum demand.

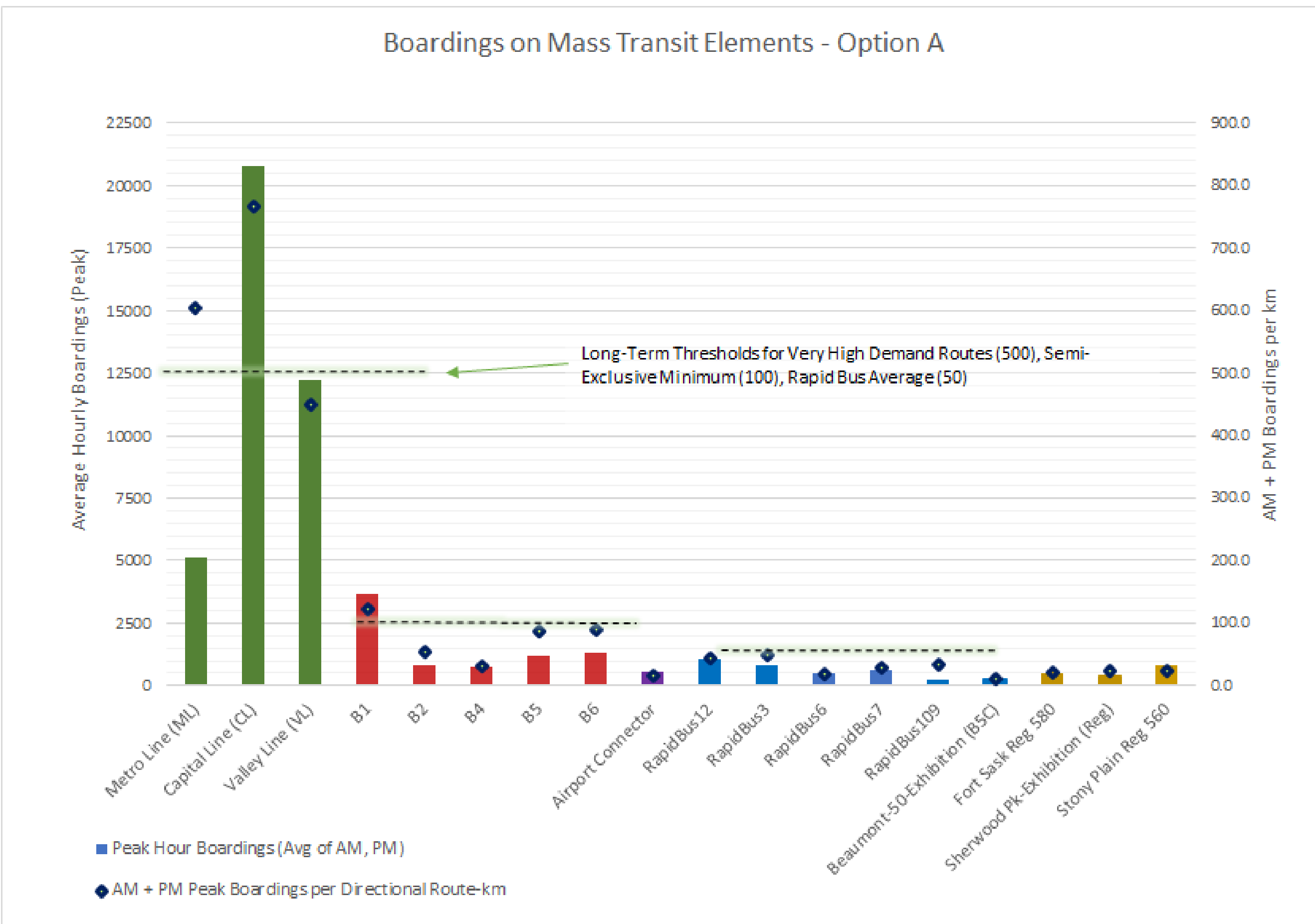
4.2. Exclusive, Semi-Exclusive and Rapid Routes

4.2.1. Boardings

Exhibit 4.1 summarizes the resulting average hourly boardings for the AM and PM peaks (coloured bars) and the AM + PM boardings per-km number (diamond shapes on the chart) for the major mass transit elements being tested in Option A.

The number of boardings has been colour-coded to roughly correspond with the maps in Section 2. Elements of the City-wide routes include exclusive ROW rail services (LRT lines in green, Airport Connector in Purple), semi-exclusive ROW transit (shown in red-orange), and routes operating in mixed traffic (rapid bus in dark blue, and major regional routes in tan-yellow).

Exhibit 4.1: Boardings on Selected Mass Transit Elements, Option A



- The first four routes in the chart all stand out with high numbers of passenger boardings indicating that these lines are most responsive to the demand generated by the mass transit network. These lines serve major travel demands and connect several of the highest-density employment areas in the city, which explains the popularity of these routes.

- The Metro Line, Capital Line, and Valley Line all include exclusive river crossings, either existing or under construction. This contributes to their capacity and speed advantages that attract passengers.
- For comparison purposes, the per-km threshold of 500 passengers is shown against the LRT routes. This threshold is comparable to the busiest surface route in Greater Vancouver, the 99 B-Line, a frequent limited bus between the SkyTrain rapid transit system and the University of British Columbia. This line represents a high level of passenger activity and requires substantial capacity – in fact part of the route is being replaced by rail in the next 5-6 years. The Capital and Metro lines will be reaching this type of threshold by the 1.25 Million population horizon.
- B1, and B2 propose new river crossings in the ultimate state, but these crossings are deferred beyond 1.25 million. The results above reflect B1 and B2 following existing routes as an interim approach to delivering service. In the case of B1, the effect of the detour and the less extensive bus lanes slows service and suppresses potential ridership, but B1 is still faster than most bus routes.
- B2 in its interim state follows Fox Drive and Whitemud, which places it in competition with peak express and all-day frequent buses for passengers. Its less direct interim routing depends on transit priority and bus lanes to gain some travel time advantages.
- The second per-km threshold of 100 passenger boardings is the suggested minimum to meet bus rapid transit service levels. This was established through comparison with peer services. For example, two of the Metro Vancouver rapid bus routes (R5 and R1, formerly the 95 and 96 B-Lines) currently achieve 130-170 peak boardings (two peak hours) per directional kilometre of route.
- B1 is projected to meet this demand threshold by the planning horizon, with B5 and B6 being close behind. Each of these routes is a combination of semi-exclusive and rapid service, on direct paths between nodes, and consequently they perform well against the per-km measure.
- Routes B4 operates as a rapid bus and at a somewhat lower frequency than the other ‘B’ routes in the interim network, and as such its performance is more in line with a starter rapid bus service.
- Other mass transit services are not expected to attract as many passengers since they serve less dense corridors and do not align with as many major activity nodes. For comparison purposes, the suggested threshold shown in the chart is 50 passengers per km.
- The Airport Connection and the regional routes are longer and with fewer stops. This type of service is usually evaluated as to how full the individual vehicles are, and how long the average passenger trips are on the service. Because the number of stops is usually fewer, the number of boardings per km will naturally be lower.

Exhibit 4.2 provides the same information, but for the set of routes included in Option B. There are several differences from Option A to point out:

- The Metro Line (ML) has more boardings in this option, since it includes the extension to Castle Downs. The number of passengers per km drops slightly as the extension includes a gap between stations that brings down the line's average.
- The Capital Line (CL) has fewer boardings in this option, which is a combination of two factors. The line does not include the HVTC extension but does add two infill stations that attract modest ridership. This has the effect of increasing the number of passengers per km despite the lower number of boardings overall.
- The set of rapid bus routes is slightly different, reflecting a different set of routes being tested. *Refer to the following pages for more discussion of the rapid bus routes across the two options where they were tested*.

Exhibit 4.2: Boardings on Selected Mass Transit Elements, Option B

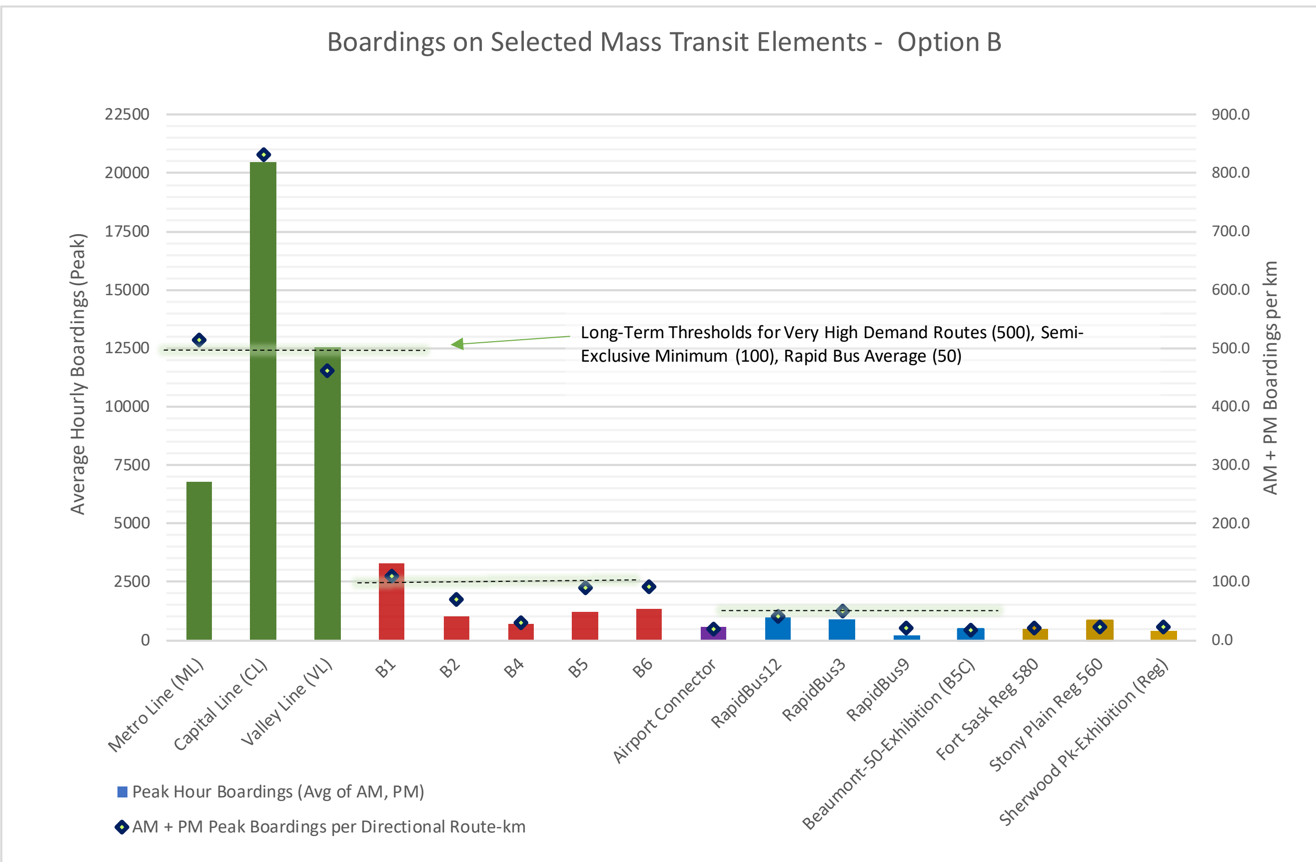
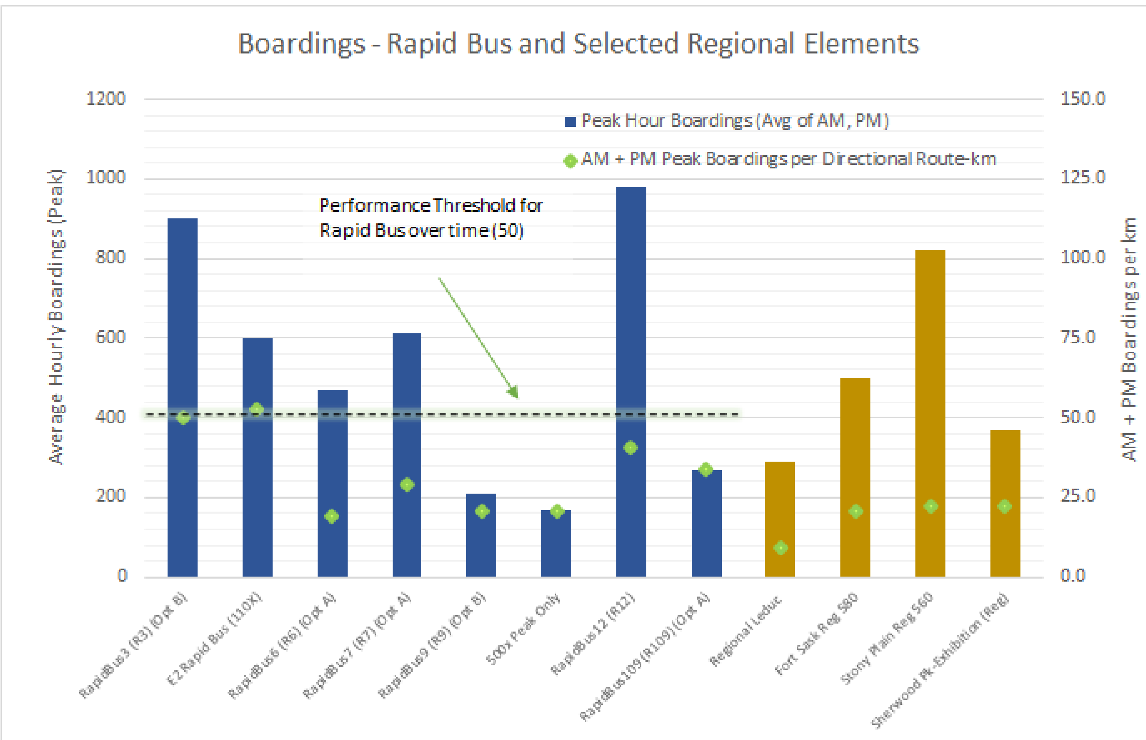


Exhibit 4.3 summarizes the average number of hourly boardings for the AM and PM peaks (coloured bars) and the per-km number of peak boardings for the rapid bus elements and several of the regional routes.

- Of the rapid bus routes, R12 (West Edmonton Mall/WEM - Clareview via Westmount, NAIT and 118 Ave) has the highest number of boardings. This is in part due to the route's length and its boardings per km are only third-highest in the category. A review of the passenger volumes shows relatively consistent peak loads along the length of the route, suggesting that many R12 passengers are travelling to the ends of the route and major transfer points along the line.
- Routes R3 serves the Ellerslie Road corridor, connecting to the Valley Line, Capital Line, and B6. It acts as both a crosstown trip option and provides access to north-south rapid transit from the southeast and southwest growth communities.
- Route E2 (ETS #110X) is a limited stop service on 97 Street between Eaux Claires and NAIT, and then continues downtown via 109 Street. It offers complementary service to B1 and is recommended to continue.

Exhibit 4.3: Boardings on Rapid Bus and Selected Regional Elements



A common transit industry metric for monitoring service performance is the number of boardings per hour of service. For most transit agencies, this is a useful way to manage service on a specific route and set financial priorities between similar types of routes, as it indicates how many passengers board each bus that is operating, in this case during the peak hours.

Exhibit 4.4 compares the LRT routes with the semi-exclusive and rapid routes in terms of boardings per hour, and boardings per route-km. The ranking of routes one would get is not the same between these measures. Boardings per hour on the LRT is naturally higher, reflecting service speeds, and the capacity of LRT being much higher. The Metro Line and Capital Line use high-floor trains of five cars, while the Valley Line uses low-floor cars in sets of two per train. The LRT indicator reflects train hours rather than car-hours.

Among the ‘B’ routes, B5 and B6 are the best performers in the service hour measure, which partly derives from their attractiveness along the route, and operations at fairly high speeds, which makes them efficient routes.

Exhibit 4.4: Boardings per km and per Service Hour, Selected Mass Transit Elements

Line Name (both Options unless indicated)	**Peak Hour Boardings (Avg of AM, PM)**	AM + PM Peak Boardings per Directional Route-km	Total Service Hours AM+PM	**Boardings Per Service Hour, Peak**
Metro Line (A)	5,120	604	6.4	1600
Capital Line (A)	20,770	768	32.2	1290
Valley Line	12,240	450	51.8	473
B1	3,680	123	79.3	93
B2	790	54	24.3	65
B4	750	31	15.9	94
B5	1,190	88	19.2	124
B6	1,310	89	24.4	107
Airport Connector	540	17	20.3	53
RapidBus12	1,070	44	39.6	54
RapidBus3	820	48	23.3	70
RapidBus6 (A)	470	19	15.1	62
RapidBus7 (A)	610	29	17.1	71
RapidBus9 (B)	*210*	*21*	7.46	56
RapidBus109 (A)	270	34	3.8	142
Beaumont-50-Coliseum (A)	290	11	18.6	31
Beaumont-50-Coliseum (B)	*460*	*18*	*18.6*	*49*

Note: In Option A, parts of RapidBus7 and Beaumont-50 overlap.

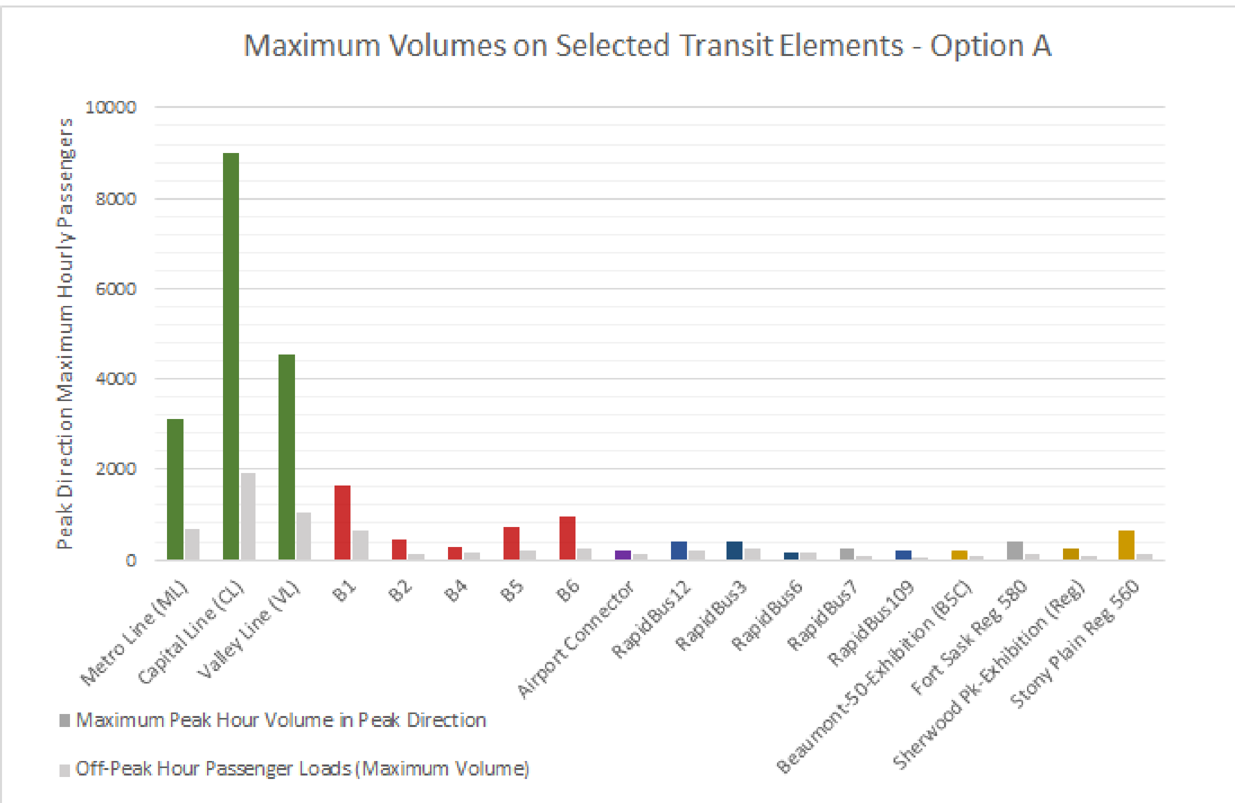
Boardings per service hour can vary greatly between different types of service, as shown above in the chart, and factors such as stop spacing, level of overlap with other routes, speed, and amount of service provided all factor into the response. The ‘speed’ is a measure of the running speed plus the time to access and wait for the service. This makes more frequent services very attractive to passengers, yielding the results as shown above where LRT and then the semi-exclusive ‘B’ routes perform well.

4.2.2. Peak Passenger Volumes (Passenger Load)

Exhibit 4.5 illustrates the maximum passenger volumes at the peak demand location on each route. It also shows the typical one-hour midday demand for each route in grey. For most of the routes, this value is less than half the peak hour which leads to service frequency being consequently much lower than in the peak, to better match service provided to demand.

- The maximum volume on the Capital Line is capacity-constrained to approximately 9,000 passengers, and this value is reached in the peak periods in the Base scenario and both of Options A and B. (Details for each line are included in Appendix A.8)
- Since it operates at half the frequency of the Capital Line, the Metro Line's capacity limit in the mode would be ~4,500 per direction, which it does not reach. Its peak load point is between MacEwan and Churchill Stations.
- While the B1 route was introduced in part to help address Capital Line capacity limits, its busiest point in Option A is north of 118 Avenue. The 97 Street segment has been identified by previous and recent studies (including the 2011 IRTMP and 2020 RTSC Business Case Analysis) as an important corridor for transit investment.

Exhibit 4.5: Maximum Volumes on Mass Transit Elements – Option A



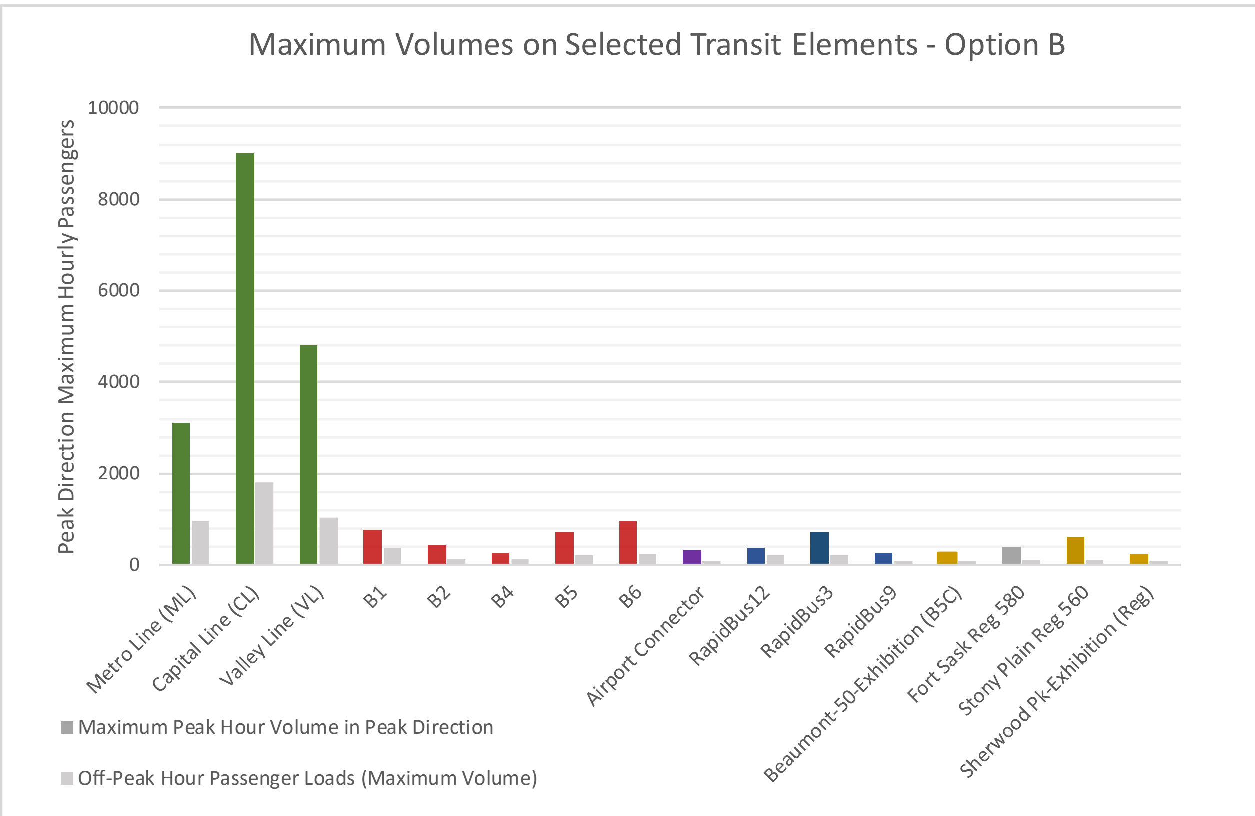
The maximum passenger volumes provide some of the guidance as to how much service would be needed on each route, in terms of frequency and vehicle capacity. Values of 2,000 passengers or fewer could be accommodated by articulated transit buses (or standard size buses) operating at a sufficiently high frequency and with support from transit priority measures.

The other aspect in defining these services is that some routes, especially in the off-peak, would not be expected to be as full, and would be operating at a policy headway to maintain convenience and make the service competitive in terms of overall trip times.

Exhibit 4.6 presents similar information for Option B. There are some notable differences to point out:

- Despite the ML extension in Option B, the peak load point downtown has similar volumes as Option A.
- The Capital Line hits the capacity limit in this option even without the extension. Additional passengers board at the infill stations, and marginally more people can fill up the capacity at stations closer to the peak demand point.
- Valley Line peak loads are slightly higher, in part due to feeder connections being tested as part of Option B.

Exhibit 4.6: Maximum Volumes on Mass Transit Elements – Option B



4.3. Frequent Routes

Exhibit 4.7 shows boardings for the Frequent routes as modelled in Option A. Many of these routes operate along primary and secondary corridors and pass through the Centre City node of The City Plan, which also explains their popularity. The routes are indicated by their functional code from the Bus Network Redesign (the same codes were used in the Mass Transit Network report). The ETS route numbers are also indicated for reference; this is what the public will see as the network identifiers.

Several routes stand out:

- Routes F5 (ETS #9) and F7 (ETS #4) are the busiest by number of boardings. F5 serves 112 Street south of downtown and 97 Street north of downtown. F7 serves 87 Avenue and Whyte Avenue, overlapping for much of its length with B2.
- The most productive route per km is F6 (ETS #3), which operates on 111 Avenue.
- F2 is not as busy a route by either measure, and it competes for passengers with the parallel Valley Line west. This appears to make it a less attractive route in the future.

Exhibit 4.7: Boardings on District Routes – Frequent Bus – Option A

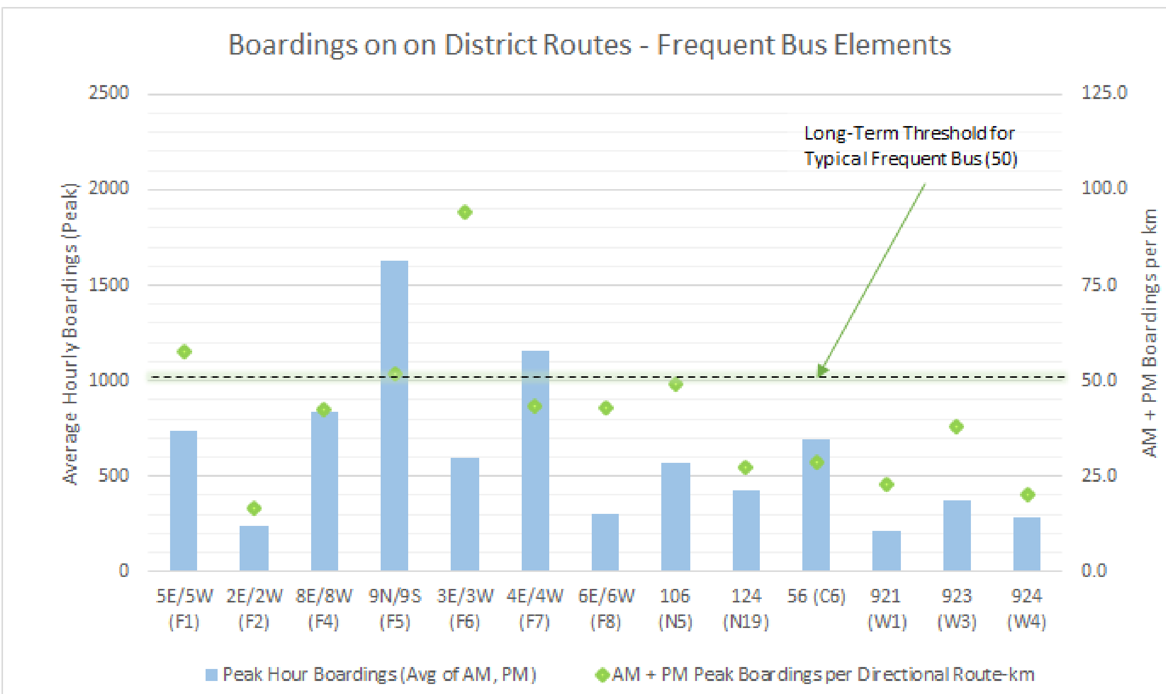
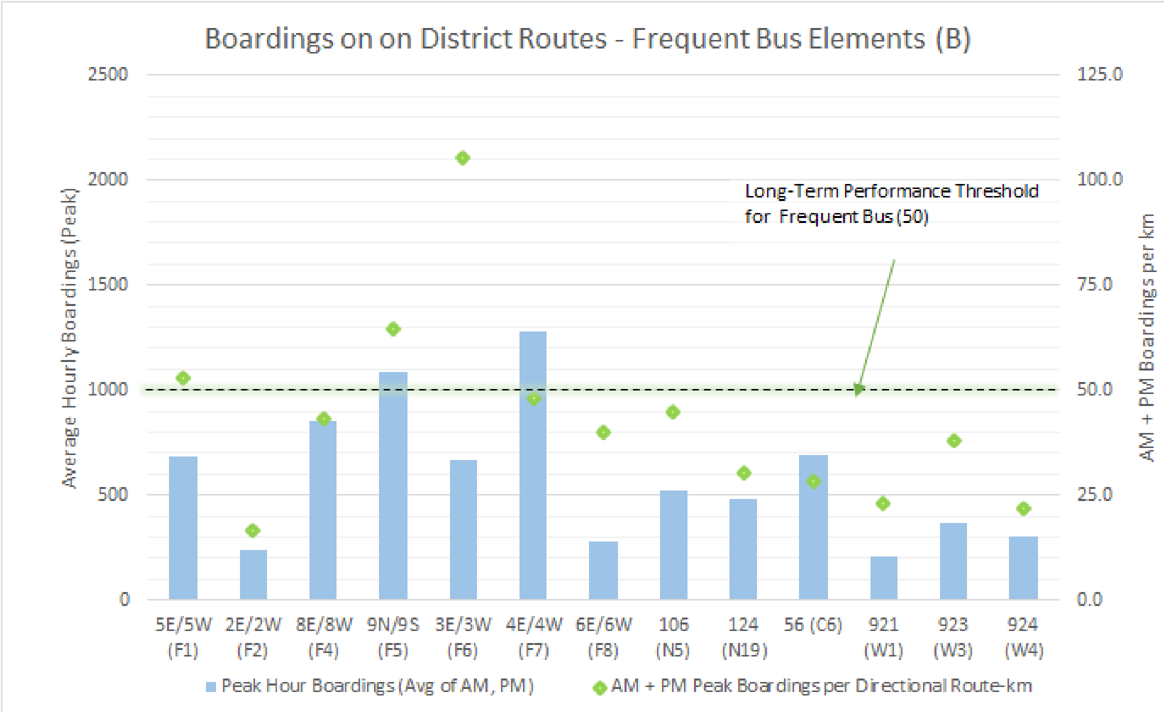


Exhibit 4.8 provides a comparison of frequent routes for Option B. The most significant difference is that F5 (ETS #9) sees fewer passengers, and this appears to be related to the Metro Line being extended north of the Yellowhead. This reduction in local demand in the face of ML and B1 competing for the same passengers also manifested itself in the demand forecasts for the Ultimate Mass Transit Network.

Exhibit 4.8: Boardings on District Routes – Frequent Bus – Option B



4.4. Trade-Offs between Mass Transit Service Options

This section focuses on locations where significant mass transit services were introduced relative to the Base Scenario, in one or both options, and illustrates the specific outcomes for those parts of the transit network.

4.4.1. Capital Line Extension

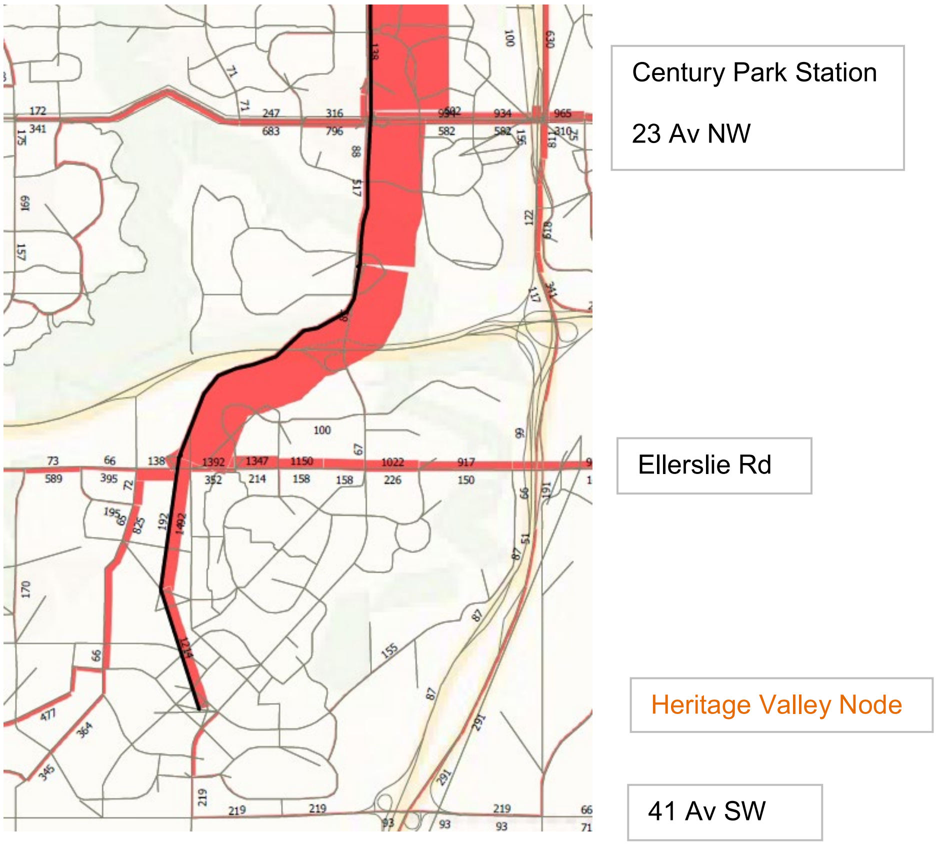
Exhibit 4.9 demonstrates the outcome of the Capital Line extension to Heritage Valley Major Node.

- During the AM peak, the Capital Line gains 1575 boardings
- Given that the length of the extension is 2.4 km, the extension attracts 650 passengers per km

The introduction of this extension increases transit ridership from this area. However, since the Capital Line is already capacity constrained in the future base, additional passengers boarding at any new stations would displace later passengers, unless the other passengers had other transit alternatives. The capacity limitation is reached for the AM northbound between McKernan/Belgravia and Health Sciences station. Past the peak point, the passenger load on the line is lower and passengers there are not displaced by adding demand.

This is where the other added transit services offered in Option A yield a benefit, by providing other routes in the north-south direction. These services include B6 (for passengers from the southwest) and B1 (for passengers heading north of Century Park towards Whyte Avenue or the City Centre). The parallel B6 service between South Campus and University stations also helps provide extra transit capacity between those LRT stations. The reverse occurs in the PM peak where the LRT sees its maximum loads south of Health Sciences and continuing until South Campus. Refer to Appendix A (Exhibit A.8) for illustrations of projected passenger activity.

Exhibit 4.9: AM Peak Passengers Volumes – Capital Line Extension, Option A



4.4.2. Peak Loads on the Capital Line and Parallel services

The Capital Line already experiences heavy passenger loads during part of the AM and PM peak hours, with the highest volume of passengers observed south of Health Sciences station. This is expected to increase in the future as growth occurs in the south and southwest corners of the city, and the Capital Line is extended beyond Century Park, first to Ellerslie and then to the Heritage Valley Major Node. The 2030 base and Option B assumed a southwest terminus at Ellerslie Road SW park and ride, whereas Option A included a two-stop extension to Heritage Valley Major Node.

In parallel, the Terwillegar corridor connects to developed and developing communities in the southwest part of the city. The 2030 base includes a 'SWBRT' route, which in Options A and B was extended to University Station and renamed B6.

Exhibit 4.10 shows the effects of providing additional options north-south to complement the Capital Line:

- In both cases, the Capital Line reaches the modelling limit of 9,000 peak direction passengers. (Earlier modelling of the future base indicated that some passengers would shift to parallel transit routes, use autos, or some trips would not be made)
- In the Base, the SWBRT and the limited stop service added to Calgary Trail carry 900 additional peak direction passengers.

- In Option A, the combination of B1, B6 and the Airport Connector carry some 2,200 peak direction passengers. The additional routes and enhanced services clearly tap into a pent-up travel market that the Capital Line alone cannot address.

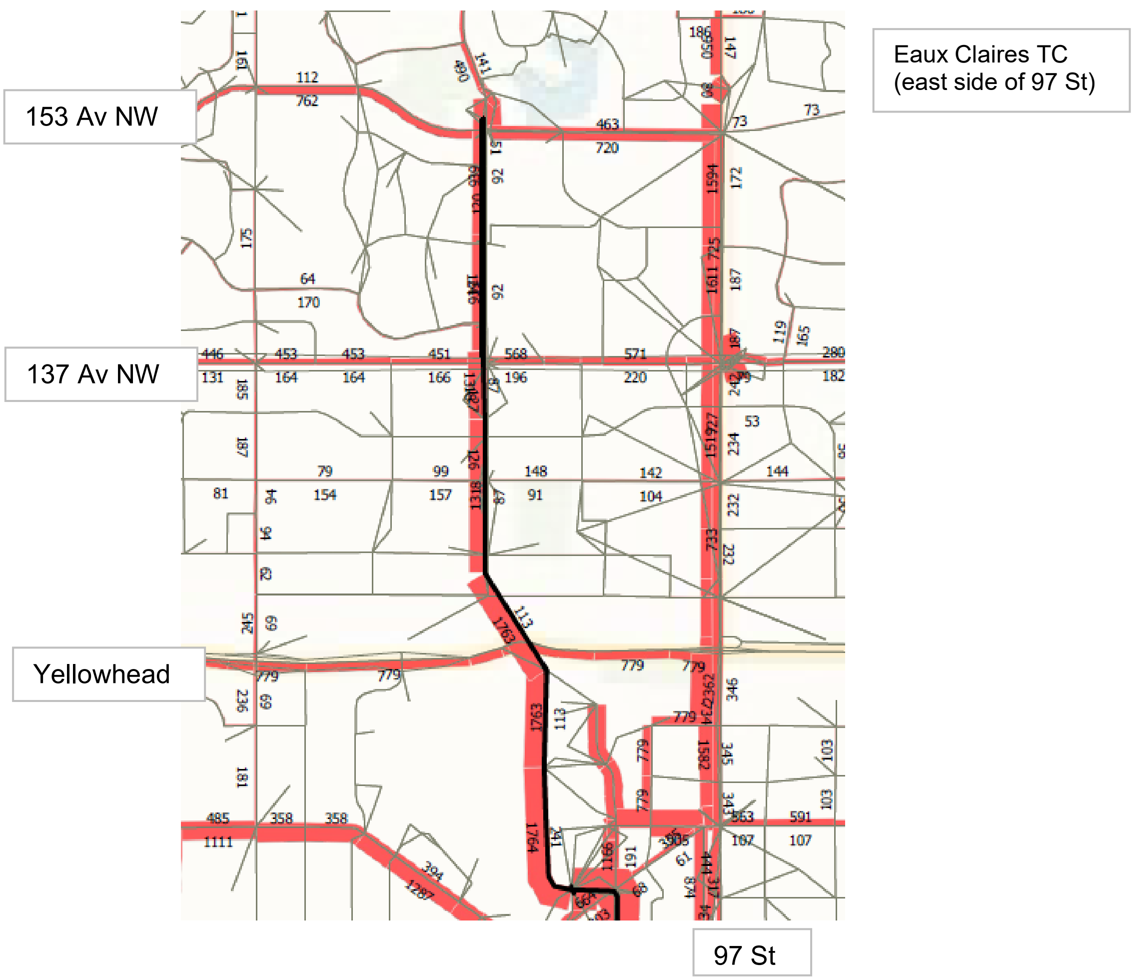
Exhibit 4.10: Peak AM Northbound Passengers on Mass Transit Lines Parallel to Capital Line

Route(s)	base	opt. a
Terwillegar Corridor (SWBRT / B6)	640	960
Capital Line LRT	9,000	9,000
Calgary Trail/Gateway (CPCBD / B1)	260	1,020
Airport Connector	--	220
Sum	**9,900**	**11,200**

4.4.3. Metro Line Extension

Option B included a test of the effects of an extension of Metro Line as far as Castle Downs station at 153 Avenue. This is illustrated in the transit volume plot in Exhibit 4.11.

Exhibit 4.11: Metro Line Extension and Connecting Services, Option B



Approximately 1700-1800 peak hour boardings are added in the AM and PM, taking into consideration the number of northbound and southbound passengers on the leg north of

Blatchford Station. For extension of 4.6 km, this amounts to over 360 passengers added per km of new construction. An important consideration for this option is the long bridge required to connect Blatchford to the stations north of Yellowhead Trail.

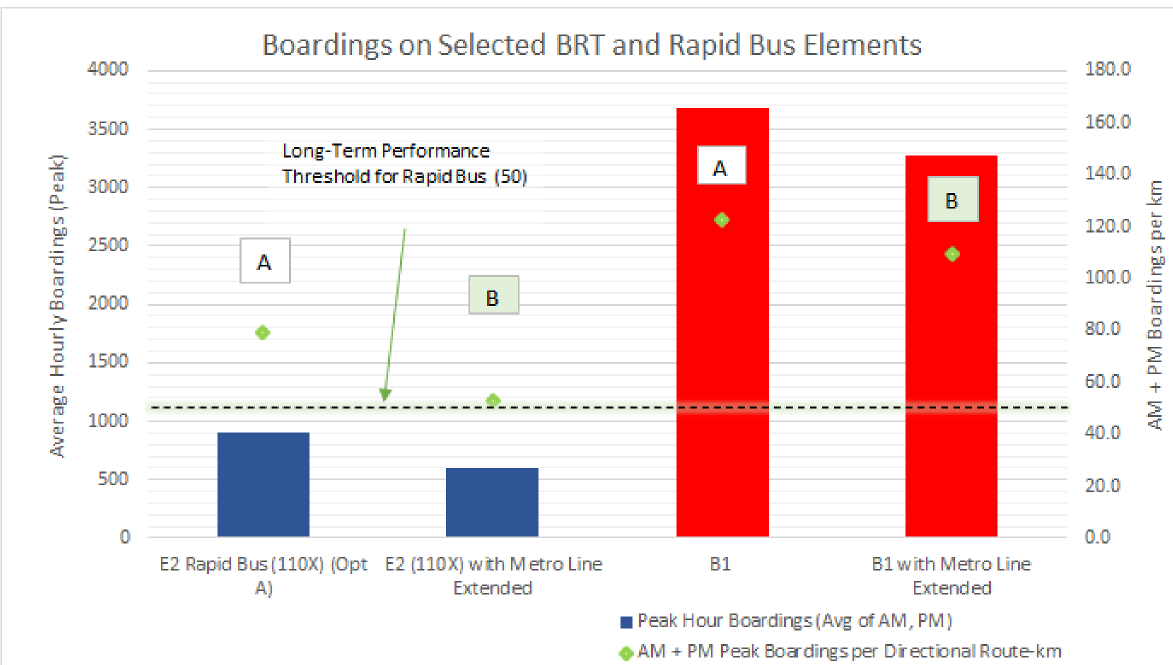
4.4.4. North of Centre City Node

As previously noted, Option B includes extension of the Metro Line to Castle Downs. This carries over 1700 passengers in the peak direction and produces 360 passengers per km. The Base Scenario and Option A exclude the Metro extension beyond Blatchford station.

Exhibit 4.12 shows the effects of the ML extension on the other key mass transit elements:

- The 110X limited stop bus drops 300 boardings, and the B1 drops nearly 400 boardings. Overall, the network gains approximately 1000 peak direction passengers from the ML extension. (This does not factor in the drop in riders on F5 also identified in Option B).
- The number of passengers per km on 110X and B1 decreases in Option B, but in either case, these are productive and attractive routes.

Exhibit 4.12: Peak Passengers to and from the North



Additional information on the demand profile for routes B1, E2 (110X) and F5 (ETS #9) is included in the Appendices. In Option A, routes 110X and 9 carry significant numbers of passengers as a complement to the B1 route, with a large number of passengers bound to and from the Eaux Claires Transit Centre.

4.4.5. Whyte Avenue

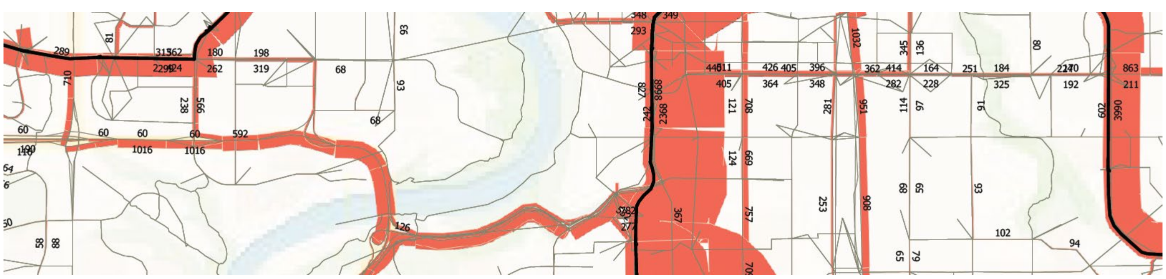
Shifting our attention to the east-west direction, one of the busiest travel corridor outside Centre City is the Whyte Avenue corridor. Options for this corridor have been reviewed in past studies and several different transit service options were considered in the scenario evaluation of this study. A semi-exclusive transit service complemented by frequent transit with closer stop spacing was identified as the best option for this corridor.

Exhibit 4.13 illustrates the differences between the base scenario and Option A, which includes B2. The interim version of B2 uses peak-direction, peak period bus lanes on Whyte Avenue as an initial step to improve travel time and reliability. With a future river crossing deferred for B2, the route would follow Fox Drive and Whitemud to connect to 87 Avenue.

- In the Base Scenario, during the AM Peak, peak loads are 760 WB and 250 EB passengers. This depends primarily on two frequent routes (F4 and F7), each operating at least every 10 minutes in the peak.
- In Option A, which includes B2, peak loads increase to 830 WB and 360 EB. There are increases in both directions and capacity for additional growth is added by the B2 service offering.
- Another benefit would be that the bus lanes in the peak direction could also benefit the F4 and F7, which was not explicitly assumed in the demand modelling.
- This corridor has a fairly high amount of passenger turnover, with passengers making short to medium length trips. This mix of activity is not as strongly reflected by the volume plot.

Based on a review of the passenger patterns, it would be recommended to assess the trade-offs between direct routing on B2, and detouring the route into University Station, and potentially South Campus.

Exhibit 4.13: Peak AM Passengers on Whyte Avenue, Base and Option A



Additional information on the demand profile for routes B2, F4 and F7 is included in the Appendices.

4.5. Additional Comparisons

GIS analysis was carried out for the major mass transit corridors being proposed to help evaluate which routes to prioritize. This information is a factor in the ridership results, but the conclusions one might draw are different, as the demand forecasts consider speed and network effects in addition to demographics.

4.5.1. LRT Station Catchments

Since Options A and B each consider LRT service expansion and test potential infill stations, the catchment of these potential new stations has been compared with some examples that would be present in the Base scenario. Several are already existing stations.

Exhibit 4.14 tabulates the results for 800-m radius catchment areas for stations, considering population and employment. The analysis takes an area-based average from the transportation zones around the stations and prorates how many residents and jobs might be within the radius. True results would vary since not all zones are uniformly developed.

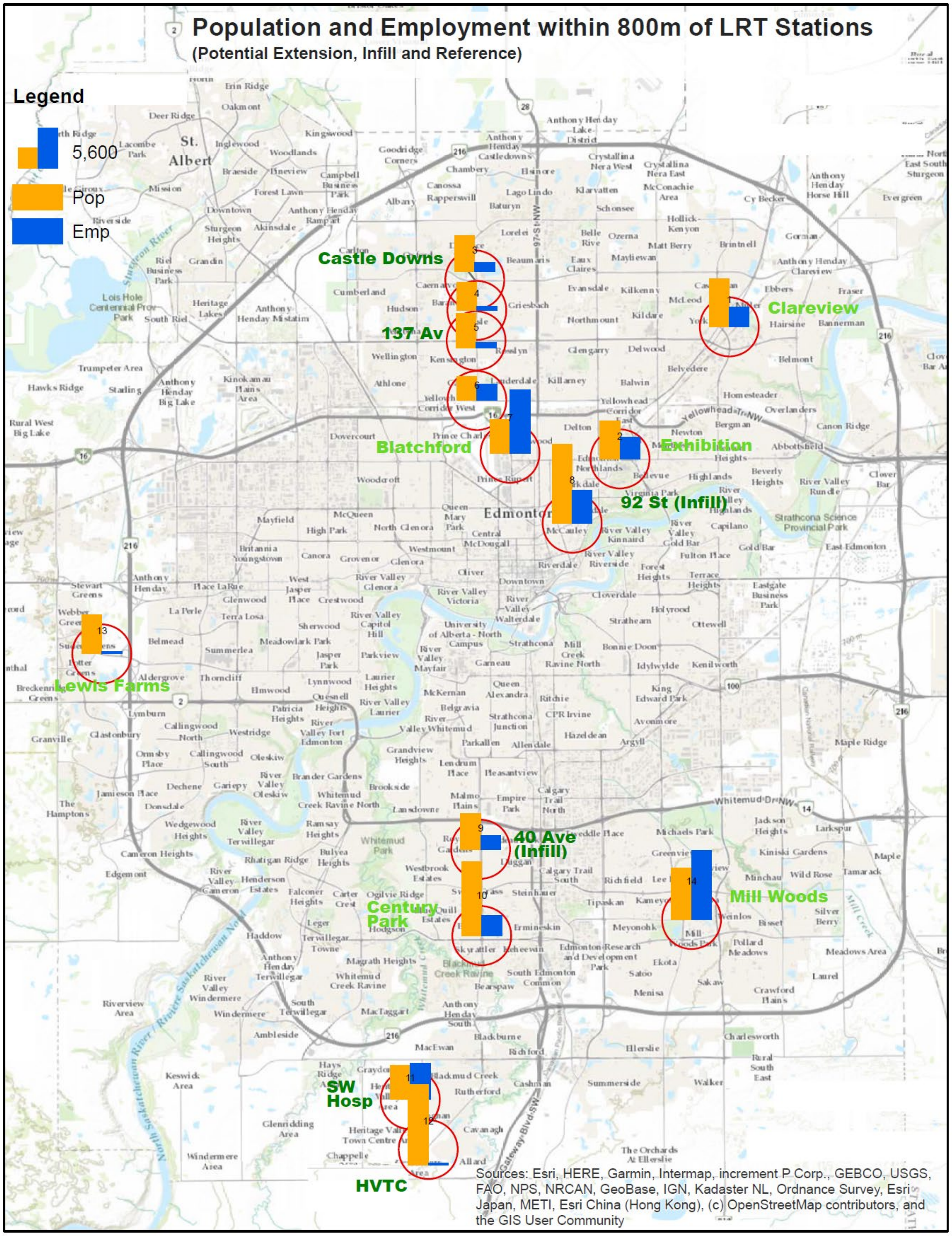
Nearly all the stations in this table have reasonable populations and most have nearby employment that would make them a potential destination for some transit passengers. Just based on these results, one might anticipate that the SW Hospital and Heritage Valley Town Centre stations will be strong performers in the future. It also suggests that the 92 Street station site might be worth pursuing provided that good connections and development plans around the station would support a business case to advance with that location.

Exhibit 4.14: Population and Employment within 800m of Selected LRT Stations

Station	Pop	Emp	Notes
Precedent Stations - included in Base			
Clareview	6,700	2,750	2021 end of CL
Exhibition	5,350	3,000	
Century Park	10,300	2,800	2021 end of CL
Mill Woods	7,150	9,650	2021 end of VL
Lewis Farms	5,500	300	future west end of VL
Blatchford	4,700	8,850	future north end of ML
Extension Stations			
Castle Downs	5,000	1,350	ML Ext. in Opt. B
145 Av	3,850	600	ML Ext. in Opt. B
137 Av	4,850	800	ML Ext. in Opt. B
132 Av	3,350	2,300	ML Ext. in Opt. B
SW Hospital	4,750	5,100	CL Ext. in Opt. A
HVTC	11,200	200	CL Ext. in Opt. A
Potential Infill Stations			
92 St	11,050	4,600	On CL in Opt. B
40 Av NW	5,000	1,900	On CL in Opt. B

Exhibit 4.15 is a map showing these stations, to provide some geographic context for the results.

Exhibit 4.15: Map - Population and Employment within 800m of Selected LRT Stations



4.5.2. Mass Transit Corridor Catchments

For the semi-exclusive and rapid bus routes, a 400-metre catchment around the path of each route was used as an approximation of the area served by each route. For several of the longer routes, segments were used in this analysis to differentiate between different parts of each corridor.

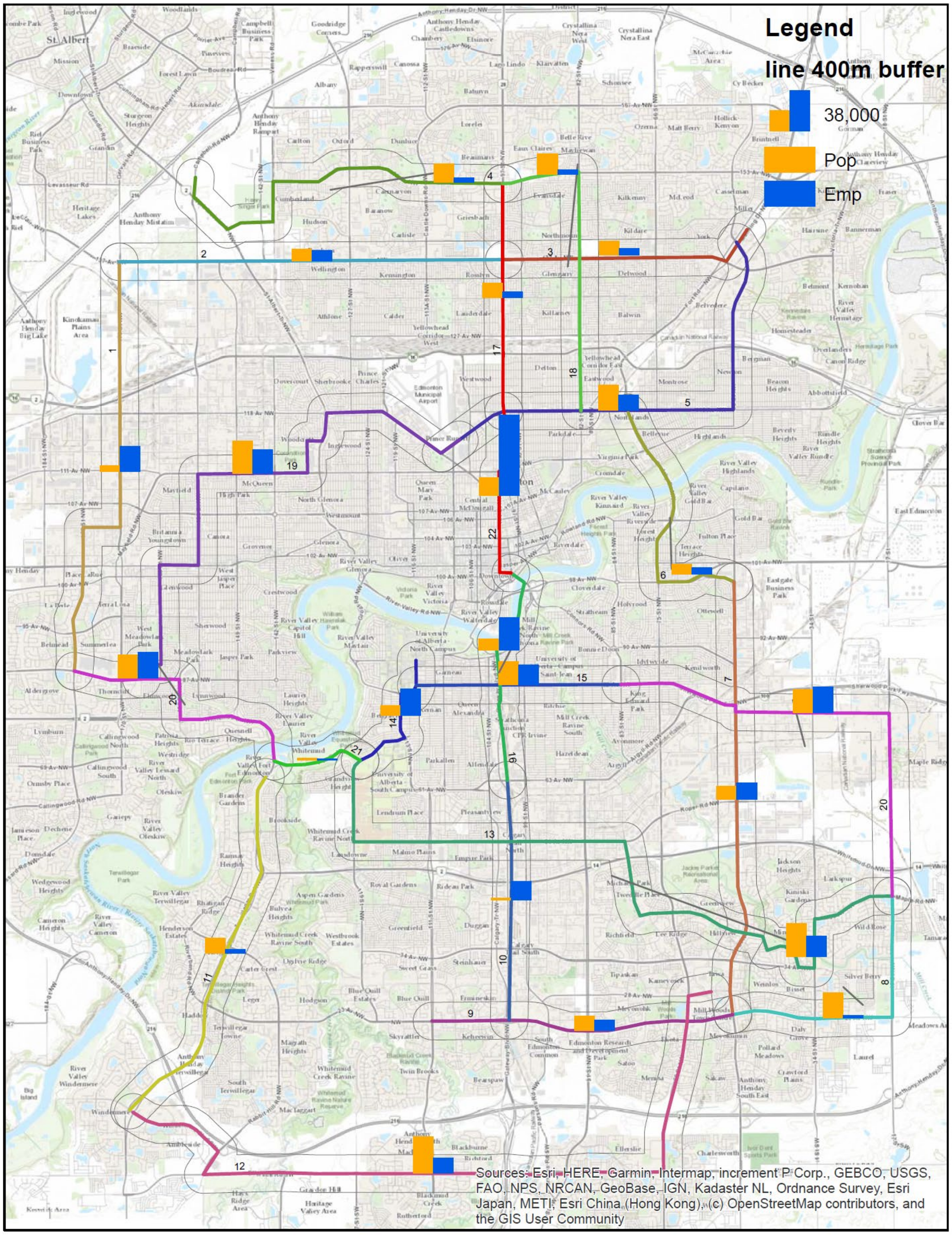
Exhibit 4.16 is a tabulation of the results for the 2030 modelling horizon. The corridor names are approximations and indicate which routes were being evaluated with each segment. Since these numbers are absolutes, they reflect land use patterns as well as the extent of each corridor. Exhibit 4.17 is a map showing the segments to aid in interpretation.

One surprising observation was that corridor 11 (Terwillegar) is not a standout from the perspective of land use, and its performance is related to its speed and the set of origins and destinations it connects.

Exhibit 4.16: Population and Employment within 400m of Mass Transit Corridors

	Estimated Statistics for 400 m Buffer around Transit Lines		
Map #	Location/Corridor	Population	Employment
1	WEM TO 153 (B4)	5,400	23,900
2	137 WEST OF 97 (B4)	10,900	9,900
3	137 EAST OF 97 (B4)	13,800	6,600
4	153 Av (B1a)	17,700	4,600
5	EAST of NAIT (R12)	24,100	14,700
6	WAYNE GRETKY (R7, B5C)	9,300	6,200
7	50 St N. of MILL WOODS (B5C)	12,900	16,000
8	EAST OF MILL WOODS (B5)	24,100	2,600
9	23 Av, W. of MILL WOODS (B5)	14,000	10,600
10	23 Av TO 63 Av (B1/B1A)	2,400	17,900
11	TERWILLEGAR (B6)	15,000	3,800
12	ELLERSLIE RD (R3)	35,300	14,700
13	FOX DRIVE to MEADOWS (R6)	32,200	20,100
14	UNIVERSITY-S.CAMPUS (B2/B6)	9,300	25,400
15	WHYTE, W. of BONNIE DOON (B2)	22,300	19,400
16	63 TO N. Sask. River (B1/B1A)	11,000	31,300
17	97 NORTH OF 118 (B1/B1A)	13,600	5,700
18	82 St (R7)	20,000	4,500
19	WEST OF NAIT (R12)	30,800	22,900
20	WEM TO FOX DRIVE (B2)	22,500	24,700
21	FOX DRIVE (B2/B6/R6)	1,700	1,000
22	101 STREET/DOWNTOWN (B1/B1A)	17,200	76,700

Exhibit 4.17: Map - Population and Employment within 400m of Mass Transit Corridors



5. Recommendations for Mass Transit Planning at 1.25 Million

This section provides an initial recommendation for mass transit priorities leading up to the 1.25 Million population horizon. It includes an overview of the network and a discussion of each of the major elements, including what areas they serve, the rationale for the route, and implementation considerations (where applicable).

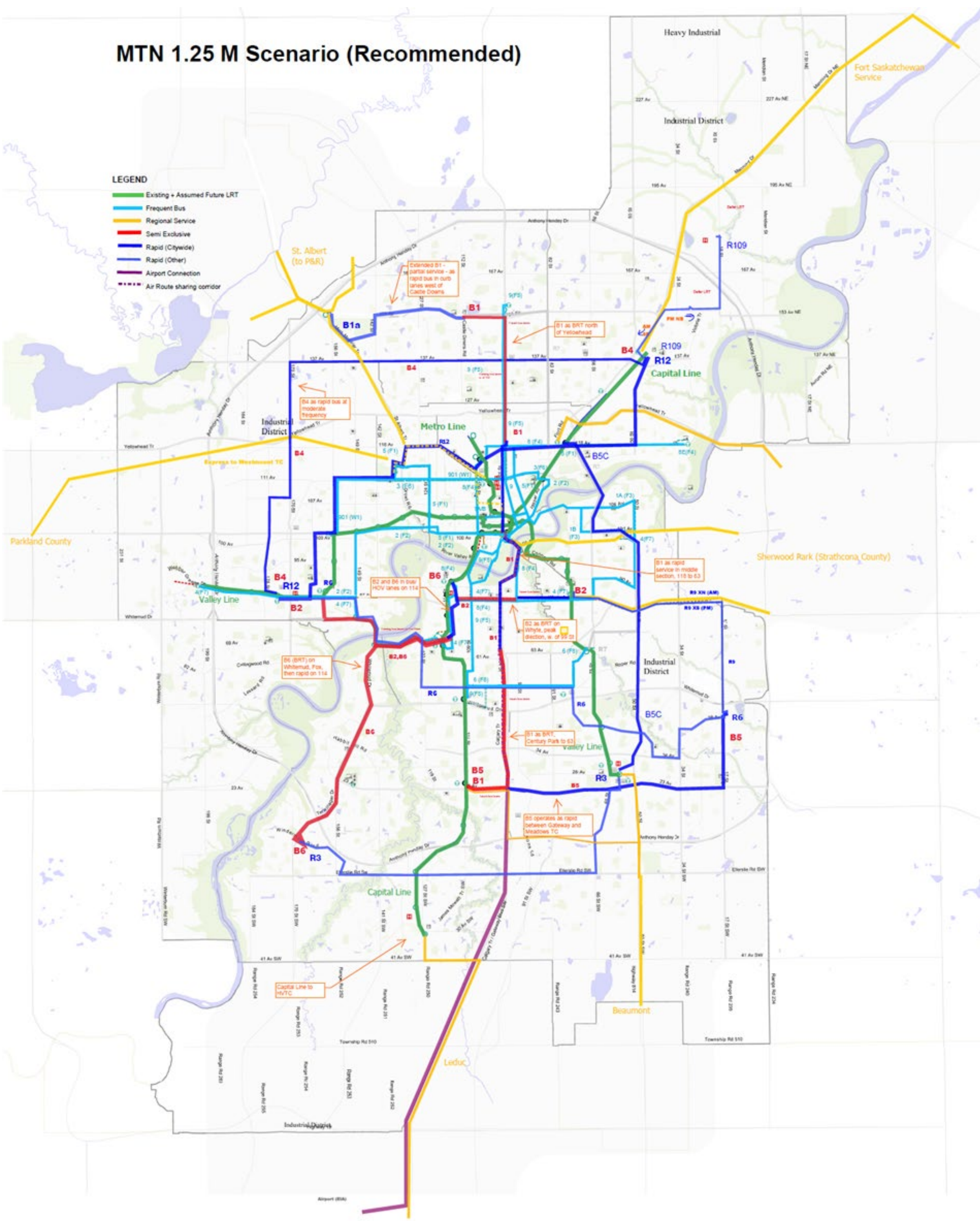
5.1. Most Promising Elements

Based on the performance indicators and success factors for mass transit, the following elements are included in the recommended interim network for the 1.25 Million population horizon:

- The Heritage Valley Major Node extension of Capital Line is more likely to occur, ahead of the Metro Line extension beyond Blatchford, due to the expected development to occur at this Major Node.
- Several infill LRT stations are possible as development opportunities arise. Business cases should be created to validate their potential as opportunities arise.
- B1 (part BRT/ part rapid bus) replaces and expands on existing routes, operating from Century Park to Campbell Road connecting Whyte Avenue, the Centre City Node with the north and south sections of the city and Castle Downs
- B2 (part BRT/ part rapid bus) will connect from West Edmonton Mall to Bonnie Doon through the University of Alberta and Whyte Avenue. The balance of service levels and stopping patterns on B2 and existing routes warrant further study.
- B4 and B5 will initially begin service as rapid bus - to build demand.
- Terwillegar Bus Lanes will be implemented and converted to the “BRT” B6 with a rapid bus extension to University station. This will help avoid a forced transfer and provides additional capacity parallel to the peak load point on the LRT network.
- RapidBus routes R3, R12, E2 (110X); and R6 are recommended to provide a consistent spacing across the city of limited-stop bus routes. The higher achievable speeds attract additional future passengers.
- R9 and R109 are recommended to provide peak rapid service and connections to LRT from outlying development.
- Initiation of the Airport Connection using Hwy QE2 and follow the B1 routing.

Details of the individual routes are discussed in the following pages. Exhibit 5.1 illustrates the resulting network. Maps of the same network subdivided by the Citywide and District components (based on their categorization in the Ultimate MTN) are included in Appendix A.

Exhibit 5.1: Mass Transit Recommendations – 1.25 Million Population Horizon



5.1.1. Light Rail Transit (Citywide)

Exhibit 5.2 focuses on the subset of routes within the interim network that are categorized as Citywide in the Ultimate Network.

Capital Line (LRT): Clareview – Heritage Valley Major Node

The Capital Line (CL) will ultimately connect North-South from Edmonton Energy & Technology Park to the Heritage Valley Major Node. Along that route, it will serve the following nodes: Horse Hill, Clareview, Exhibition, Stadium, Centre City, University/Garneau, Southgate, Century Park, Heritage Valley and several important corridors. The line is recommended to retain its current northeast terminus at Clareview until at least 1.25 million horizon, given that only modest development is envisioned to the northeast. A peak-period bus route (see RapidBus109) is proposed to serve the area in the meantime.

This line currently has the highest peak passenger volumes and is expected to grow, with peak volumes occurring south of Health Sciences. This section will be capacity constrained until post-1.25 million horizon, as operating more than 12 trains per direction is not feasible at the existing level crossings. The mass transit network will include pre-1.25 million alternatives, including the B1, B2 and B6 routes (described in the next section) and an Airport Connection which all demonstrate positive results in ridership uptake and relief for the Capital Line.

Metro Line (LRT): Blatchford – Health Sciences

The Metro Line (ML) will ultimately connect north-south from Campbell Road to South Campus through the following nodes and corridors: Castle Downs, 137 Avenue, Blatchford-NAIT-Kingsway, Centre City and University/Garneau utilizing an exclusive ROW (as defined in this study).

For the 1.25 Million horizon, the current phase under construction will replace the temporary NAIT station and extend the line to Blatchford. A second phase of construction, likely to occur post-1.25 million, would follow a new bridge over the Yellowhead Trail and CN rail yards, and add four new stations, ending at Castle Downs station until a third phase to Campbell Road is constructed.

To the south the proposed longer-term service will be South Campus station, to provide capacity relief for the Capital Line. However, due to significant challenges in grade separating at University Avenue/114 St, the interim terminus for the Metro Line will be at Health Sciences station. It is anticipated that the implementation of other capacity relief measures (such as route B6) could provide future flexibility (post-1.25 million) to address this location.

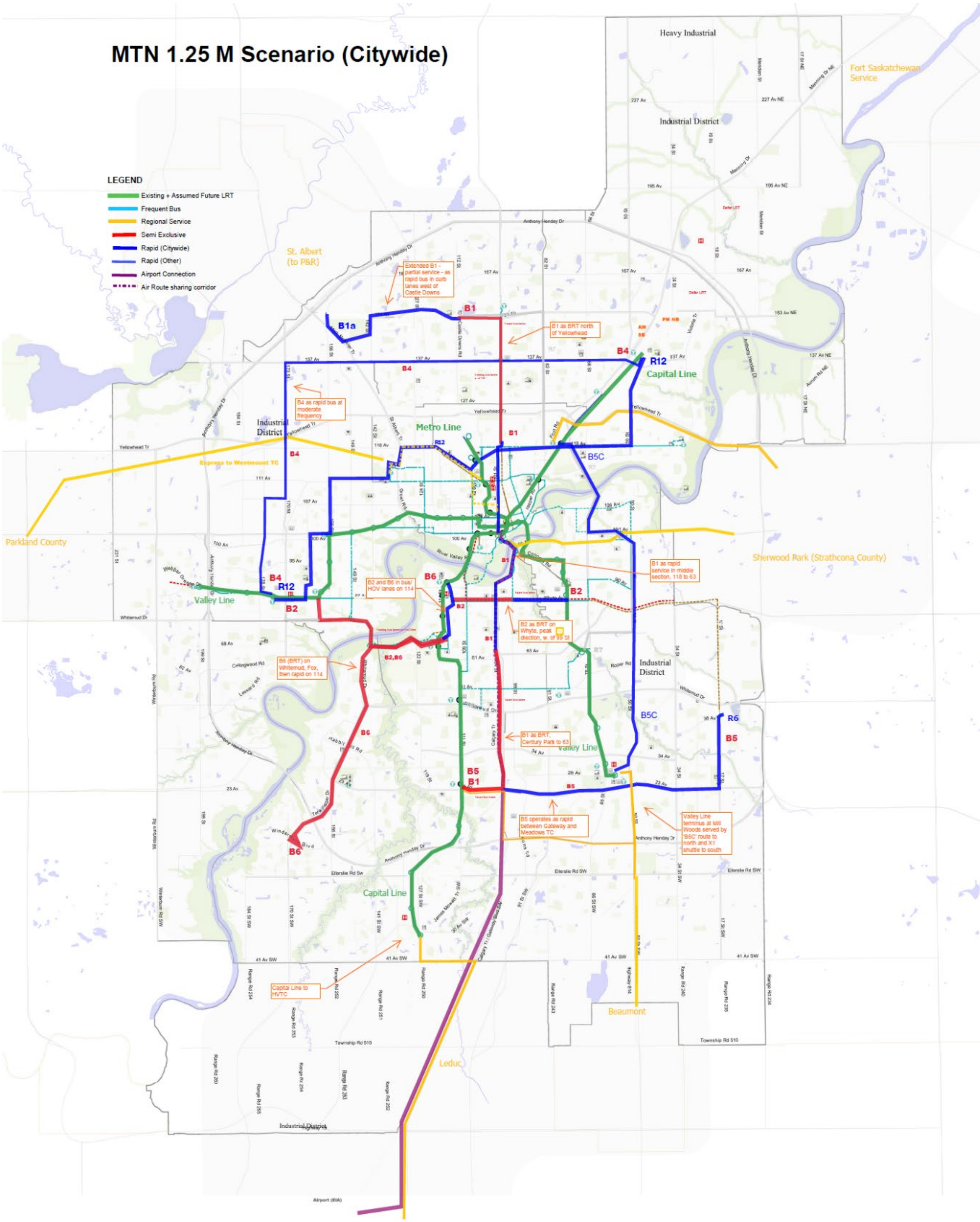
Valley Line (LRT): Lewis Farms – Mill Woods Node

The Valley Line (VL) will connect West to Southeast from Lewis Farms to Ellerslie Road (Charlesworth District Node). Along the way, it will serve the following nodes and corridors: Charlesworth, Mill Woods, Bonnie Doon, Centre City, Stony Plain Road, Meadowlark, West Edmonton Mall/Misericordia.

This LRT line will be using low-floor technology and will be more integrated into the urban fabric of the areas it serves, in particular the street-level segments on 102 and 104 Avenue in the Centre City. An initial segment from 102 Avenue to Mill Woods will enter service later in 2021, and construction of the west segment to Lewis Farms is now in the procurement stage.

Any extension beyond Mill Woods is expected to occur post-1.25 million. At or near the future site of Ellerslie SE/Charlesworth Station, a park and ride facility is planned, with an express shuttle connecting it to Mill Woods.

Exhibit 5.2: Citywide Mass Transit at 1.25 Million Population Horizon



5.1.2. Semi-Exclusive Services (Citywide)

Each of the non-LRT services introduces bus services on various forms of right of way with different levels of priority. In most cases, these routes provide an alternative form of transit service on routes that would already have service by extending the principles of the Transit Strategy and the Bus Network Redesign. However, the new mass transit routes offer speeds, directness, and coverage different from the other forms of bus service, which would make more frequent stops.

When the mass transit routes are implemented, ETS will find there are advantages to re-balancing the levels of service between the different routes to optimize how passenger needs are met. Based on other Canadian cities where the two forms of bus transit run in parallel, the semi-exclusive and rapid services typically capture 60-80% of the passenger demand and the other services can thereby operate at reduced frequencies, depending on the type of corridor.

B1 Route (BRT): Campbell Road – Castle Downs District Node – Century Park District Node

B1 is a proposed semi-exclusive transit route that will operate north-south from the Castle Downs district node to the Century Park district node in its ultimate configuration. This route will serve the following nodes and corridors: Northgate/Northtown, 97 Street, Centre City, Whyte Avenue, Gateway/Calgary Trail. The route would primarily utilize 97 St, 101 Street and Gateway Boulevard/Calgary Trail.

The B1 service would stop every 1 to 1.5 km along its route and provide connections to numerous other elements of the mass transit network as well as the underlying network of other bus transit services. This adds significant north-south high-capacity frequent service to denser parts of the urban area. In the section north of 118 Avenue, B1 would operate in parallel with another rapid service, E2 (ETS #110X), which would provide additional capacity on this busy section of the transit network. E2 was assumed to connect to Eaux Claires Transit Centre while B1 stopped nearby at 153 Avenue and 97 Street. These assumptions should be revisited to determine the optimal stopping pattern for the services in the 97 Street corridor.

In its early stages of implementation, a 'B1A' extended service would continue onwards as a rapid bus using the mixed traffic lanes of 153 Avenue, making limited stops until a terminus at Campbell Road. This will provide service in northwest Edmonton and connect to numerous regional routes at the St. Albert transit facility. By the 1.5 Million horizon, once the Metro Line is extended west past Castle Downs, route B1 would be shortened and Castle Downs would become its north terminus.

In its interim state, this route will make use of dedicated bus lanes covering the maximum extent feasible. For 1.25 million, it is proposed that the bus lanes extend:

- North-south on 97 Street during peak periods in the peak direction (as a minimum);
- North-south on Calgary Trail and Gateway Boulevard, once implementation has been worked out for stop locations and operations at connecting streets and major commercial driveways;
- East-west on 153 Avenue to connect to Castle Downs hub, during peaks, and similarly east-west on 23 Avenue to connect to Century Park.

In addition to these areas where bus lanes are proposed, transit priority measures may also be considered where warranted to mitigate speed and reliability issues, in particular for limited-stop buses to avoid long queues and delays at signals with lengthy peak-period cycle lengths. This guidance would apply to all other routes in the semi-exclusive family in addition to transit hot-spots identified through travel time performance monitoring by ETS.

This route proposes a dedicated river crossing in the long term (by 2065); however, for the 1.25 Million horizon it is assumed that route B1 would repurpose some of the capacity on existing bridges to carry the route between the downtown hub and the Whyte Avenue district. Near-term options include the Low Level and Walterdale Bridges and connecting streets. The details of this section of the route will require more detailed analysis and will also reflect other projects in the vicinity, such as River Crossing.

B2 Route (BRT): WEM/Misericordia Major Node – Bonnie Doon District Node

B2 is a proposed route crossing east-west from WEM/Misericordia Major Node to Bonnie Doon District node. B2 will serve the following nodes and corridors: Meadowlark, University/Garneau, Whyte Ave/99 Street and Gateway/Calgary Trail.

The interim route for B2 defers consideration of a new river crossing to post-1.25 million2030, and instead follows a less direct route via Whitemud Drive and Fox Drive. Long-term demand will warrant future exploration of the river crossing connection, not only determining potential financial costs but also social and environmental costs associated with this option.

B2 will operate semi-exclusively using peak-period, peak direction bus and HOV lanes on Whitemud Drive, Fox Drive, and Whyte Avenue west of 99 Street.

B5 Route (BRT): Century Park – Meadows North District Node

B5 is a proposed route making limited stops, operating in a primarily east-west orientation across the southern part of Edmonton. Longer-term, it is proposed that the route would operate from WEM/Misericordia and Meadowlark and then south and east to the Meadows North node. The interim version of the route includes only the eastern portion, where passenger demand is projected to emerge sooner. The proposed interim route, using 23 Avenue NW, will serve Century Park, South Common - Research Park, Mill woods, and Meadows South. The western portions of the ultimate B5 service will initially be addressed by similar crosstown bus routes.

This route will initially operate as a mix of semi-exclusive (west of Calgary Trail) and rapid bus, and transition over time towards more semi-exclusive alignment as demand increases.

B6 Route (BRT): University/Garneau Major Node – Windermere Hub

B6 is a proposed route servicing south-west Edmonton, using dedicated lanes on the Terwillegar Expressway to serve stations at major cross streets. The map shows an assumed route via Fox Drive and an extension of service via 114 Street to University LRT station. This extension is assumed to operate in mixed traffic given the physical constraints present on these streets. Spot improvements to signal timing along 114 or 112 Streets may be able to provide some transit priority; however, the details would also depend on adjacent LRT operations and how that interfaces with the traffic signals.

As indicated in public presentations for the Terwillegar Project, the initial “southwest BRT” was assumed to follow Fox Drive and Whitemud westbound/south, while coming north it would use 122 Street. This is nearly identical to B6, except for the section between the University and South Campus stations.

A direct connection to University station was found to increase the attractiveness of this route, by avoiding a forced transfer at South Campus station, in a section of the Capital Line where peak direction capacity is more limited.

5.1.3. Airport Connector

Airport Connector: Centre City (Downtown) – Edmonton International Airport

This proposed Citywide route would provide regional and intercity travel to the Airport, connecting with other services including the Metro Line, Capital Line, Valley Line and other City-wide routes (B1, B2, R8, B5, and R3).

The interim proposal for this route is to provide coverage by extending bus services using the B1 corridor between approximately 104 Ave (downtown) and 23 Ave NW. Because this route extends well beyond the city to EIA, there may arise challenges with operational reliability. In addition, operating bus service with stops along the Queen Elizabeth Highway may also require a provincial partnership.

5.1.4. Rapid Bus

Citywide Elements

B4 Route (BRT): Clareview Major Node – WEM/Misericordia Major Node

B4 is a proposed route operating crosstown from WEM/Misericordia Major Node to Clareview Major Node, connecting the following nodes and corridors: Londonderry, Northgate/Northtown, 137 Avenue. It will travel through northern and western Edmonton, primarily on 137 Avenue (east-west) and a combination of 170 and 178 Street (north-south). Initially, this route will operate in mixed traffic with strategically located transit priority features. Over time, it is expected to transition towards using semi-exclusive lanes in more congested portions.

RapidBus12 (R12): WEM/Misericordia Node– Clareview Major Node

R12 is a proposed rapid transit route operating east-west with limited stops between Meadowlark district node and Clareview major node. The route travels primarily along 118 Avenue, with a north-south section on 163 Street. This route has strong ties to land use, with ten nodes and corridors along its proposed route including the following: 124 Street, Blatchford-NAIT-Kingsway, 97 Street, 118 Street, and Exhibition.

In addition to the corridors being served and the support it will provide for intensification along 118 Avenue, and Kingsway near Blatchford, this route has an important role providing connections to other mass transit routes at transit centres and LRT stations. This includes two locations along the Valley Line, once on the Metro Line, and twice on the Capital Line. In addition, it also provides service to Westmount Transit Centre.

B5C (50 Street-Exhibition): Mill Woods Node – Exhibition District Node

Over the long term, this route is identified as a regional connection due to the southern portion operating in the City of Beaumont. Trips from Beaumont are partially oriented towards the southern end of the Valley Line, but many also continue north along 50 Street. The primary markets served by this route are crosstown travel to and from the Exhibition district node and trips to and from employment areas along 50 Street and in Capilano. The interim B5C route will focus on providing rapid crosstown service between Mill Woods and Exhibition (Coliseum LRT station). Service south of Mill Woods on 50 Street is planned to be provided by a limited-stop shuttle (in lieu of route B5C) to a future park and ride facility at Ellerslie Rd SE.

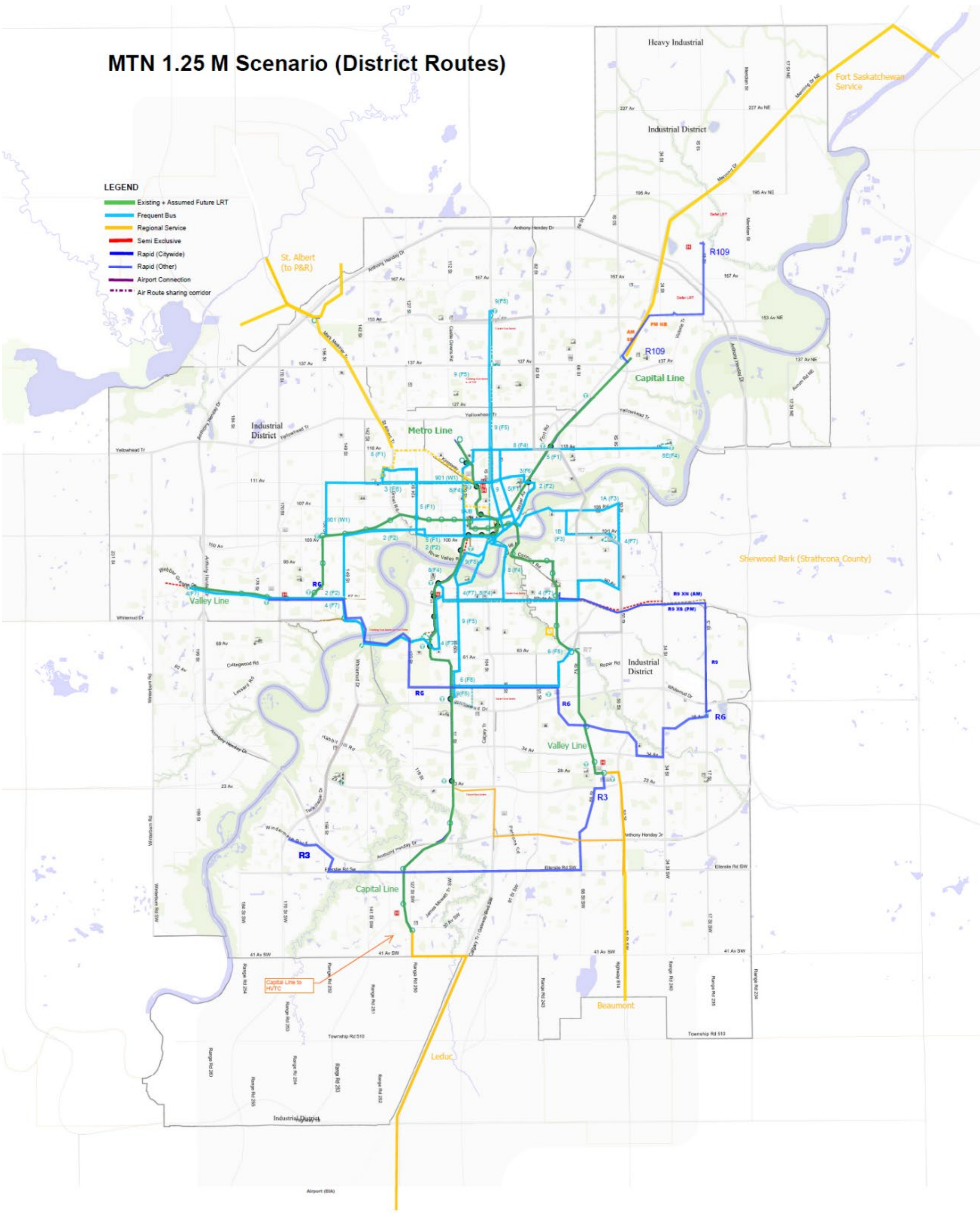
District Elements

Exhibit 5.3 is a map of the recommended interim network, focusing on the district routes. (The LRT lines are included for geographic reference since many of theses routes terminate at transit centres adjacent to stations.)

RapidBus3 (R3): Windermere District Node – Mill Woods Node

R3 is a proposed rapid route operating west-east between Windermere and Mill Woods, which will extend in the future to the Meadows district nodes. It will connect several development nodes as well as the Ellerslie Road corridor in the southern part of the city. Further into the future, there could also be potential for this route to be extended via mixed traffic to the Riverview area west of the river, depending on how travel patterns evolve.

Exhibit 5.3: Mass Transit at 1.25 Million Population Horizon – District Routes



RapidBus6 (R6): WEM/Misericordia Node –Meadows North District Node

The R6 is a proposed rapid route going east-west between WEM/Misericordia Node and Meadows North District Node primarily along Whitemud Drive, 51 Avenue, and 38 Avenue. Design for this service will consider its potential relationship with crosstown service on Whitemud Drive and with local services in the eastern part of Mill Woods.

RapidBus9 (R9): Bonnie Doon District Node – Meadows North District Node

R9 is a proposed east-west rapid route between Bonnie Doon district node and Meadows North district node primarily along 82 Avenue, 76 Avenue, and 17 Street. It would provide key linkages to the B2, Valley Line, B5C, R3, and B5 routes.

This route initially serves commute trips in two directions during peak periods. There is also a parallel peak express route (500X) that skips the 76 Avenue corridor; there are opportunities for these two services to be scheduled to provide alternating service along the two routes, since they both pass through Bonnie Doon station and the transit centre in Meadows.

Rapid Bus 109 (R109): Edmonton Energy Park Area – Clareview Major Node

Route R109 is a proposed rapid bus connection into the northeast residential and employment districts, with termini proposed at the Clareview major node and serving Alberta Hospital. The northern terminus may be a temporary on-street layover or could continue towards Edmonton Energy Park. Much of this route's initial projected demand relates to a transitional park and ride opportunity at the future Gorman station site. This route is intended to operate – in peak periods at a minimum – until the Capital Line is extended northeast, well after the 1.25 million horizon.

5.1.5. Frequent Routes (District Services)

The names of the urban frequent are indication of where they are located within the city. Routes passing through the centre of the city have the 'F' designation carried over from the upcoming BNR, while N, SE, SW, and W routes extend into city quadrants. The near-term numbering of these routes (the ETS designation appearing on buses) is also identified.

- **F1 Route: Westmount District Node – Exhibition District Node (ETS #5)**. The proposed F1 east-west route connects the Westmount and Exhibition district nodes travelling mainly along 124 Street, Jasper Avenue, 97 Street, and 118 Avenue.
- **F2 Route: Stadium LRT-WEM/Misericordia Major Node (ETS #2).** F2 is a proposed route operating crosstown from Stadium LRT to WEM/Misericordia Major Node to, connecting the following traveling along Jasper Avenue, 102 Avenue, 142 Street and 87 Street.
- **F3 Route: Centre City – Capilano District Node (ETS #1A/1B)**. The F3 east-west route connects Centre City to Capilano district node travelling mainly along Jasper and 98 Avenue.
- **F4 Route: University Major Node – 118 Avenue Primary Corridor (ETS #8)**. The proposed F4 is an S-shaped route to connect University Station and the east limit of 118 Avenue primary corridor travelling mainly along 82 Avenue, 99 Street, Jasper Avenue, 109 Street, and 118 Avenue and it expected to serve nodes and corridors well.
- **F5 Route: Eaux Claires – Southgate District Node (ETS #9)**. BNR line F5 is a north-south route travelling mainly along 97 Street, 101 Street, 105 Street/109 Street. It will provide linkages to the Capital Line, B2, Metro, Valley, B1, R8, and R12.
- **F6 Route: Westmount – Stadium LRT (ETS #3)**. This line will operate on 111 Avenue, providing frequent local service immediately north of the downtown core.
- **F7 Route: Lewis Farms – Capilano District Node (ETS #4)**. The proposed F7 east-west transit service between Lewis Farms and Capilano travels mainly along 87 Street,

Whitemud, Fox Drive, 114 Street, and 82 Avenue. Despite competing with other mass transit network services (such as B2) along much of its length, this route is attractive to passengers. It serves several higher-density areas, and since its stop spacing is closer than B2, it provides a complementary service.

- **F8 Route: Southgate District Node – Davies LRT (ETS #6)**. This line will operate on 51 Avenue, providing a connection between Capital Line LRT, B1 and Valley Line LRT, as well as service along a secondary corridor.
- **W1 Route: Stony Plain Road Primary Corridor – Centre City (ETS #901).** The W1 proposed east-west line connects Jasper Place within the Stony Plain Road primary corridor and Centre City travelling mainly along 107 Avenue. It would provide linkages to the Valley Line, R12, Metro Line and B1.

5.1.6. Other ETS Services

The Bus Network Redesign (BNR) carried out as part of the Transit Strategy (2017) includes restructuring of the network to address customer service objectives, and to reshape the system around the introduction of Valley Line SE LRT later in 2021.

The same principles were carried forward by ETS and planning staff to define the underlying transit services for the 1.25 Million population horizon, and this set of routes is included in the transit plan. Where there is some duplication of service, or a mix of local and rapid services in the same corridors, future headways would be adjusted to optimize how demand is served and the transit fleet deployed.

5.1.7. Regional Service Assumptions

Regional services are subject to decisions made by the regions and municipalities in the Edmonton Metropolitan Region. For the analyses in this report, the set of services currently provided to and from surrounding cities is included in the demand model, including refinements to include proposals from the RTSC business case. Some of the regional proposals included significant portions of routes within Edmonton, and these are represented either as regional routes in the current analysis, or by proposed semi-exclusive and rapid routes that had already been identified during The City Plan Mass Transit Study.

Significant connections include:

- St. Albert routes connecting into Edmonton. Local routes were assumed to terminate at Campbell Road, and express routes at West Edmonton Mall, University of Alberta, NAIT, and downtown;
- Service between Fort Saskatchewan and the Capital Line NE;
- Services between Strathcona County and Edmonton, including continuation of existing express routes to University of Alberta, downtown and NAIT, and potential future connections to the Capital Line outside of downtown to the northeast;
- Beaumont and Leduc tot Valley Line and Capital Line LRT stations;
- Services from Parkland County, Spruce Grove and Stony Plain, with express services being considered to Metro Line or to Westmount TC, and shorter distance services from locations such as Big Lake and Acheson connecting to Valley Line stations.

The exact routing and the operations of these routes in the future are outside the scope of this current study.

5.2. Summary of Routes

Exhibit 5.4 presents a rolled-up summary of the mass transit routes in the LRT, semi-exclusive, rapid bus and airport connector categories. The table includes information on the round-trip distance, the one-way length of the route, and how much of each falls into different categories of Right of Way. These distances are based on the interim stages of each route as presented in the map (Exhibit 5.1). Refer also to Appendix A for additional maps of this interim network.

Exhibit 5.4: Characteristics of Mass Transit Elements – 1.25 Million Population Horizon

Line Name	Principal Alignment(s)	Endpoints	*Directional Route-km*	*One-way distance*	LRT (km)	Semi-Exclusive Bus (km)	Mixed Bus (km)
Citywide Transit Routes (at Interim 1.25 Million Horizon)							
Metro Line		Blatchford – Health Sciences	16.9	8.5	8.47		
Capital Line		Clareview – Heritage Valley District Node	54.1	27.1	27.1		
Valley Line		Lewis Farms - Mill Woods Node	54.4	27.2	27.2		
B1	153 Av, 97 St, Calgary Tr, Gateway	Campbell Rd - Castle Downs Node - Century Park Node	60.0	30.0		16.0	14.0
B2	Whyte Av, 87 Av	WEM/Misericordia Node – Bonnie Doon Node	29.1	14.6		4.3	10.3
B4	137 Av, 170 St	Clareview Node - WEM/Misericordia Node	48.3	24.2			24.2
B5	23 Av. 17 St	Century Park – Meadows North Node	27.0	13.5		1.8	11.7
B6	Terwillegar Expressway	University/Garneau Node – Windermere Hub	29.3	14.7		10.3	4.4
Airport Connector	Hwy QE2, Calgary Tr, Gateway	Centre City – Edmonton International Airport	63.0	31.5		5.1	26.4
RapidBus12 (R12)	118 Av, Kingsway, 111 Av, 163 St	WEM/Misericordia Node – Clareview Node	48.3	24.1			24.1
B5C (50 Street-Exhibition)	50 St (north of 23 Av)	Mill Woods Node – Exhibition Node	30.0	15.0			15.0
District Transit Routes (at Interim 1.25 Million Horizon)							
RapidBus3 (R3)	Ellerslie Rd	Windermere Node – Mill Woods Node	34.3	17.1			17.1
RapidBus6 (R6)	51 Av	WEM/Misericordia Node –Meadows North Node	53.6	26.8			26.8
RapidBus9 (R9)	76 Av	Bonnie Doon District Node – Meadows North Node	20.1	10.1			10.1
RapidBus109 (R109)	153 Av, 18 St	Edmonton Energy Park Area – Clareview Node	15.9	8.0			8.0
Approximate Network Extents		***Overlaps between routes***			***4.0***	***9.0***	***5.0***
for Exclusive, Semi-Excl., and Rapid		***Net distance for network elements (km)***			***59***	***29***	***189***

Exhibit 5.4, continued

Line Name	Principal Alignment(s)	Endpoints	*Directional Route-km*	*One-way distance*	LRT (km)	Semi-Exclusive Bus (km)	Mixed Bus (km)
Frequent Routes (part of District Network)							
5 (F1)	124 St, Jasper Av, 97 St, 118 Av NW	Westmount Node-Coliseum	25.6	12.8			12.8
2(F2)	Jasper Av, 102 Av, 142 St, 87 Av	Stadium - WEM/Misericordia	29	14.5			14.5
1A/1B (F3)	504 Av, 106Av, 76 St, 101 Av, 50 St	Capilano-Downtown	16.5	8.3			8.3
8 (F4)	112 St, 82 Av, 99 St/ Scona, Jasper, 109 St	University Stn - Abbottsfield	39.5	19.7			19.7
9 (F5)	97 St, 101 St, Bellamy Hill, 105 St/109 St	Eaux Claires - Southgate	31.5	15.8			15.8
3 (F6)	111 St	Westmount-Stadium	12.7	6.4			6.4
4 (F7)	87 St, Whitemud, Fox Dr, 114 St, 82 Av	Lewis Farms - Capilano	53.3	26.7			26.7
6 (F8)	51 Av	Southgate - Davies	14	7			7
901 (W1)	107 Av	Jasper Place - Downtown/ 101 Street	18.3	9.2			9.2
		Total Frequent routes, km (includes some overlaps)					**120**

5.3. Order of Magnitude Costs

The capital costs for the recommended network have been estimated to determine the incremental costs beyond the future base, which already includes existing and planned services for the City of Edmonton.

The costs in Exhibit 5.5 are based on typical unit rates for transit construction and on the incremental quantities of infrastructure and transit vehicles implied by the recommended interim network. Major items are as follows:

- Expansion of the Capital Line LRT south to Heritage Valley Major Node. The estimate shown was previously provided by city staff, and is based on an extension by two stations;
- Bus lane modifications and BRT stop/station installations along the portions of routes B1, B2 and B5 proposed to advance towards semi-exclusive operations;
- Articulated vehicles for the semi-exclusive/BRT routes, including the portions initially operating in mixed traffic;
- An allowance for rapid bus stops to be installed along all planned 'R' routes, including the portions of the B1, B2 and B5 that will operate in mixed traffic. This allowance is to provide for expansion of bus stops or installation of new stops, to allow the limited stop routes their own space adjacent to any local services.
- Additional transit buses to operate the net increase in bus service associated with the rapid bus routes (based on Section 3.2). The rapid routes fully or partially replace some future base service, so this increase assumes reallocation of buses;
- The increased bus fleets for the addition of BRT and rapid services will be factored into planning for bus garages by ETS. This cost would be in addition to what is shown in the exhibit.

Exhibit 5.5: Order of Magnitude Capital Costs (Increment over Future Base)

Proposed Element	**Cost - Conceptual**
LRT Extension of Capital Line, including vehicles[1]	$ 325,000,000
BRT vehicles, stations, and initial lane conversions[2]	$ 220,000,000
Rapid Bus stops and additional buses[2]	$ 50,000,000
Incremental Cost over Future Base	**$ 595,000,000**

Note 1: LRT costs for Capital Line South from Report: CR_8337, Att. 3.

Note 2: BRT and rapid bus costs are conceptual, subject to a -50%/+100% cost range due to potential for changes as the project is developed.

These costs do not include the entire interim network for 1.25 Million, which is largely comprised of existing and planned services. Some have committed funding and others are related to planned growth of the city.

Future Base Items Excluded from Mass Transit Incremental Cost

Major items in the future base, and therefore not counted in the mass transit costs, include:

- LRT services that either exist, have construction underway, or have committed funding. These include:
  - Existing Capital Line from Clareview to Century Park;
  - Extension of Capital Line to Ellerslie Road SW;

  - Valley Line, eastern and western segments, from Mill Woods to Lewis Farms;
  - the existing Metro Line to NAIT;
  - Metro Line extension now under construction to Blatchford Gate.
  - LRVs to operate these services at a 5-minute peak headway, plus spare vehicles. This would include new vehicles and replacements for aging vehicles.
- The southwest BRT service on Terwillegar Expressway to South Campus, including dedicated lanes and buses to operate the route;
- Planned future bus services, including:
  - 2021 implementation of the Bus Network Redesign, including frequent routes, rapid routes, peak rapid/express, crosstown, local and community shuttles.
  - Expansion of bus service into growth areas between 2021 and the 1.25 Million population horizon. This would represent approximately 25% more buses in service than today, and installation of new bus stops.
  - Ongoing bus fleet renewal, replacement, and technological innovation.
  - As noted above, expansion of the bus fleet is accommodated by new bus garage facilities, and these are outside the costs shown above.
- Changes related to regional services in the future.

5.4. Success Factors

As a foundation to the definition of future transit network options for this study, a review of several peer agencies and background industry technical reports was conducted, with the results documented in the *Mass Transit Backgrounder*. The key lessons from this review were applied during the entire study, and many of the key elements of a successful mass transit network were demonstrated in the Ultimate Mass Transit Network defined for the 2 Million population horizon, as documented in Section 2.1.

Given that the **1.25 Million horizon** is an **interim state**, some of the measures of success are less complete for the partially implemented Mass Transit Network. However, since the developed portion of Edmonton will have a smaller footprint, a smaller network will still meet many of the requirements.

The following factors are common to other transit networks (or strong-performing portions of networks) across North America:

- Supportive urban form and densities (measured as number of people and jobs located near rapid transit stations);
- Length of exclusive right-of-way transit available, and the strongly related travel time competitiveness with the car; and
- Frequent Transit Network (FTN) coverage.

Exhibit 5.6 recaps the summary of key measures of success and major lessons learned identified through the peer review. Most of these measures relate directly to the mass transit and the land use around mass transit station locations. Measures such as these were applied to define network elements for the evaluation scenarios in the previous stage of the study, and the implementation options evaluated in this current report.

As identified in the following pages, the interim mass transit network begins to address all the factors that were previously defined as key descriptors of a successful mass transit network. The success factors were an input to the definition of the interim network scenarios, and the factors were also a key consideration in selecting the elements carried forward from that evaluation.

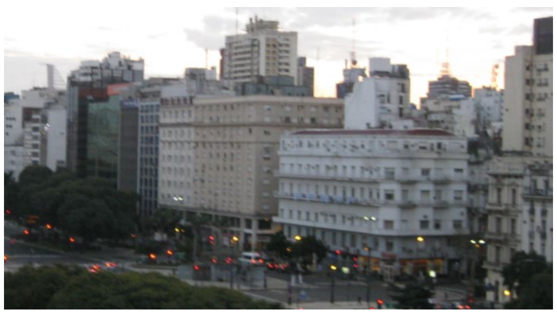
Exhibit 5.6: Key Measures of Success for Mass Transit

Number of residents and jobs located near mass transit stations

This promotes the network serving more passengers, and supporting land use objectives in The City Plan

Most City-wide and District routes, including the LRT, connect to major nodes and primary corridors in The City Plan land use concept.

The focus of the interim network is on adding service to nodes and corridors where investment is planned to stimulate development, and in growth areas around and within the current built-up footprint of the City.



Images are examples illustrating the concepts.

Length of exclusive and semi-exclusive right-of-way transit available

Reflects speed and reliability for transit dependent and choice riders; *also supports travel time*

The proposed mass transit network includes planned extensions of the Valley Line to Lewis Farms and proposed LRT extensions to Heritage Valley Major Node. It also includes and semi-exclusive transit routes B1, B2, B5 (east portion) and B6. These will increase the length of exclusive and semi exclusive ROW of Edmonton's mass transit network from 24 km now (37 km when Valley Line Southeast opens) to over 90 km for the interim network.

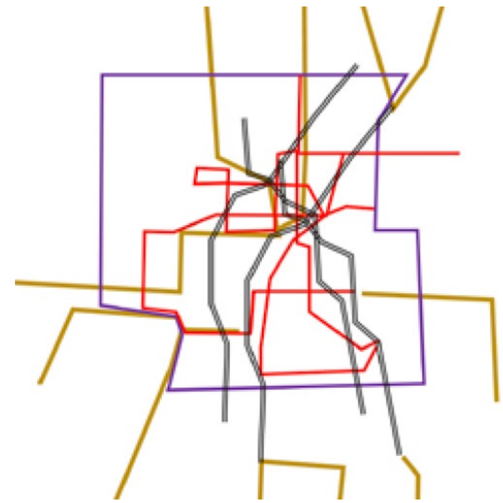
Frequent Transit Network (FTN) coverage

Connectivity beyond basic rapid transit, integration of services

All parts of the city will have at least one transit route with frequent service within 1km, due to the grid structure of the mass transit network

Core areas of the city will be served by a variety of exclusive, semi-exclusive, rapid and frequent routes offering more localized service.

Outer parts of the City, including growth areas to the southwest, southeast and west, will gain new rapid bus routes as a starting point for mass transit.



Travel time competitiveness with the car

Support mode share and sustainability objectives

Higher mode shares result in most parts of the city, including harder-to-serve employment areas, due to introduction of higher-speed semi-exclusive routes and a network of rapid and frequent routes.

The projected all-day mode share with the proposed interim network will be 9.3%, an increase from the recent 8.3% (based on the most recent travel survey in 2015).

Just maintaining the past transit share requires investment keeping pace (or more) with population; generating a future increase comes from some trip types becoming more attractive by transit than currently.

Multiple anchor destinations along mass transit

Increases ridership and spreads demand across more of the day

The mass transit network achieves this through expansion of service types and additional capacity options between major origins and destinations.

The anchor destinations include Centre City node, University/Garneau, Mill Woods, Heritage Valley, West Edmonton Mall /Misericordia, Blatchford-NAIT-Kingsway and Clareview Major Nodes and all of these are served by various mass transit routes.

Parking cost/availability at destination(s)

Higher parking prices are a stronger deterrent to drive-alone travel than fuel or the ‘sunk costs’ of auto ownership.

While general parking policy goes beyond the scope of the mass transit strategy, new park and ride would be focused at ends of the rapid transit lines to create a catchment area feeding into transit. In other locations, parking would be tied in with development objectives, with mobility hubs providing parking where consistent with their function, and then redeveloping some or all parking as more travel shifts to other transit routes and relies less on parking supply.

Speed, reliability and capacity measures

Operating transit in mixed traffic tends to reach a capacity limitation sooner, often due to platform (sidewalk) space at stations. In addition, the speed and reliability of mixed operations can reduce how many transit vehicles can operate along the route during peak hour. The impacts on travel speed therefore have a knock-on effect on capacity.

Implementing exclusive and semi-exclusive ROW with priority measures help to sustain higher-capacity service. The mass transit network includes extensions of the Capital, Metro and Valley Lines, and proposed new semi-exclusive routes B1, B2, B4, B5 and B6 (some of which may be BRT routes). In addition, priority measures for other routes, such as the 'R' series of limited stop Rapid routes, helps distribute this benefit around the city.

Limited stop buses

A highly flexible form of mass transit, with some limitations due to operations in traffic; nevertheless, these routes can be highly productive, especially when linked to a major destination.

In addition to the 'B' series of routes that may be bus or rail, the 'R' rapid bus routes form a grid with services between major nodes and providing a two-way grid of crosstown connections.

The interim network focuses on areas where higher demand and land use support warranted implementation of service. This network includes approximately half of the ultimate route coverage and frequency.

Operations in different parallel corridors

This approach helps match the demand more effectively with capacity, with the added benefit of providing limited stop service to other passengers.

Analysis of the interim horizon focused on capacity-constrained modelling which caps transit volumes on each route.

Many of the major nodes and transit terminals are served by multiple routes in the mass transit network, in addition to local bus routes.
A specific case where parallel services are critical is the north-south travel to areas between downtown and the airport. While the Capital Line is planned to be extended to Heritage Valley Major Node, new Airport Connector routes and B1 (stopping 1-1.5 km) help to serve the employment areas parallel to 111 Street and offload some of the potential excess demand from the Capital Line. Similar offloading can be expected from the B6 route.

6. Developing the Network

The mass transit network will require implementation that stages the network, so it is developed in response to existing transit demand and capturing future ridership demand. It is also critical that the network be developed in manner the helps support components of The City Plan, in particular the land use concept. Finally, the next steps for this study and beyond are outlined to conclude this chapter.

6.1. Concept Staging

The Ultimate Mass Transit Network defined in conjunction with The City Plan represented the transit services available over a long-term horizon for a city with 2 million residents. This doubling in size will take several decades. As the city grows, the population increase will also mean that more public funding is available for transit operations. The extent of the transit system will gradually increase over time, through introduction of new types of service, new routes, and increased frequency. Staging is typically carried out under the guidance of shorter-term strategic and investment plans focusing on 4-year and 10-year time periods.

The COVID-19 pandemic has had a marked influence on travel patterns in the short term (2020-2021), and due diligence through monitoring of ridership recovery and the emergence of any new patterns will no doubt influence the first few years of this plan. That is part of the reason the 1.25 Million horizon has been given a range of 10 to 15 years in the future.

The mass transit network is expected to be deployed over time, with several opportunities and constraints factoring into the staging.

Existing ridership demand and desired lines can provide a starting point for developing and expanding Edmonton's current mass transit network (mainly dominated by LRT). The result will be building the network logically through extensions or new mass transit lines (where the infrastructure/technology allows for exclusive or semi-exclusive ROW) connecting to current demand and to where already existing services exist (ideally coalescing around at least one mobility hub location). Additionally, the potential to capture future ridership (through future land development, or direct/fast connections) should be considered as the mass transit network is developed.

- The interim network proposed in Section 5 assumes extension of the Valley Line to Lewis Farms, and of the Capital Line to Ellerslie Road SW. It proposes a further extension to Heritage Valley Town Centre.
- The proposed interim network consolidates and extends the Terwillegar Bus Lanes project past South Campus to University Station, thereby adding capacity parallel to the Capital Line at its peak demand point and making the route (B6) itself more attractive by offering direct service.
- The north-south B1 service provides service into northwest Edmonton in advance of the future extension of the Metro Line, and south of downtown, this new route adds future capacity and opens new transit travel markets.

There will be a need to further evaluate the best solution to Capital Line capacity issues. Additional routes such as B1 and B6 can also mitigate capacity issues in the south which may be an effective way to address the LRT 'pinch point' that occurs in the peak hour between Health Sciences and South Campus stations. Solutions may include combinations of measures directly related to the Capital Line operations, and introduction of other services.

The rationale for projects can and should be linked to city building opportunities. The City Plan land use concept proposes its own staging plan for different types of development, and the deployment of transit infrastructure and services can provide support and be a catalyst for the land use initiatives and transit-oriented development.

- East-west corridors such as Whyte Avenue (B2) and 118 Avenue (R12) are supported by implementation of new semi-exclusive and rapid routes.

Financial resources available during a given period mean that certain projects will be prioritized while others are deferred until more funding becomes available.

- The implementation of B1 on 97 Street and 153 Avenue provides a lower-cost and easier to implement building block for eventual extension of the Metro Line north from Blatchford. The ML extension requires a costly bridge to carry the LRT over the Yellowhead and CN yards, and this also introduces a long gap between feasible station locations.
- Some of the longer-term rapid bus services within the existing built area of Edmonton have been deferred to post-1.25 million, focusing investment on higher ridership and more strategic corridors to start with. Some of these corridors, such as 111 Avenue, are projected to achieve high demand in the future as infill development occurs, and in the meantime can be served by planned services such as F6 (ETS route 3).

Some forms of capital construction can be converted from one mode to another, but this will have significant capital cost and design implications. (I.e. new bridges or tunnels built for transit). Designing and building for multiple modes can introduce extra design features, requirements and costs which become ‘throw away’ after the transition. Furthermore, upgrading to new infrastructure requirements requires shut down or diversion to existing services causing disruption to mobility options.

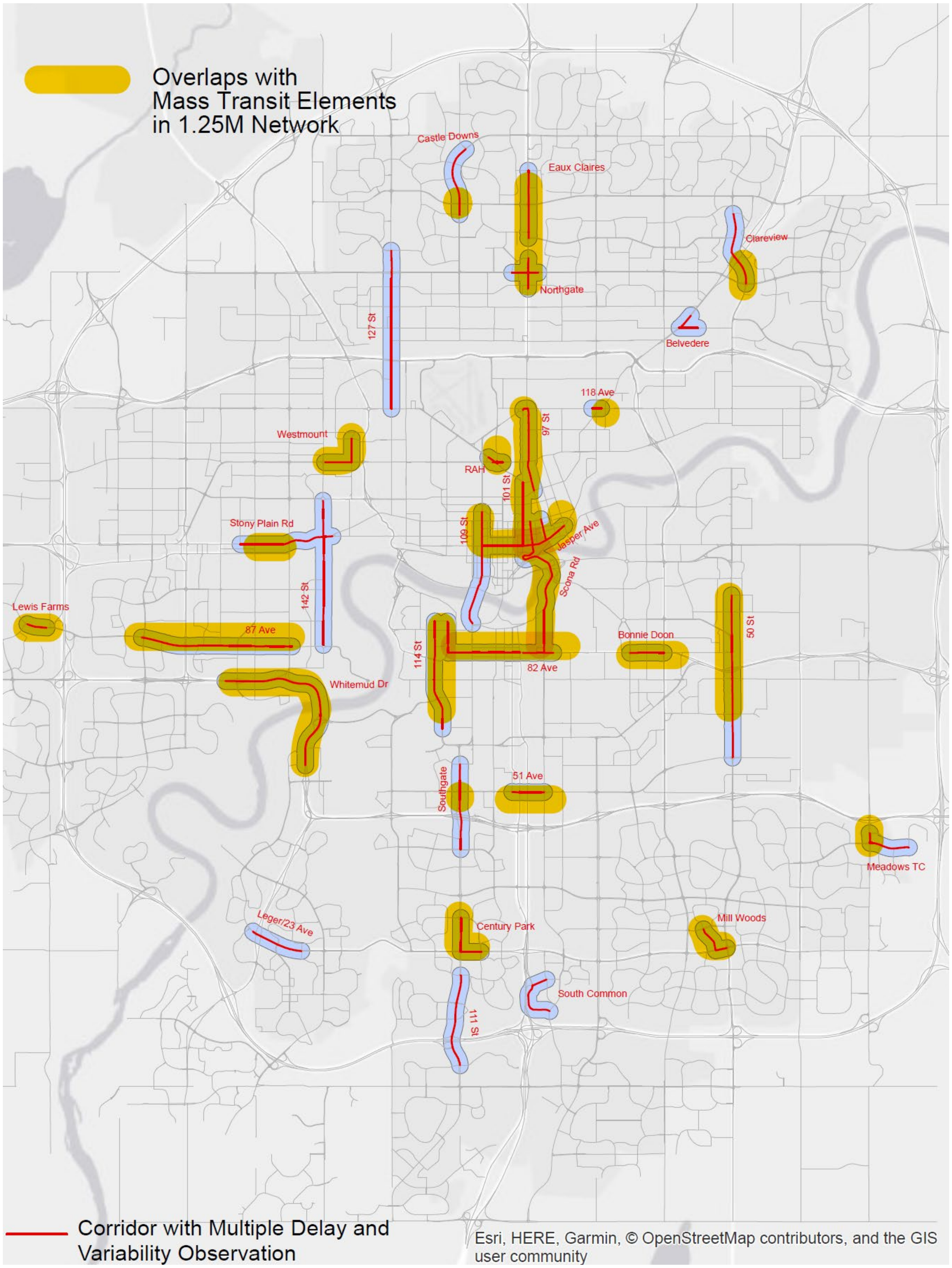
- Addition of more frequent Metro Line and Capital Line service through the downtown tunnel and across the grade crossings south of Health Sciences is currently constrained by several technical factors. The frequencies of each route during the peak are capped, with 18 trains per hour per direction assumed in the tunnel, and no more than 12 per hour at the grade crossings.
- Addressing these constraints may become more feasible once other mass transit options are available, so that construction to upgrade these lines can take place (replacement of signals and other upgrades to LRT typically require reduced service or bus bridging around the site to carry out upgrades). The interim network includes new routes that could form part of the building block to this enhancement strategy such as the incorporation of the south leg of B1 into semi-exclusive route and extension of B6 to University major node. With these routes in place, the transitional upgrades might then become feasible post-1.25 million.

Some services may be introduced in a less capital-intensive form sooner (for example a rapid or limited stop bus) and then be converted in part or in full to semi-exclusive or exclusive transit as needs arise.

- This approach has been taken with partial implementation of bus lanes assumed on B1, B2, and B5.

There will also be opportunities to implement Transit Priority Measures (TPM) at hot spots – either existing or emerging. These TPMs may include physical measures, as well as lane management/regulatory and signal operations modifications. Many corridors across the city could potentially warrant TPM implementation, including sections of 97 Street, 101 Street, and longer sections of arterials approaching key mobility hubs (such as Century Park and Mill Woods.) Exhibit 6.1 shows the overlap between mass transit elements and potential TPM implementation corridors.

Exhibit 6.1: Potential Locations for Transit Priority (Within 10-15 Years)

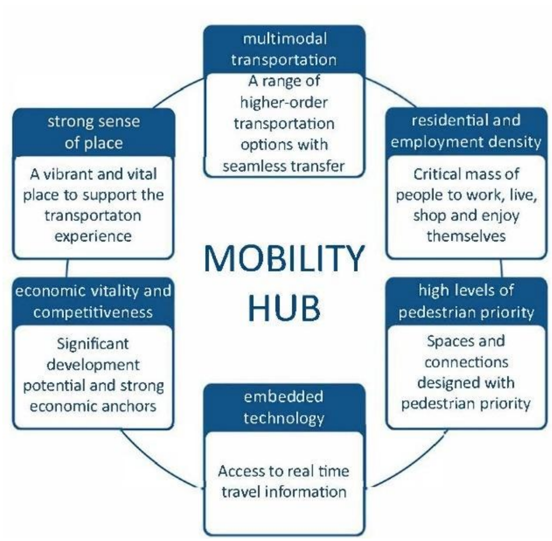


6.2. Mobility Hubs

The mass transit network recommendations for 1.25 million can be further refined by identifying intermodal transit hub locations, based on transportation and land use considerations that will emerge during the first quarter of development towards the ultimate 2 million. These intermodal sites are referred to as mobility hubs and are an important form of investment in transit infrastructure and help to support and incentivize large scale transit-oriented development. They tie important pieces of the proposed land use and transit strategies together.

A mobility hub is more than just a transit station. Mobility hubs consist of major transit stations and the surrounding area. They serve a critical function in the regional transportation system as the origin, destination, or transfer point for a significant portion of trips. They are places of connectivity where different modes of transportation – from walking to riding transit – come together seamlessly and where there is a concentration of working, living, shopping and/or playing. They are an important form of investment in transit infrastructure and help to support and incentivize large scale transit-oriented development. They tie important pieces of the proposed land use and transit strategies together. The key elements of a successful mobility hub are illustrated in Exhibit 6.2.

Exhibit 6.2: Mobility Hub Elements



Mobility hubs vary in size, but generally comprise the transit station and surrounding area that can be comfortably accessed by foot, approximately an 800-metre radius. However, the actual hub boundary should be determined based on the specific physical characteristics, neighbourhood context, and planning framework of the area. Of the mobility hub concept locations nominated for the Edmonton area, there is a range between existing sites and those that are envisioned after rapid transit investment. Many existing sites offer little more than vast parking lots, while others are easily accessible by many modes and are already vibrant places of activity and destinations in themselves.

Mobility Hubs are strategically located in nodes or can be centred on a mass transit station. They serve as critical places for trip origins, destinations and transfer points. Furthermore, they create connectivity to different modes, supporting a mobility system that allows people to seamlessly move from one travel option to another and to conveniently fulfill their daily needs. This is where different modes of transportation come together including walking, biking, transit and shared mobility options to create connections within Edmonton and to the region. Existing examples of possible emerging mobility hubs where key connections between routes are made could include Century Park and West Edmonton Mall.

The provision of a safe transportation system is a cornerstone of The City Plan. Given the fact that most transit users are pedestrians during the first, last and transfer components of their trips, pedestrian safety is a major concern. These users need safe and efficient routes when accessing stations and while making multi-modal transfers. They rely on existing active transportation networks.

Selection of these functional types of mobility hubs was made based on identifying key City Plan nodes and key transportation intersection points that were candidates to fit the primary function for each of these types of mobility hubs:

- **Entry hubs**: Typically situated at or near the end of the high-capacity mass transit lines;
- **Transfer hubs:** Areas of significant network transfer points that combine higher volumes of passengers with a proposed land use node or location along a designated development corridor.
- **Destination hubs:** Identified as the Major Nodes from The City Plan Concept, since these are planned to act as both employment centres (destinations) and as origins and transfer points for people movement.

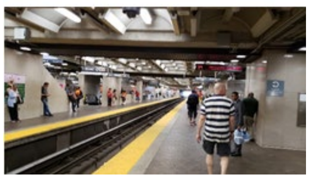
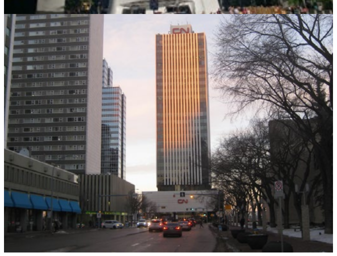
Exhibit 6.3 describes the characteristics of the mobility hub locations and provides high-level guidance as to the typical features of each hub. The locations of the hubs in each category are also listed for reference. It should be recognized that each mobility hub location may serve more than one function. Therefore, the typologies assigned to each location serve as preliminary identification of each mobility hub's primary function. It is expected that further study and planning will identify and incorporate other secondary functions of each mobility hub in parallel to land use planning for infill development.

Planning Steps

Common early steps to plan for and start to implement Mobility Hubs include the following suggestions:

1. Reviewing the existing planning context for the location, including regional, municipal and neighbourhoods plans. This assists in determining what elements of a hub would align with existing plans and community values. Where plans are due for a refresh, this presents an opportunity to incorporate stakeholder and community input into the process as the mobility hub is introduced as a concept.
2. Carrying out an inventory of study area infrastructure and land parcels to identify available capacity, constraints and opportunities. These steps are important where the vision for the hub is to encourage or help support redevelopment or infill, consistent with the vision in The City Plan for the study area. Since some mobility hubs are constructed adjacent to or jointly with developments, it is important to understand how feasible development would be, what form it might take, and when it may be triggered.
3. Defining guiding principles for the hub, such as what specific objectives it will have, and how it relates to the surrounding community.
4. Developing options and selecting a concept plan. Again, with input from community stakeholders, a recommended built form, and proposed infrastructure and streetscape modifications are developed. A staging plan that includes lead and supporting partners is also drafted to help carry forward momentum. Partnerships are typically needed in the areas of planning, services and elements, land development and funding.

Exhibit 6.3: Proposed Mobility Hub Typologies and Design Guidance – for the Edmonton Mass Transit Study

Typology		Examples	Description
Entry Hubs		Ellerslie District Windermere	• Typically situated at or near the end of the high-capacity mass transit lines. • Existing development forms and transportation network generally auto oriented. • Growing market for mixed use development with significant developable land available including high development potential.
Transfer Hubs	 	Whyte Avenue Century Park Jasper Place Bonnie Doon Castle Downs	• Areas of significant network transfer points that combine higher volumes of passengers with a proposed land use node or location along a designated development corridor. • Major and local centres with a mix of uses and moderate to high densities. • Some developable land availability. Development opportunities primarily through infill.
Destination Hubs	 	Downtown City Centre University of Alberta West Edmonton Mall	• Identified as the Major Nodes from The City Plan Concept. • Regional centre with mature mix and scale of development, multiple destinations, and high densities. • Universities, Colleges, Airports in varying urban contexts. • Large trip generators. • Good pedestrian environment with well connected, walkable street network. • Limited developable land availability. Development opportunities primarily through infill.

The proposed locations of mobility hubs in the City of Edmonton are identified on Exhibit 6.4. A general explanation of what could take place at these hubs follows.

Entry Hubs

- The NW Metro Line hub will form around the future extension of the Metro Line to the Campbell Road station. The City of St. Albert owns land near the future station and in 2020 opened the Naki Transit Centre, which includes a bus terminal and large park and ride lot. The City of Edmonton will want to include mobility hub considerations in the station area planning for this location, in advance of construction, which is expected post-1.25 million.
- Horse Hills is deferred to post-1.5 million since much of the development in that part of the city is not staged to occur until then, which would become a trigger for Capital Line extension.
- A hub at Lewis Farms should be under consideration as soon as possible, building on the existing transit centre and responding to any opportunities related to the construction of Valley Line West, which will commence imminently.
- Windermere Centre hub requires decisions to be made around the optimal location for the major transit exchange in this corner of the city. The current Ambleside location may see many of the functions shift to a larger transit centre in Glenridding. Once this has been resolved, planning of the joint hub and transit centre should begin, given that the area around this hub is projected to see significant residential growth and high transit mode shares. The B6 route would be modified as necessary to serve the major hub.
- The 'New Southwest Node' on SW 41 Avenue will be triggered by plans to extend the Capital Line to its terminus in the Heritage Valley Major Node. Based on the recommendations of this report, that extension will take place once development of lands south of SW 41 begins in earnest, which is likely after the initial 10-15-year window.
- Ellerslie District hub is planned to include a park and ride and be connected by frequent limited-stop bus service to Mill Woods LRT station and Transit Centre. The initial hub should consider street-facing land uses. The park and ride would feature transitional surface parking set back from the arterial streets, and ideally this will be laid out in modules of s suitable size for staged redevelopment in the medium to longer-term.

Transfer Hubs

- Castle Downs: In keeping with the recommendation to initiate B1 service through Castle Downs, this hub would initially focus on the operations of the new route, and how this would be integrated with the transit centre in this area. The planning process for the transit infrastructure and adjacent land uses would also need to consider staging considerations for the future extension of the Metro Line.
- Exhibition: This hub has the potential to build from the existing transit centre at Coliseum LRT and feed into planning processes related to the Exhibition lands. Several of the new mass transit routes will connect or terminate at this hub.
- Jasper Place: This location represents an opportunity to link existing commercial areas and the transit exchange in the area with the Valley Line. Planning here may need several smaller stages to advance as the area is constrained and the streets where the LRT is being constructed will not lend themselves directly to high numbers of connecting buses.
- South Campus: New mass transit services will either pass close to or connect directly to the LRT station and some reconfiguration of stops may be required to optimize operations. Given that University of Alberta regularly undertakes planning initiatives, a

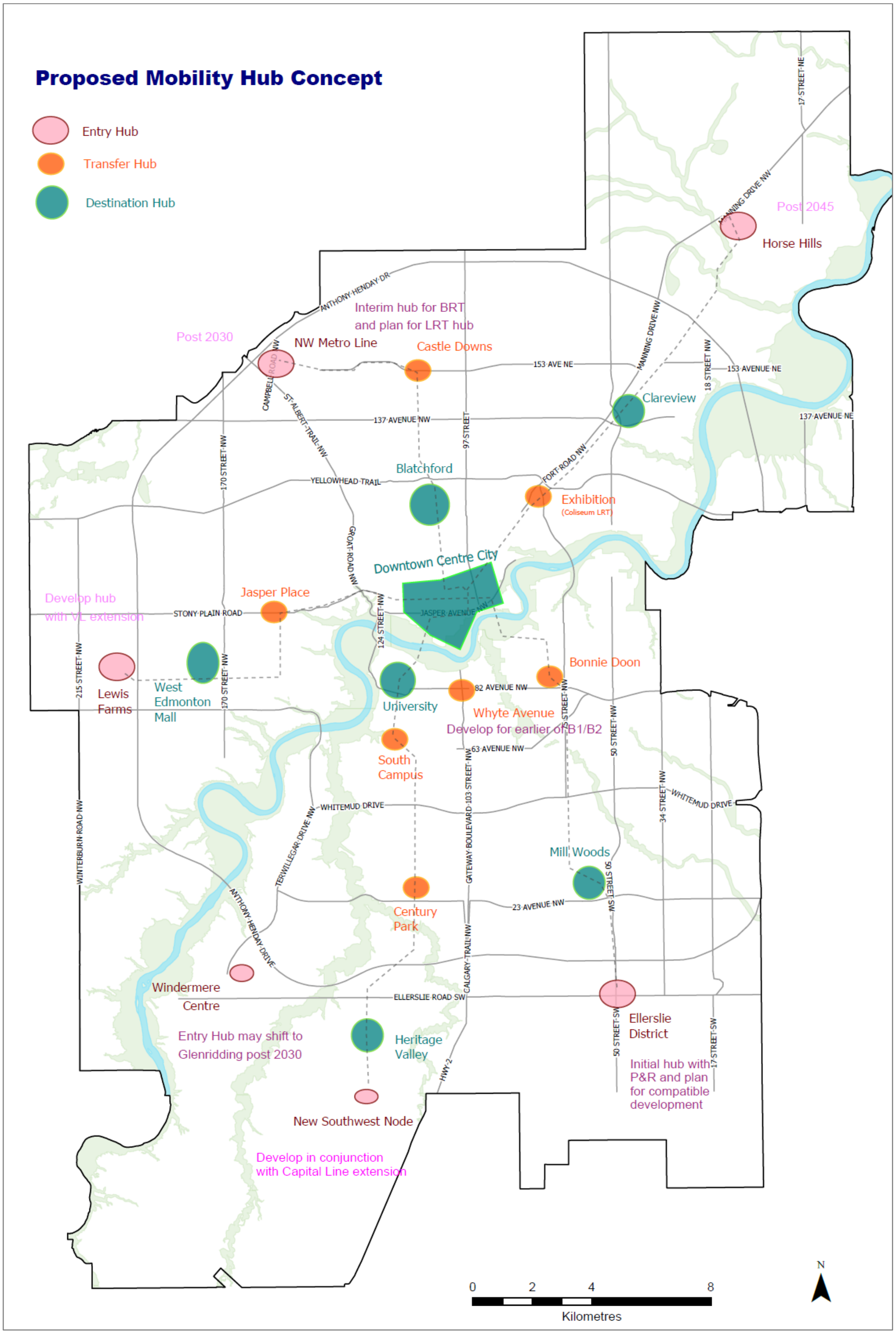
review of transit needs and transit-friendly development opportunities around this hub should feed into that process.

- Whyte Avenue: This future hub is already served east-west by several frequent bus routes. It will become a transfer point once the B1 service is implemented. As part of the planning for those stops, which may be split northbound/southbound onto different streets, active modes connections, public spaces and development plans in nearby parts of Whyte Avenue will need to be included in planning for this connection.
- Century Park: This is an existing LRT station and bus transit center that will remain important even after the Capital Line is extended farther south. There will be need here to re-organize the bus operations to accommodate new routes such as B1 and B5. In addition to these needs, there may be opportunities at such time the site undergoes renovation or redevelopment.
- Bonnie Doon. This near-future LRT station will be a terminal point for the B2 route, and potentially an intercept point for some regional services. Again, over time this area may evolve in response to the additional transit services.
- In addition to the hubs noted on the map, there are existing locations where transit centres are adjacent to commercial areas (such as Northgate and Southgate), and efforts to enhance the integration and urban design of these locations may take place as needs and opportunities arise at those locations.

Destination Hubs

- These include Centre City Node, Blatchford, Clareview, Mill Woods, Heritage Valley and West Edmonton Mall Major Nodes.
- These areas have already undergone planning processes, and so more of the focus in defining mobility hub features will be to determine the major passenger destinations, flows to/from/between transit services, and how the active modes network and public spaces in these hub areas will function together.
- Each of these should undergo review of the station areas and transit centres within them in conjunction with planning around transit service expansion, including new LRT, BRT and rapid routes.

Exhibit 6.4: Proposed Mobility Hubs – Edmonton Mass Transit Study



6.3. Next Steps

This report documents the ultimate mass transit network and a proposed interim network for a 1.25 Million population horizon. The next technical step is to integrate these findings with the other aspects of the **Mobility Network Assessment** to define transportation project priorities across multiple modes. These will be guided by community needs and opportunities, as well as the logistics of implementing infrastructure and services.

Another branch of technical analysis will be to assess the **operational feasibility** of elements of the mass transit network, to evaluate if and how they could be implemented. The increases in service frequency and new types of service point to several challenges that will need to be addressed through future study. These include:

- Increasing the capacity of certain parts of the LRT network to interline the Capital and Metro Lines at higher frequencies, and finding the best way to address the capacity constraint at University Avenue;
- Operating frequent and rapid buses at high frequencies, typically in mixed traffic and with constraints on 'platform' space in the public right of way. This will need to consider transit priority measures and curb management;

This type of work is usually collaborative and would draw upon the local knowledge base for the transit system, bring in lessons learned from applicable case studies, and evaluate potential solutions, potentially through modelling simulation.

Design Guidelines and Standards for the new and evolving types of transit service will need to be developed to inform planning and design of future services. This may take several forms but typically starts with confirming the 'function and feel' of transit infrastructure and services, with technical and stakeholder input informing this. Design standards can then be developed by merging best practice from existing standards, with emerging urban design principles, and the guidelines developed for transit infrastructure, vehicles and operations. It will also be important to align these guidelines and standards to City Policy (both short term and long term) and in particular land use development policy to ensure the integration with land use policies.

Bus Rapid Transit (with fully-segregated or dedicated lanes) types of service would be "new" to Edmonton and some elements would warrant development of guidelines and standards to support and inform future project development. This would also be applicable to mobility hubs and large-scale mass transit stations not designed specifically for rail technology.

Early Implementation can take several forms. The Bus Network Redesign is already approved and many of the early versions of future routes included in the mass transit network will be in service in the city before the end of 2021.

The rapid bus and semi-exclusive services, including the look and application of Bus Rapid Transit (BRT), bus only or HOV lanes (painted and segregated) and transit priority measures, will be new to Edmontonians. Therefore, purposeful and coordinated efforts to define these concepts in the Edmonton setting will be critical for the success of implementing the mass transit network. It is common in the industry to select a priority corridor, work with stakeholders to develop, design and implement 'quick wins' improvements (for example, confirming and implementing bus stop locations for a rapid bus service) and deploying a demonstration/pilot version of the service.

Appendix A – Additional Mass Transit Reference Exhibits

Categories of Mass Transit Modes

Nodes and Corridors Reference Maps

Volume Plots for AM Peak – Options A and B

Additional Model Outputs (Transit Volumes)

Categories of Mass Transit Modes

In addition to building on the future base network, the mass transit network provides as opportunity to bring together and categorize different mass transit modes. Exhibit A.1 outlines the types of services that are included in the mass transit network, and explains their role or the primary market that they cater too as well as some examples of each type of service. Most of the services can be provided by more than one technology option (primarily rail and bus variations).

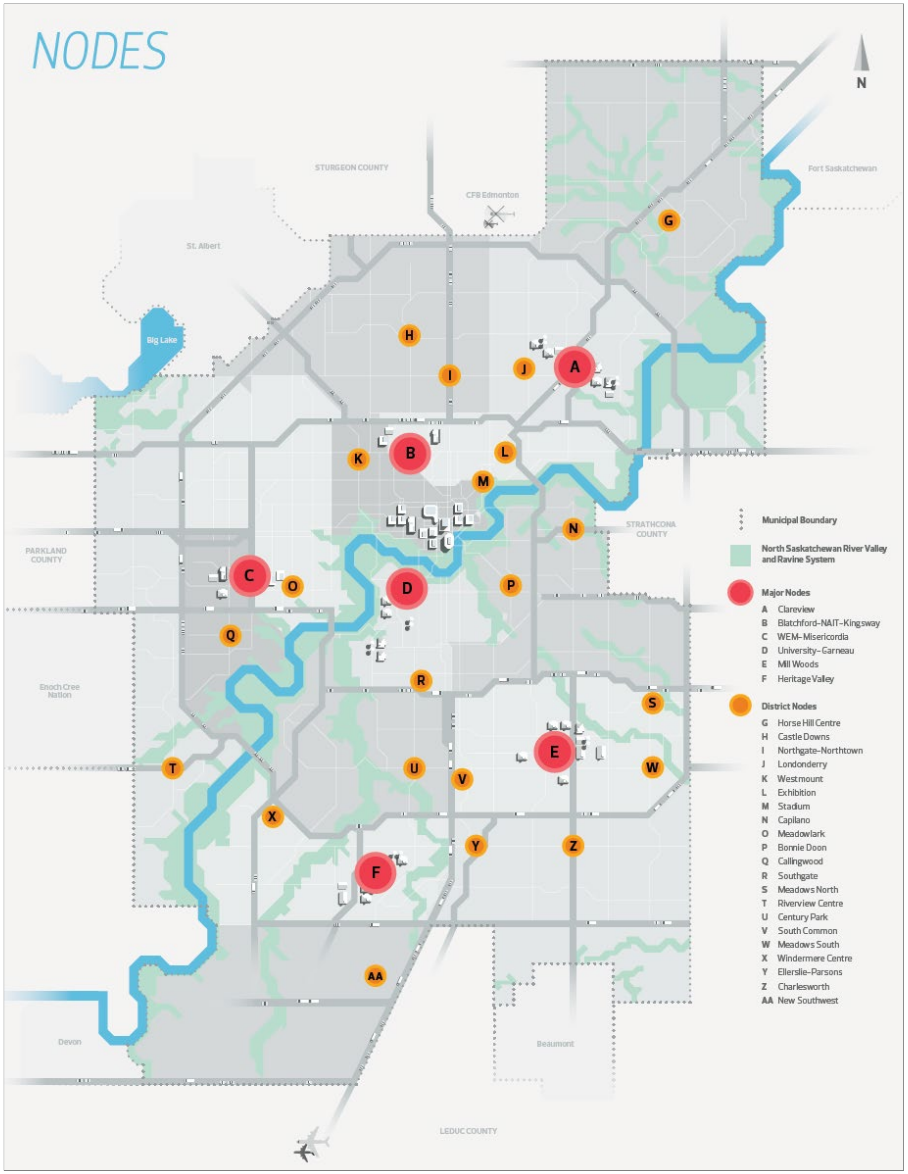
The exhibit also identifies:

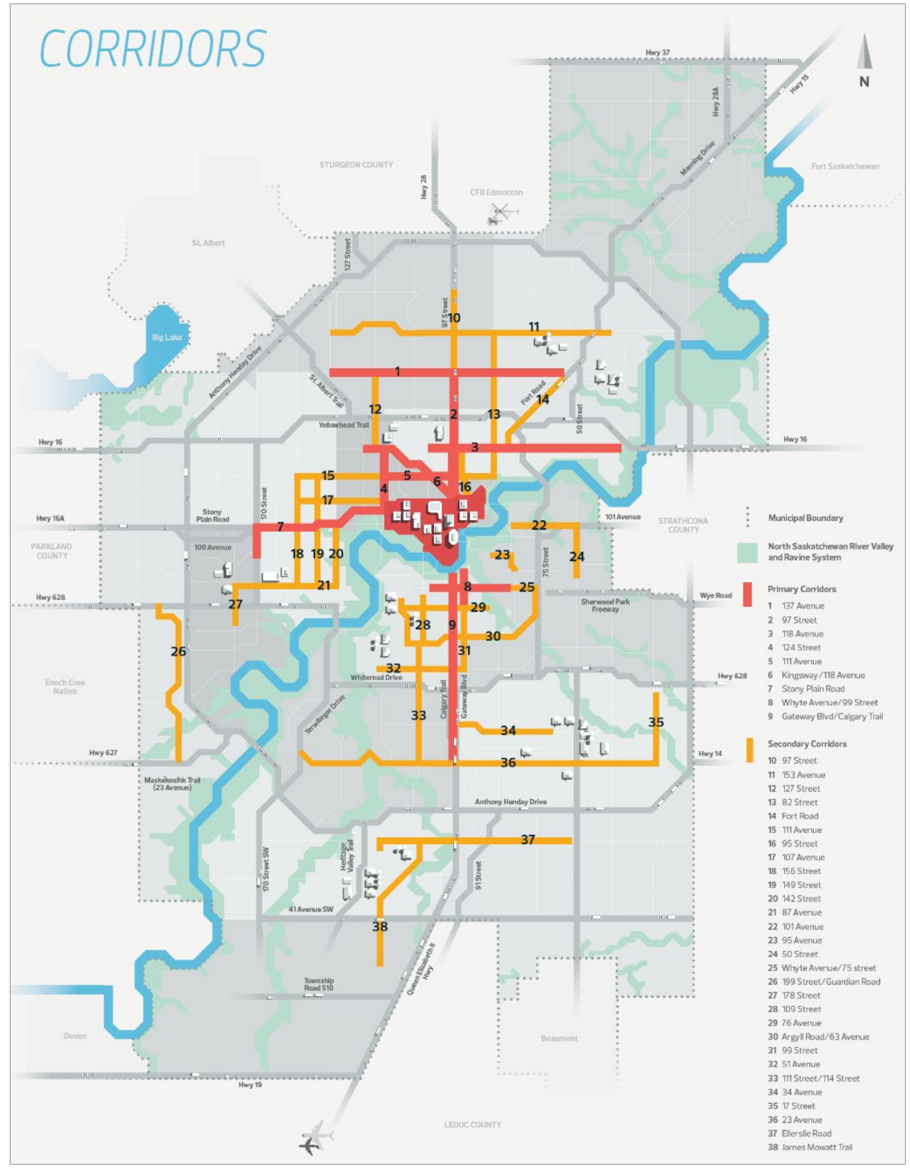
- The range of typical operations usually seen with the different modes of transit operation for the regional, rapid and urban forms of mass transit. These are expressed in terms of stop spacing and frequency;
- The lengths of typical trips supported by the different forms of mass transit;
- The typical densities served and connected by the different forms of transit. This provides some guidance as to where the different forms of transit would usually find success in attracting enough passengers;
- Typical benefits and challenges associated with implementation and operation of each type of service. These are based on general practice in North America.

Exhibit A.1: Mass Transit Modes, Technology Examples and Service Characteristics

Mode	Primary Trip Markets	Technology Examples	Typical Services	Trip Length (km)	Density (people + jobs/ha)	Benefits	Challenges
Regional Transit (Link Cities Together)							
All Day	• Long commuter trips • Long off-peak discretionary trips	• Passenger train • Highway coach (Bus)	• Peak headway, 5 to 15 minutes • 800 m to 4 km spacing	>15	Varies by context	• Competitive with auto for long trips • Better mitigates peak hour congestion	• ROW can be costly given long distances • Costly station parking & road improvements
Peak Only	• Long commuter trips	• As above, but only commuter services	• Peak headway, 10 to 20 minutes • 800 m to 4 km spacing	>15	Varies	• Better mitigates peak hour congestion Restricted service times lowers operating costs	• Does not serve non-work based trips well • Costly station parking & road improvements
Rapid Transit (Support Cross-City Travel and Higher Density Development)							
Exclusive ROW	• Long and intermediate distance trips, all times of day	• Subway • Automated Train or Bus • LRT or BRT in tunnel, trench or on structure • Signal Pre-emption or Priority System at intersections	• Peak headway, 3 to 6 minutes • 400 m to 2 km spacing	5-15	>200	• Very high capacity • Can encourage densification	• High capital costs • Space requirements
Semi-Exclusive ROW	• Long and intermediate distance trips, all times of day	• LRT or BRT in exclusive path, but with intersections • Integrated Transit Priority Measures (queue jumping, dedicated lanes, etc.)	• Peak headway, 3 to 10 minutes • 400-800 m stop spacing	5-15	100-200	• High capacity at lower costs than exclusive ROW • Can encourage densification	• Less reliable and potentially slower than exclusive ROW • Space requirements
Limited Stop	• Long and intermediate distance commuter trips	• Limited stop 'rapid' bus in bus lanes and mixed traffic • Optional Transit Priority Measures (queue jumping, dedicated lanes, etc.)	• Peak headway, 5 to 12 minutes • 400-800 m stop spacing.	5-15	50-100	• Reduced travel times attracts new riders • Low cost, flexible route designs	• Reliability concerns due to mixed traffic • Less impact on densification
Urban Mass Transit– (Convenient Access to Local Destinations)							
Frequent	• Long and intermediate distance commuter • Off-peak discretionary trips in major nodes and corridors	• Bus or streetcar/ tram in frequent/primary transit network	• Peak headway, 5 to 10 minutes • Spacing same as currently done, 100-200m.	<10	50-100	• Extend reach of rapid services	• Operating costs need to be justified by demand • Need many intersecting routes to work well

Exhibit A.2– Reference Maps – City Plan Nodes and Corridors





Source: City of Edmonton

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Exhibit A.3 – Combined Population and Employment Distribution at 1.25 Million Horizon

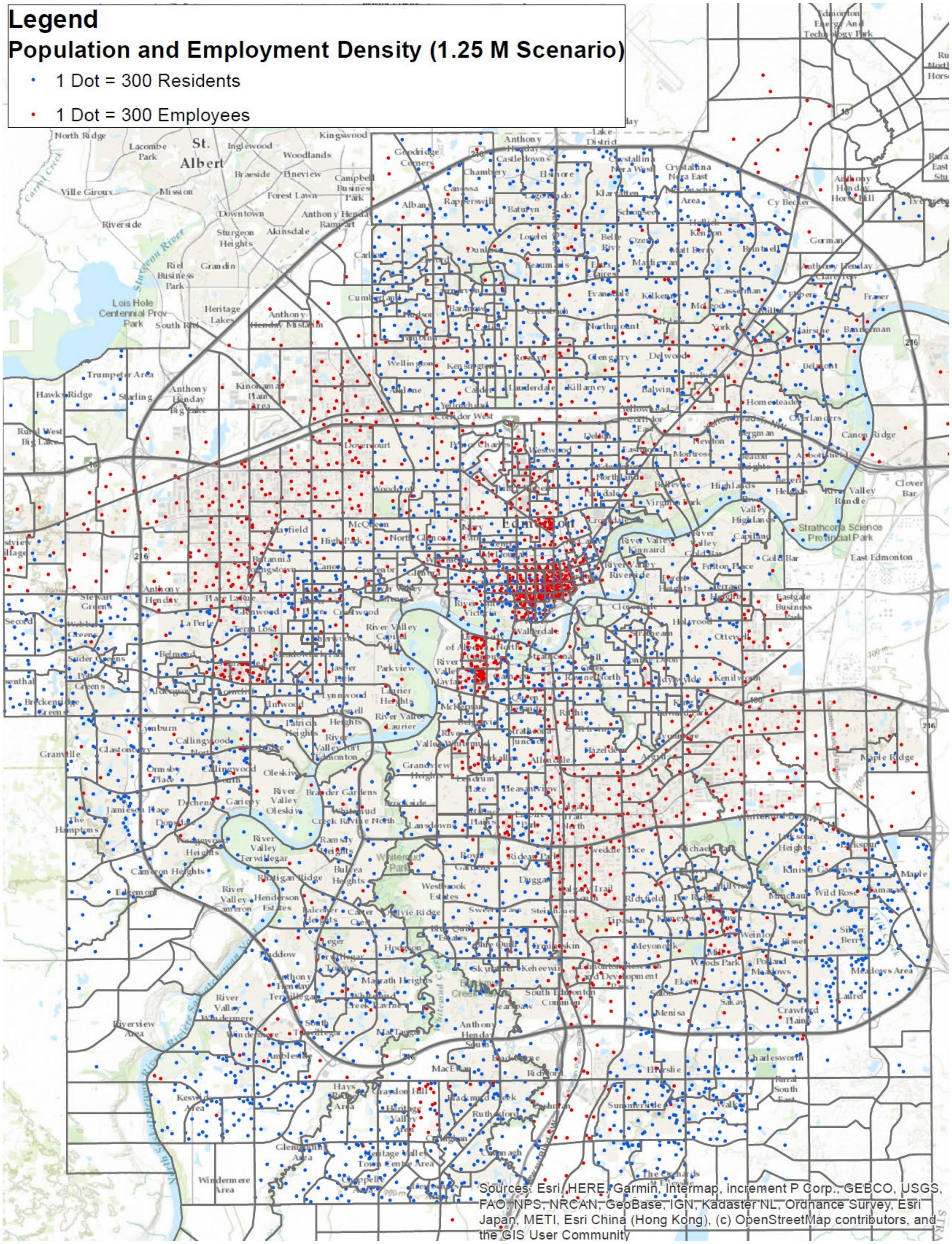
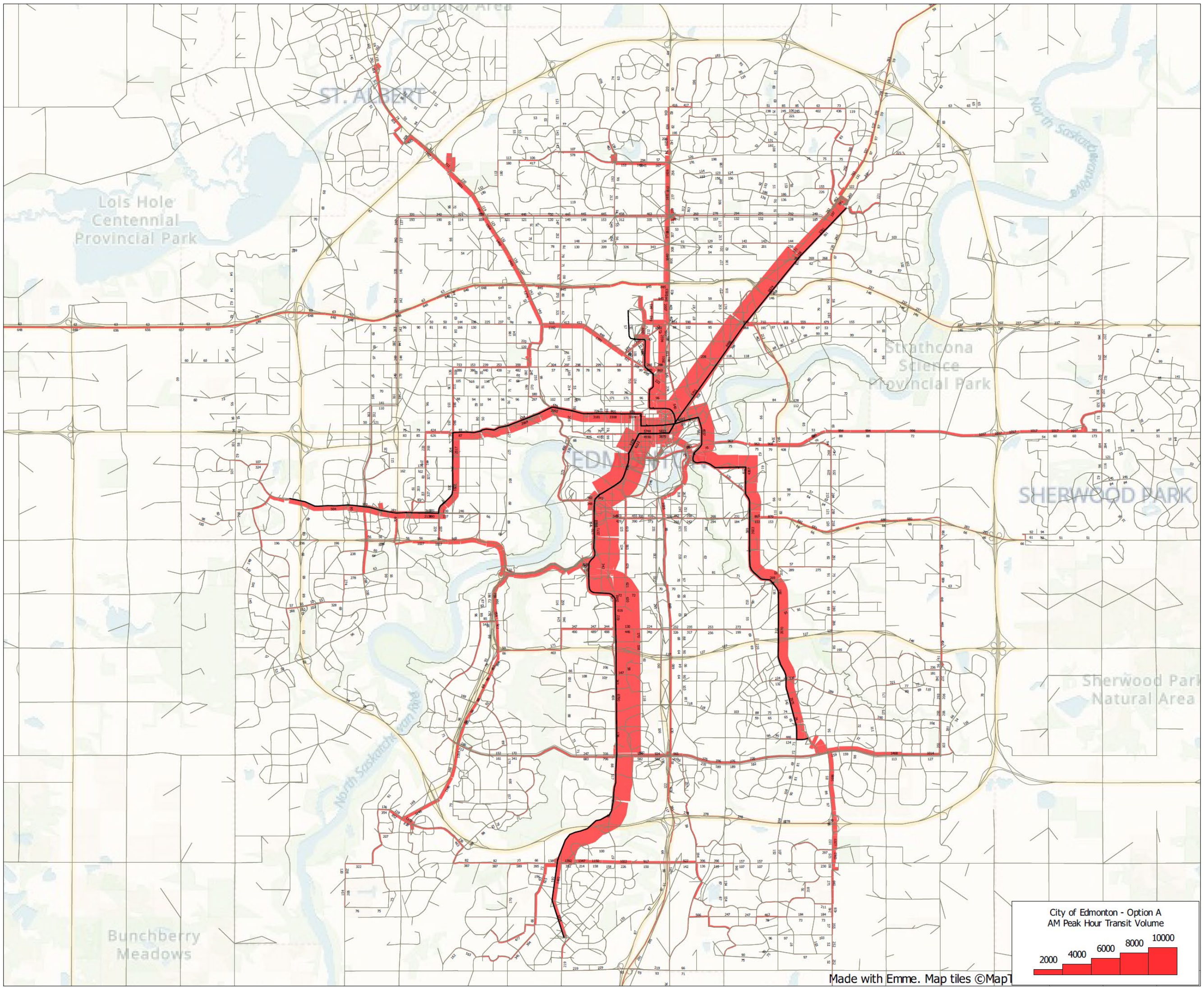
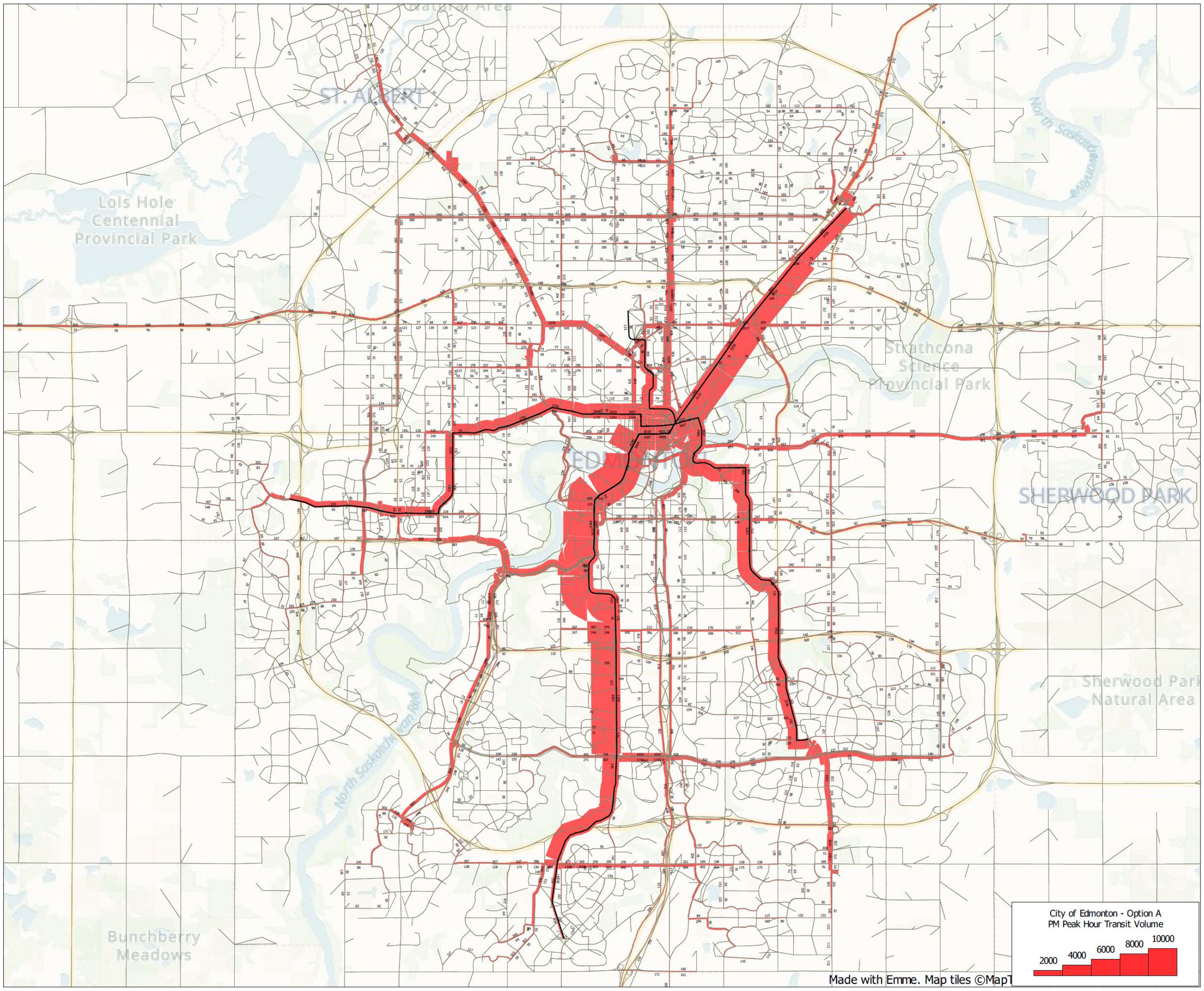


Exhibit A.4 – AM Peak Transit Assignment Result – Option A



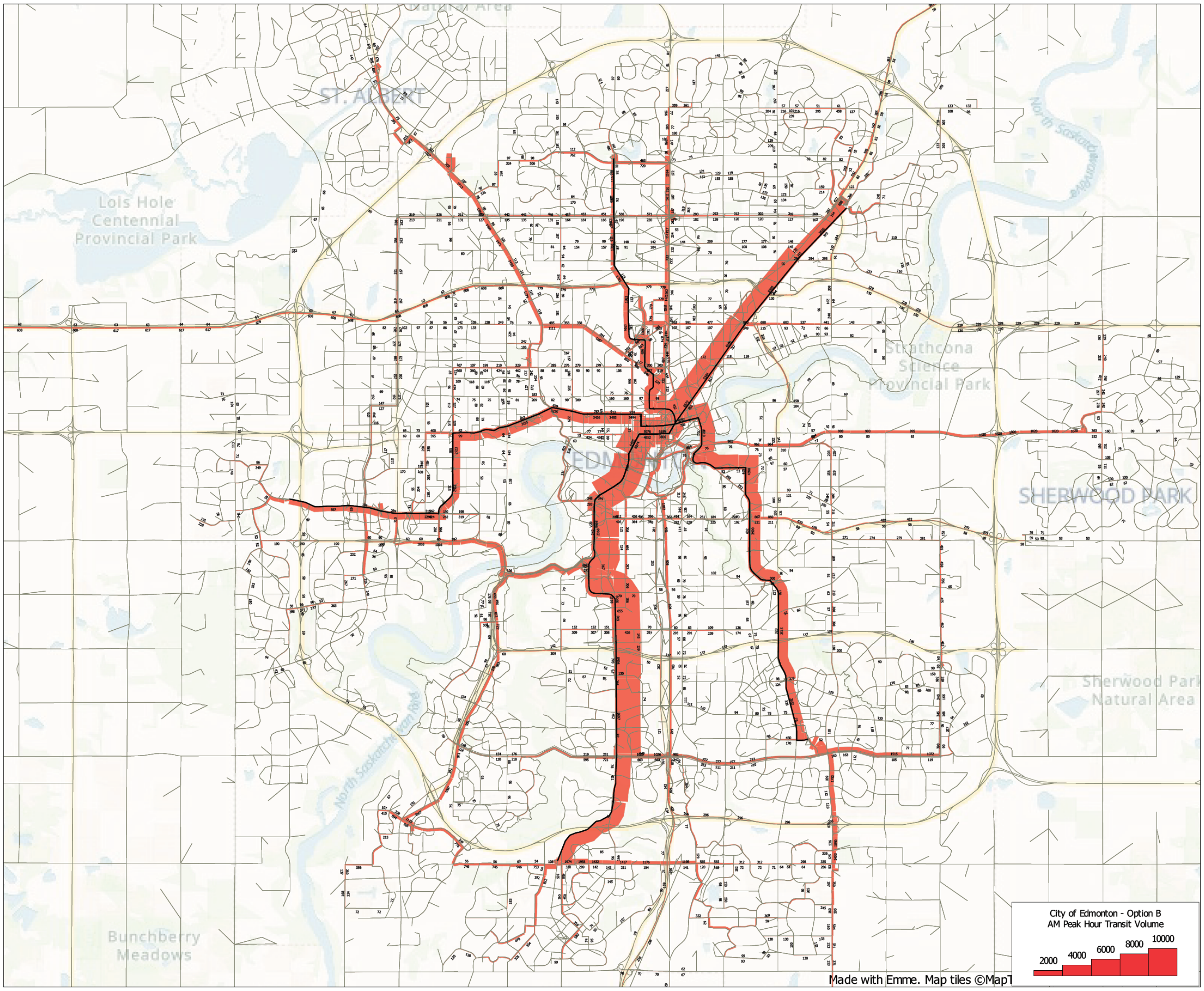
Source: IBI Group/City of Edmonton. EMME Transit Volume Plot.

Exhibit A.5 – PM Peak Transit Assignment Result – Option A



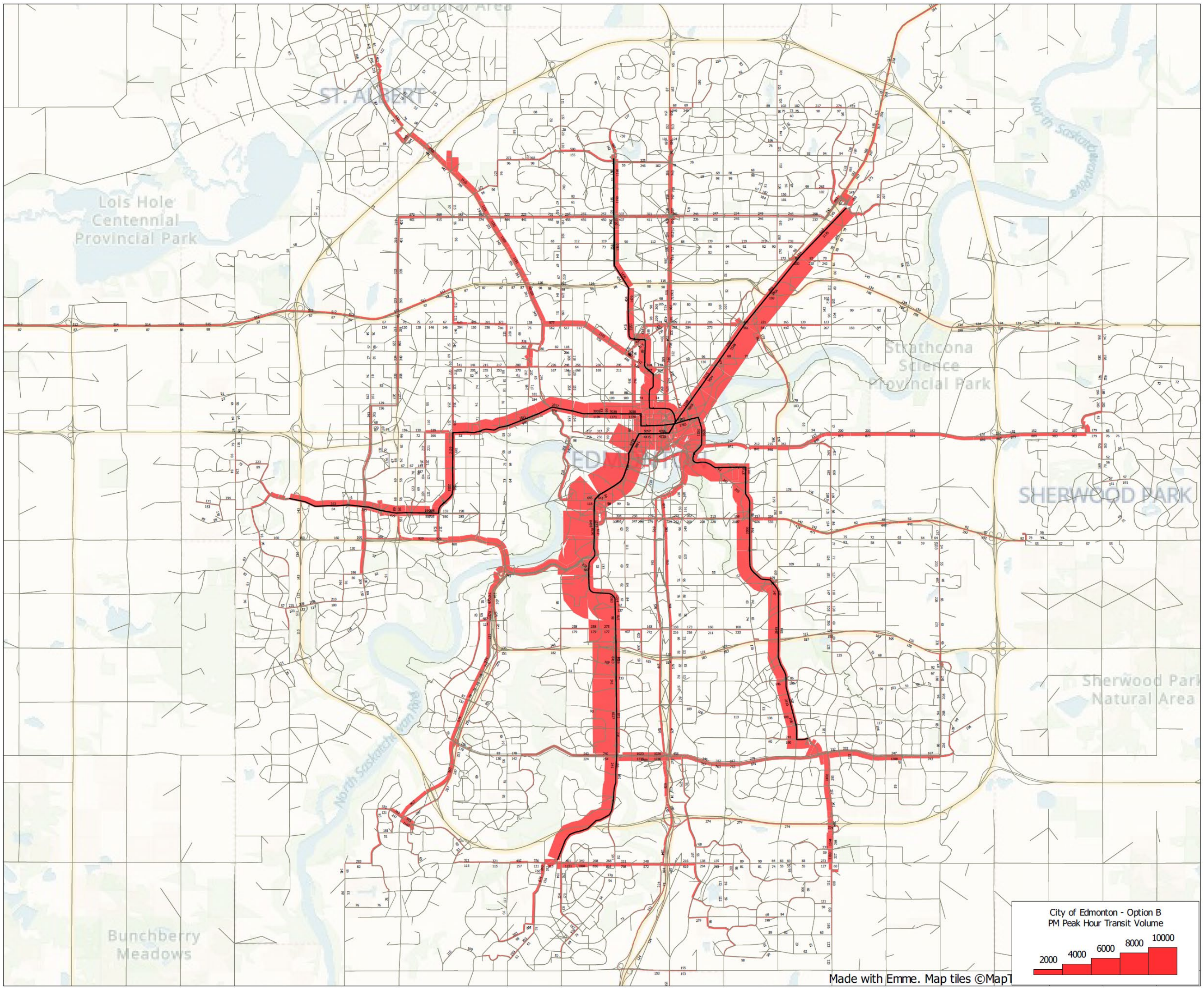
Source: IBI Group/City of Edmonton. EMME Transit Volume Plot.

Exhibit A.6 – AM Peak Transit Assignment Result – Option B



Source: IBI Group/City of Edmonton. EMME Transit Volume Plot

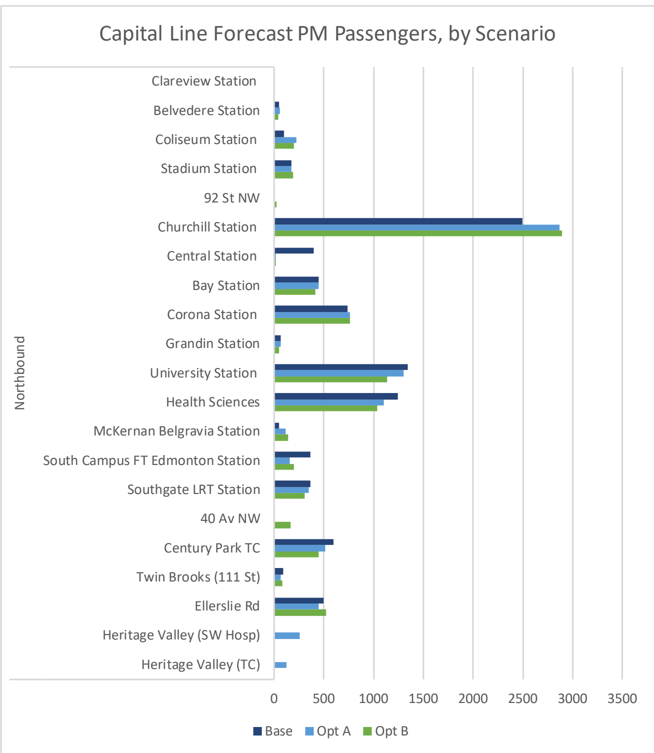
Exhibit A.7 – PM Peak Transit Assignment Result – Option B

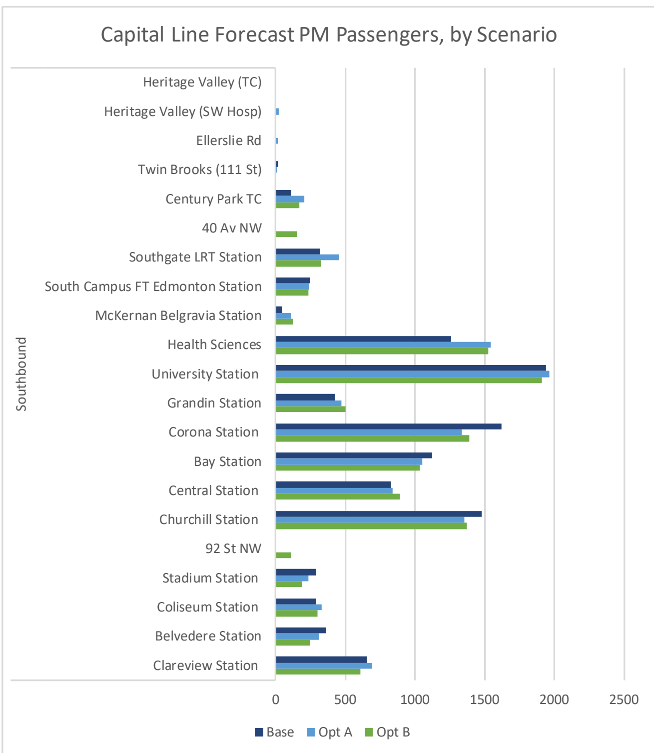


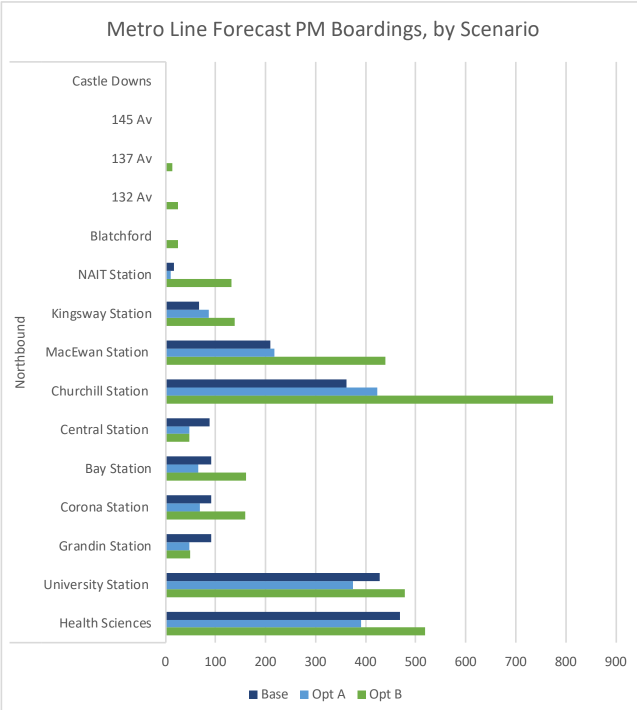
Source: City of Edmonton. EMME Transit Passenger Demand - Volume Plot.

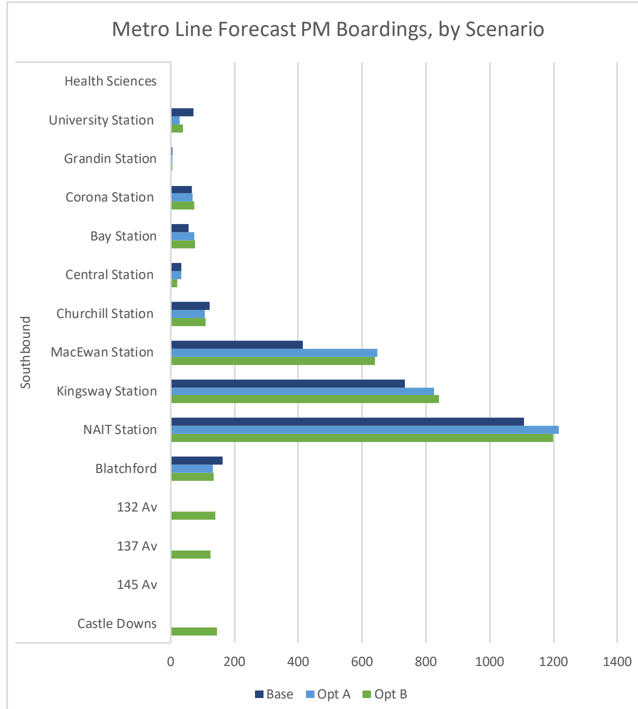
Exhibit A.8– Light Rail Transit Boarding Activity, by Scenario

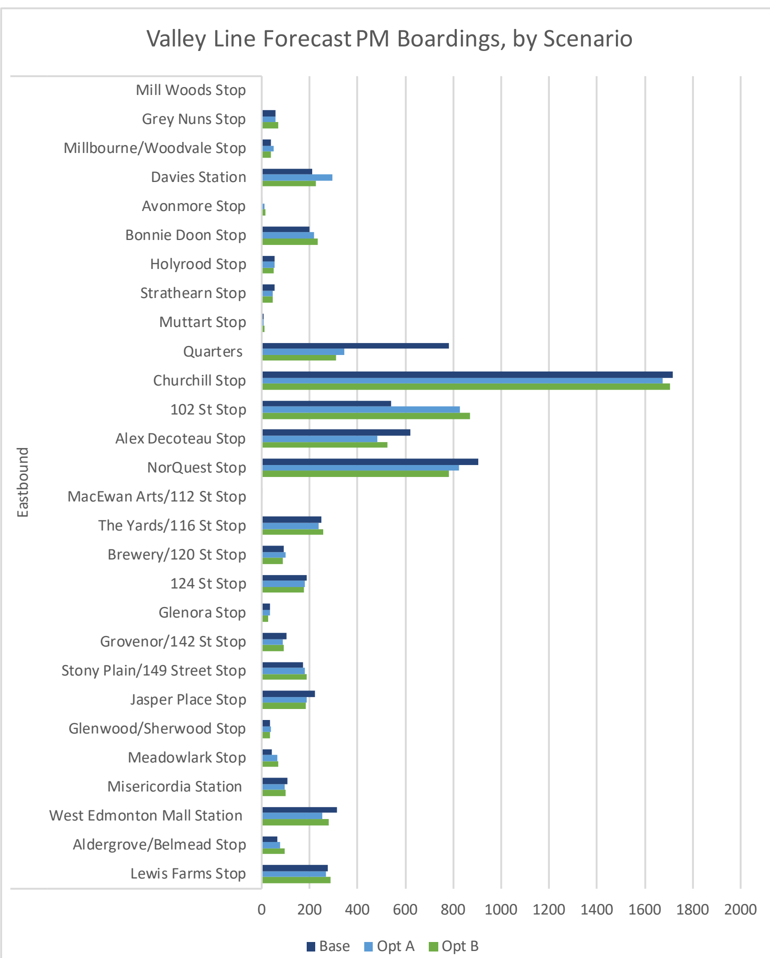
			Capital Line		Metro Line		Valley Line	
	Peak	**Direction**	**Board**	**Alight**	**Board**	**Alight**	**Board**	**Alight**
Comparing Options								
PM	**Base**	2-way	**20,014**	**20,015**	**4,680**	**4,679**	**13,130**	**13,130**
	Opt A	2-way	20,216	20,220	4,869	4,867	12,507	12,507
	Opt B	2-way	20,216	20,220	6,510	6,511	12,563	12,562
Option A	PM Peak	North	9,038	9,040	1,731	1,730		
		South	**11,178**	**11,180**	**3,138**	**3,137**		
		East					**6,703**	**6,704**
		West					5,804	5,803
		Total	20,216	20,220	4,869	4,867	12,507	12,507
	AM Peak	North	**11,327**	**11,326**	**3,836**	**3,836**		
		South	9,988	9,986	1,539	1,538		
		East					5,487	5,487
		West					**6,493**	**6,493**
		Total	21,315	21,312	5,375	5,374	11,980	11,980






Metro Line Forecast PM Boardings, by Scenario
Northbound
Castle Downs
145 Av
137 Av
132 Av
Blatchford
NAIT Station
Kingsway Station
MacEwan Station
Churchill Station
Central Station
Bay Station
Corona Station
Grandin Station
University Station
Health Sciences
0 100 200 300 400 500 600 700 800 900
Base Opt A Opt B


Metro Line Forecast PM Boardings, by Scenario
Southbound
Health Sciences
University Station
Grandin Station
Corona Station
Bay Station
Central Station
Churchill Station
MacEwan Station
Kingsway Station
NAIT Station
Blatchford
132 Av
137 Av
145 Av
Castle Downs
0 200 400 600 800 1000 1200 1400
Base Opt A Opt B


Valley Line Forecast PM Boardings, by Scenario
Eastbound
Mill Woods Stop
Grey Nuns Stop
Millbourne/Woodvale Stop
Davies Station
Avonmore Stop
Bonnie Doon Stop
Holyrood Stop
Strathearn Stop
Muttart Stop
Quarters
Churchill Stop
102 St Stop
Alex Decoteau Stop
NorQuest Stop
MacEwan Arts/112 St Stop
The Yards/116 St Stop
Brewery/120 St Stop
124 St Stop
Glenora Stop
Grovenor/142 St Stop
Stony Plain/149 Street Stop
Jasper Place Stop
Glenwood/Sherwood Stop
Meadowlark Stop
Misericordia Station
West Edmonton Mall Station
Aldergrove/Belmead Stop
Lewis Farms Stop
0 200 400 600 800 1000 1200 1400 1600 1800 2000
Base Opt A Opt B

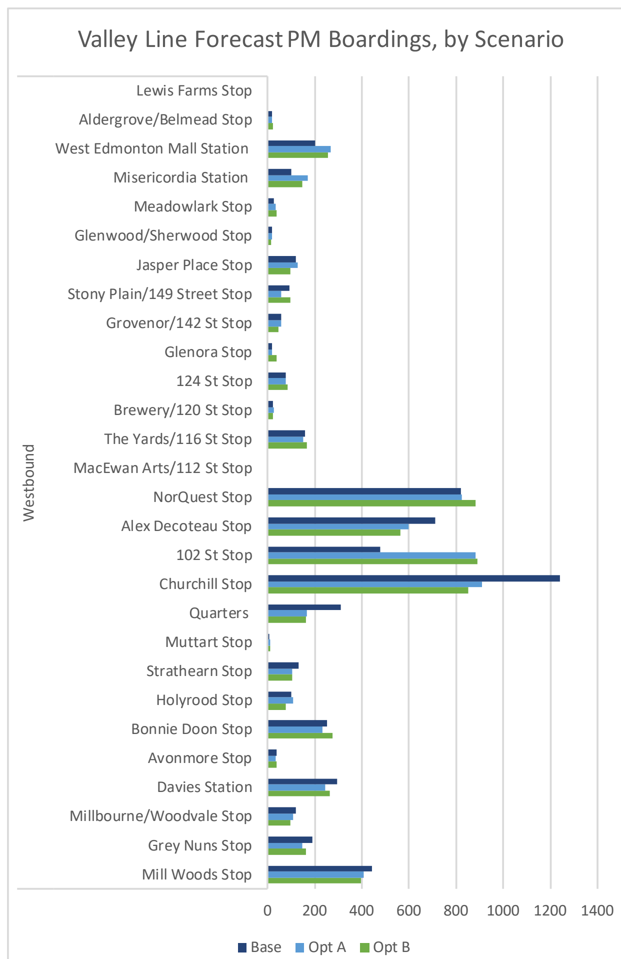
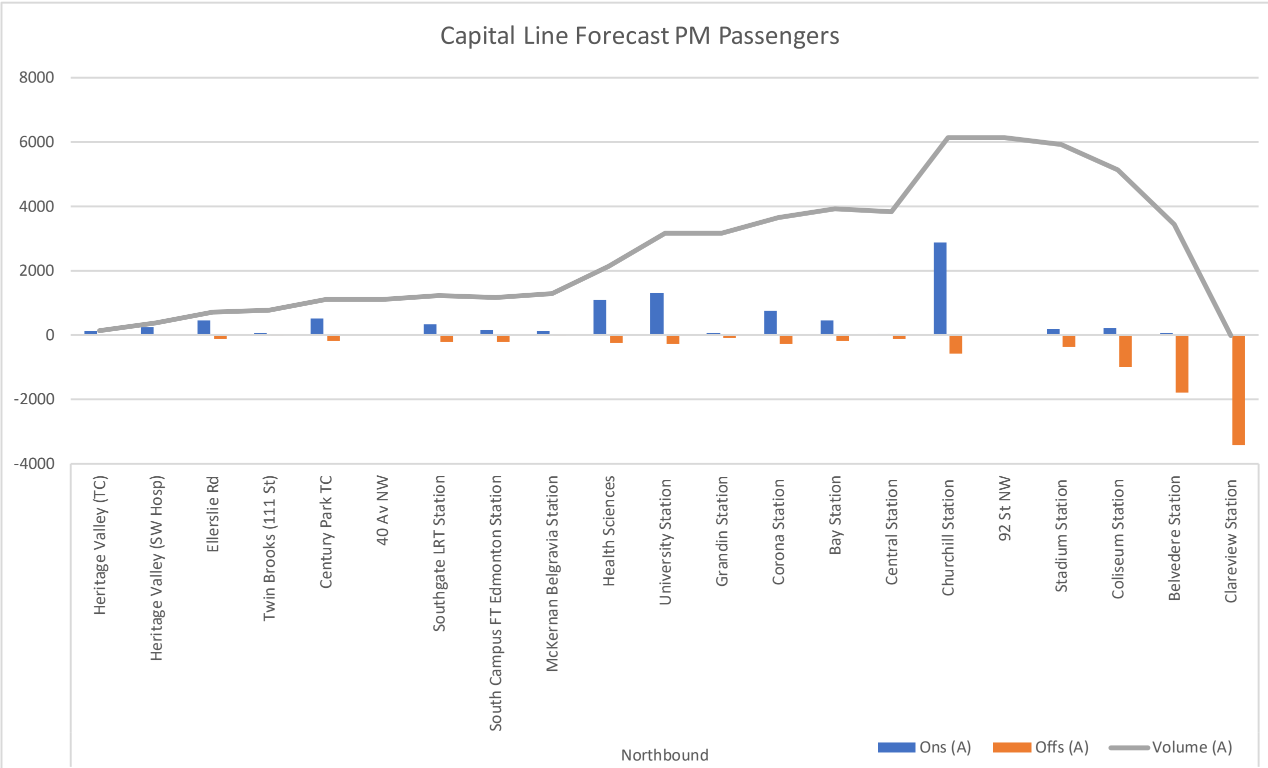
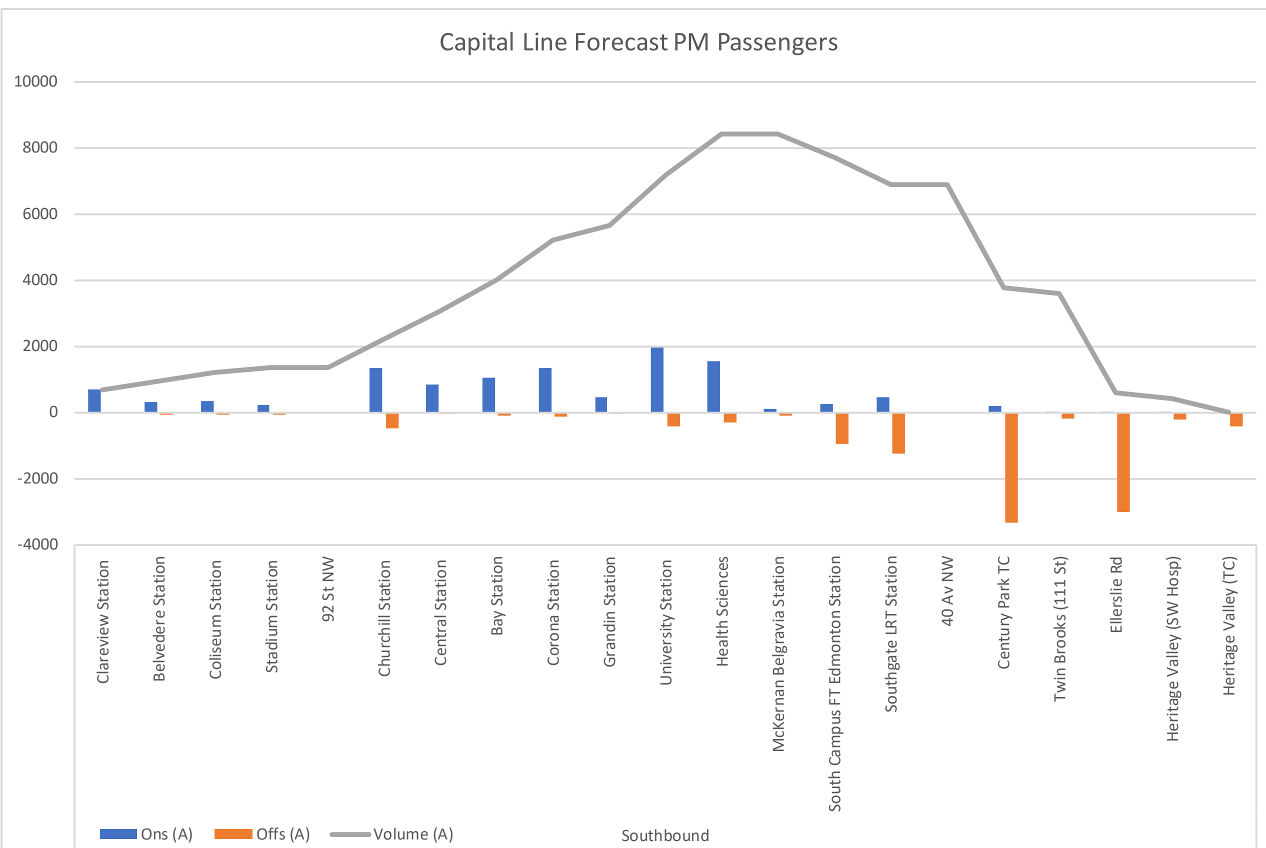
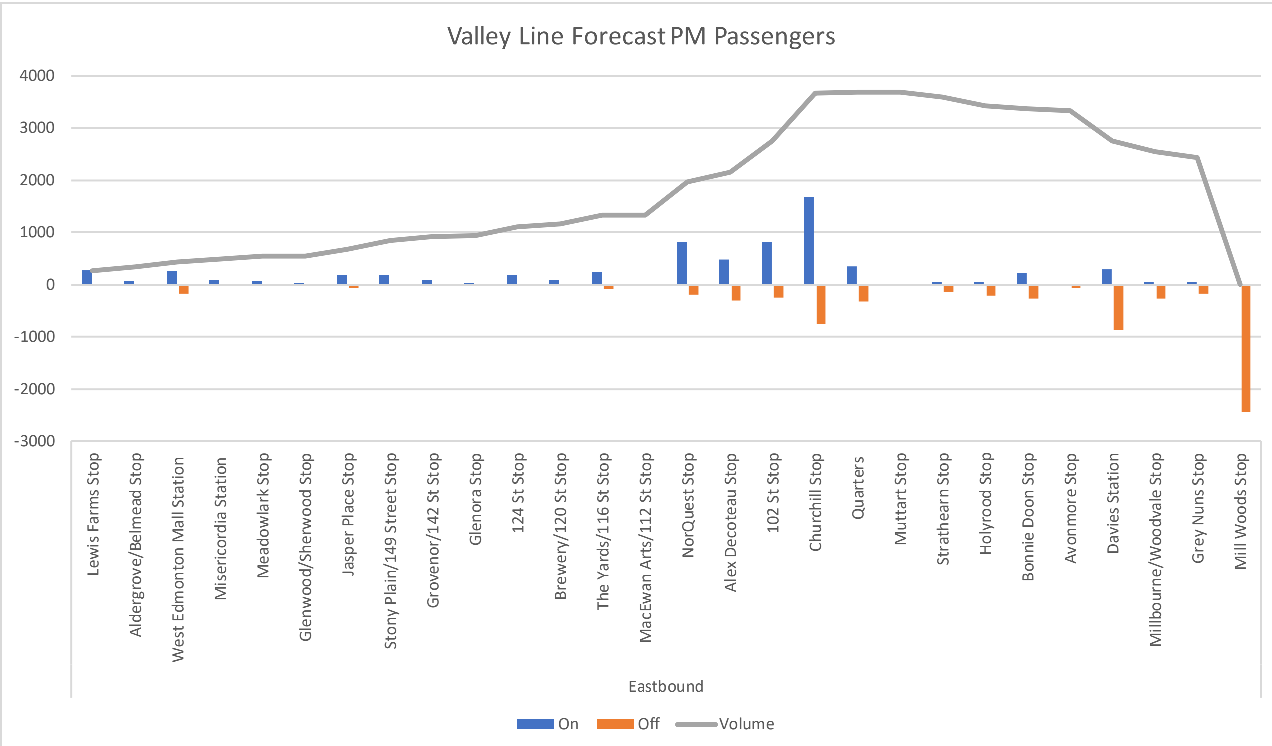
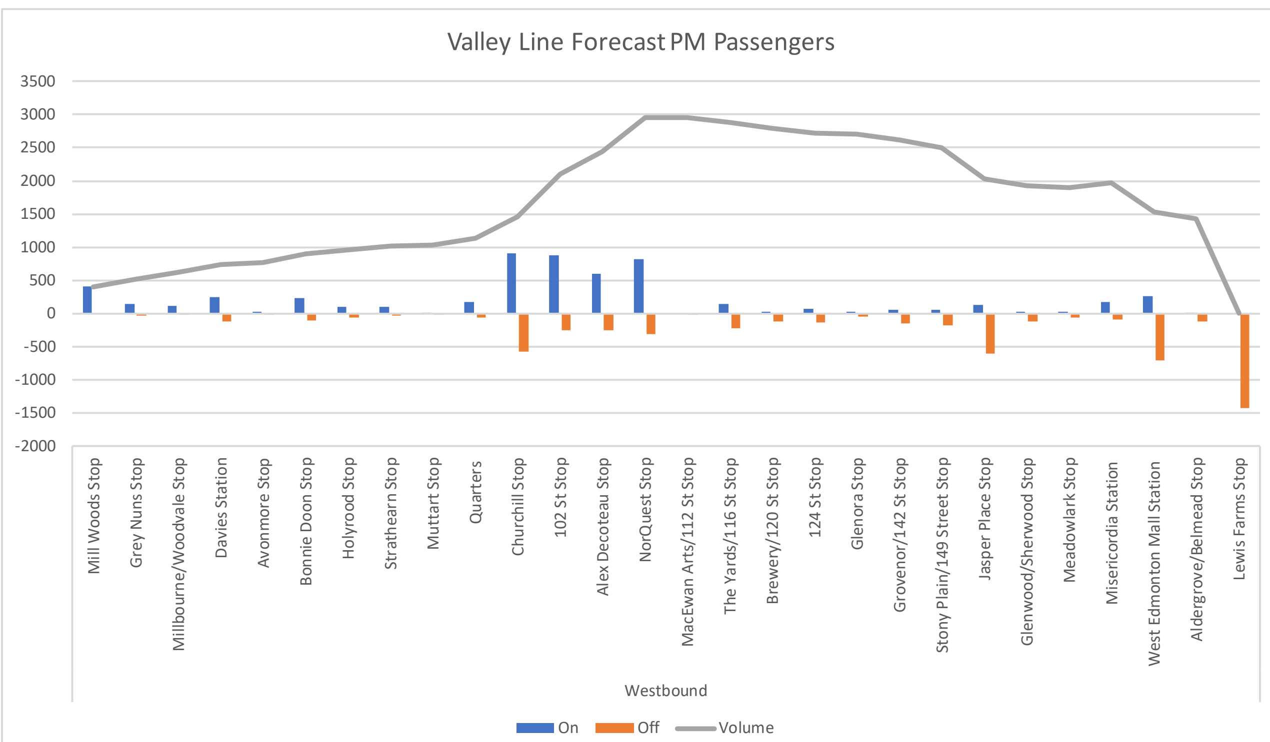

Valley Line Forecast PM Boardings, by Scenario
Westbound
Lewis Farms Stop
Aldergrove/Belmead Stop
West Edmonton Mall Station
Misericordia Station
Meadowlark Stop
Glenwood/Sherwood Stop
Jasper Place Stop
Stony Plain/149 Street Stop
Grovenor/142 St Stop
Glenora Stop
124 St Stop
Brewery/120 St Stop
The Yards/116 St Stop
MacEwan Arts/112 St Stop
NorQuest Stop
Alex Decoteau Stop
102 St Stop
Churchill Stop
Quarters
Muttart Stop
Strathearn Stop
Holyrood Stop
Bonnie Doon Stop
Avonmore Stop
Davies Station
Millbourne/Woodvale Stop
Grey Nuns Stop
Mill Woods Stop
0 200 400 600 800 1000 1200 1400
Base Opt A Opt B

Exhibit A.9– Light Rail Transit Passenger Profiles (PM Peak)






Valley Line Forecast PM Passengers
4000
3000
2000
1000
0
-1000
-2000
-3000
Lewis Farms Stop
Aldergrove/Belmead Stop
West Edmonton Mall Station
Misericordia Station
Meadowlark Stop
Glenwood/Sherwood Stop
Jasper Place Stop
Stony Plain/149 Street Stop
Grovenor/142 St Stop
Glenora Stop
124 St Stop
Brewery/120 St Stop
The Yards/116 St Stop
MacEwan Arts/112 St Stop
NorQuest Stop
Alex Decoteau Stop
102 St Stop
Churchill Stop
Quarters
Muttart Stop
Strathearn Stop
Holyrood Stop
Bonnie Doon Stop
Avonmore Stop
Davies Station
Millbourne/Woodvale Stop
Grey Nuns Stop
Mill Woods Stop
Eastbound
On
Off
Volume


Valley Line Forecast PM Passengers
3500
3000
2500
2000
1500
1000
500
0
-500
-1000
-1500
-2000
Mill Woods Stop
Grey Nuns Stop
Millbourne/Woodvale Stop
Davies Station
Avonmore Stop
Bonnie Doon Stop
Holyrood Stop
Strathearn Stop
Muttart Stop
Quarters
Churchill Stop
102 St Stop
Alex Decoteau Stop
NorQuest Stop
MacEwan Arts/112 St Stop
The Yards/116 St Stop
Brewery/120 St Stop
124 St Stop
Glenora Stop
Grovenor/142 St Stop
Stony Plain/149 Street Stop
Jasper Place Stop
Glenwood/Sherwood Stop
Meadowlark Stop
Misericordia Station
West Edmonton Mall Station
Aldergrove/Belmead Stop
Lewis Farms Stop
Westbound
On
Off
Volume

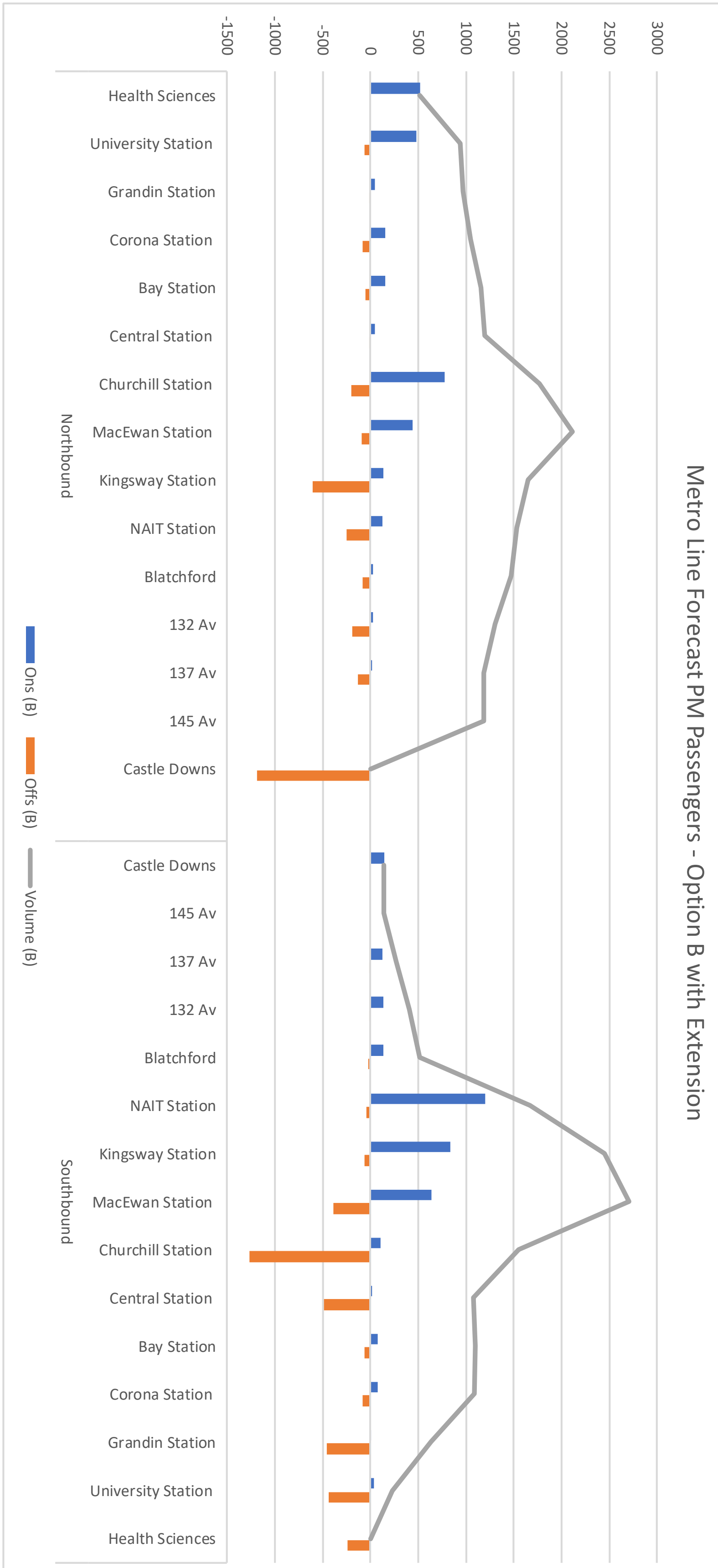

Metro Line Forecast PM Passengers - Option B with Extension
-1500
-1000
-500
0
500
1000
1500
2000
2500
3000
Northbound
Health Sciences
University Station
Grandin Station
Corona Station
Bay Station
Central Station
Churchill Station
MacEwan Station
Kingsway Station
NAIT Station
Blatchford
132 Av
137 Av
145 Av
Castle Downs
Southbound
Castle Downs
145 Av
137 Av
132 Av
Blatchford
NAIT Station
Kingsway Station
MacEwan Station
Churchill Station
Central Station
Bay Station
Corona Station
Grandin Station
University Station
Health Sciences
Ons (B)
Offs (B)
Volume (B)

Exhibit A.10 – Bus Passenger Activity – 97 Street North of 118 Avenue

			B1/B1a		110X		9		Total	
Peak	**Direction**	**Location**	**Board**	**Alight**	**Board**	**Alight**	**Board**	**Alight**	**Board**	**Alight**
PM Peak	NB	97 Street & 118 Avenue	42	43	9	17	16	23	67	83
PM Peak	NB	97 Street & 127 Avenue/128 Ave	43	45			1	71	44	116
PM Peak	NB	97 Street & 132 Avenue	37	36	1	9	1	4	39	49
PM Peak	NB	97 Street & 137 Avenue/Northgate	98	113	54	139	62	73	214	325
PM Peak	NB	97 Street & 153 Avenue	100	536				18	100	554
PM Peak	NB	Eaux Claires TC			8	457	10	279	18	736
PM Peak	NB	Castle Downs Road & 153 Avenue	46	134					46	134
PM Peak	NB	Castle Downs Transit Centre	38	372					38	372
	NB PM Total		404	1279	72	622	90	468	**566**	**2369**
PM Peak	SB	Castle Downs Transit Centre	96	36					96	36
PM Peak	SB	Castle Downs Road & 153 Avenue	72	7					72	7
PM Peak	SB	Eaux Claires TC			105		174		279	0
PM Peak	SB	97 Street & 153 Avenue	18	37					18	37
PM Peak	SB	97 Street & 137 Avenue/Northgate	7	29	57	31	114	38	178	98
PM Peak	SB	97 Street & 132 Avenue	8	2	2	1	4	1	14	4
PM Peak	SB	97 Street & 127 Avenue/128 Ave	54	6			13	6	67	12
PM Peak	SB	97 Street & 118 Avenue	18	2	0	6	6	8	24	16
	SB PM Total		273	119	164	38	311	53	**748**	**210**

B1 operates from Campbell Rd to Century Park

110X operates Eaux Claires to Government Centre; ETS #9 operates Eaux Claires to Southgate

Exhibit A.11– Bus Passenger Activity – Whyte Avenue Corridor/U of Alberta area

Major Services on Whyte/82 Avenue - as modelled			B2		4		8		3-Route Total	
Peak	**Direction**	**Location**	**Board**	**Alight**	**Board**	**Alight**	**Board**	**Alight**	**Board**	**Alight**
PM Peak	EB	Fort Edmonton Park Road & Fox Drive		0	-	-			0	0
	EB	Belgravia Road & Fox Drive	28	1	-	1			28	2
	EB	116 Street & Belgravia Road			-	4			0	4
	EB	116 Street & 68 Avenue			-	-			0	0
	EB	South Campus Ft Edmonton Station			47	72			47	72
	EB	113 Street& 65 Avenue			2	43			2	43
	EB	114 Street & 71/72 Ave	3	3	-	1			3	4
	EB	114 Street & 76 Avenue	-	54	0	3			0	57
	EB	114 Street & 82 Avenue/University Dr	0	1	1	0			1	1
	EB	114 Street & 83 Avenue			0	28			0	28
	EB	114 Street & 85 Avenue			-	33			0	33
	EB	University Station			252	6	167	-	419	6
	EB	112 Street & 87 Avenue			0	31	0	17	0	48
	EB	112 Street & 84 Avenue			0	17	-	13	0	30
	EB	112 Street & 82 Avenue/Whyte Ave	129	10	0	1	0	4	129	15
	EB	109 Street & 82 Avenue/Whyte Ave	20	25	-	34	1	26	21	85
	EB	106 Street & 82 Avenue/Whyte Ave			10	46	6	34	16	80
	EB	104 Street & 82 Avenue/Whyte Ave	85	146	2	10	2	7	89	163
PM Peak	**EB Total**		**265**	**240**	**315**	**330**	**176**	**101**	**756**	**671**
PM Peak	WB	104 Street & 82 Avenue/Whyte Ave	33	2	13	6	8	4	54	12
	WB	106 Street & 82 Avenue/Whyte Ave			15	17	9	9	24	26
	WB	109 Street & 82 Avenue/Whyte Ave	17	8	8	3	4	2	29	13
	WB	111 Street & 82 Avenue/Whyte Ave		12	-	11	-	6	0	29
	WB	112 Street & 82 Avenue/Whyte Ave			-	22	-	5	0	27
	WB	112 Street & 84 Avenue			-	30			0	30
	WB	112 Street & 87 Avenue			-	44			0	44
	WB	University Station			133	10	-	5	133	15
	WB	114 Street & 85 Avenue			-	10	-	13	0	23
	WB	114 Street & 83 Avenue			1	0			1	0
	WB	114 Street & 82 Avenue/University Dr	-	1	-	-			0	1
	WB	114 Street & 76 Avenue	3	21	-	0			3	21
	WB	114 Street & 71/72 Ave		1	-	-			0	1
	WB	113 Street & 65 Avenue			4	8			4	8
	WB	113 Street & 65 Avenue			2	26			2	26
	WB	South Campus Ft Edmonton Station			100	9			100	9
	WB	Belgravia Road & Fox Drive	67	2					67	2
	WB	Fort Edmonton Park Road & Fox Drive	1	5	4	0			5	5
PM Peak	**WB Total**		**121**	**52**	**280**	**196**	**21**	**44**	**422**	**292**

EB	Subtotal - Fox Drive/114 Street/U of A	31	59	303	239	167	30	**501**	**328**
	Subtotal - Whyte Avenue (82)	234	181	12	91	9	71	**255**	**343**
								756	671

WB	Subtotal - Whyte Avenue (82)	50	22	36	59	21	26	**107**	**107**
	Subtotal - Fox Drive/114 Street/U of A	71	30	244	137	-	18	**315**	**185**
								422	292

B2 operates from West Edmonton Mall Station to Bonnie Doon Station

ETS #4 operates Lewis Farms to Capilano; ETS #8 operates University to Abbotsfield

Appendix B – Previous Mass Transit Study Reports

Mass Transit Backgrounder

https://www.edmonton.ca/city_government/documents/PDF/CityPlan_MassTransitBackgrounder.pdf

City Plan Mass Transit Scenario Analysis

https://www.edmonton.ca/city_government/documents/PDF/CityPlan-MassTransit_ScenarioAnalysis.pdf

Mass Transit Strategy

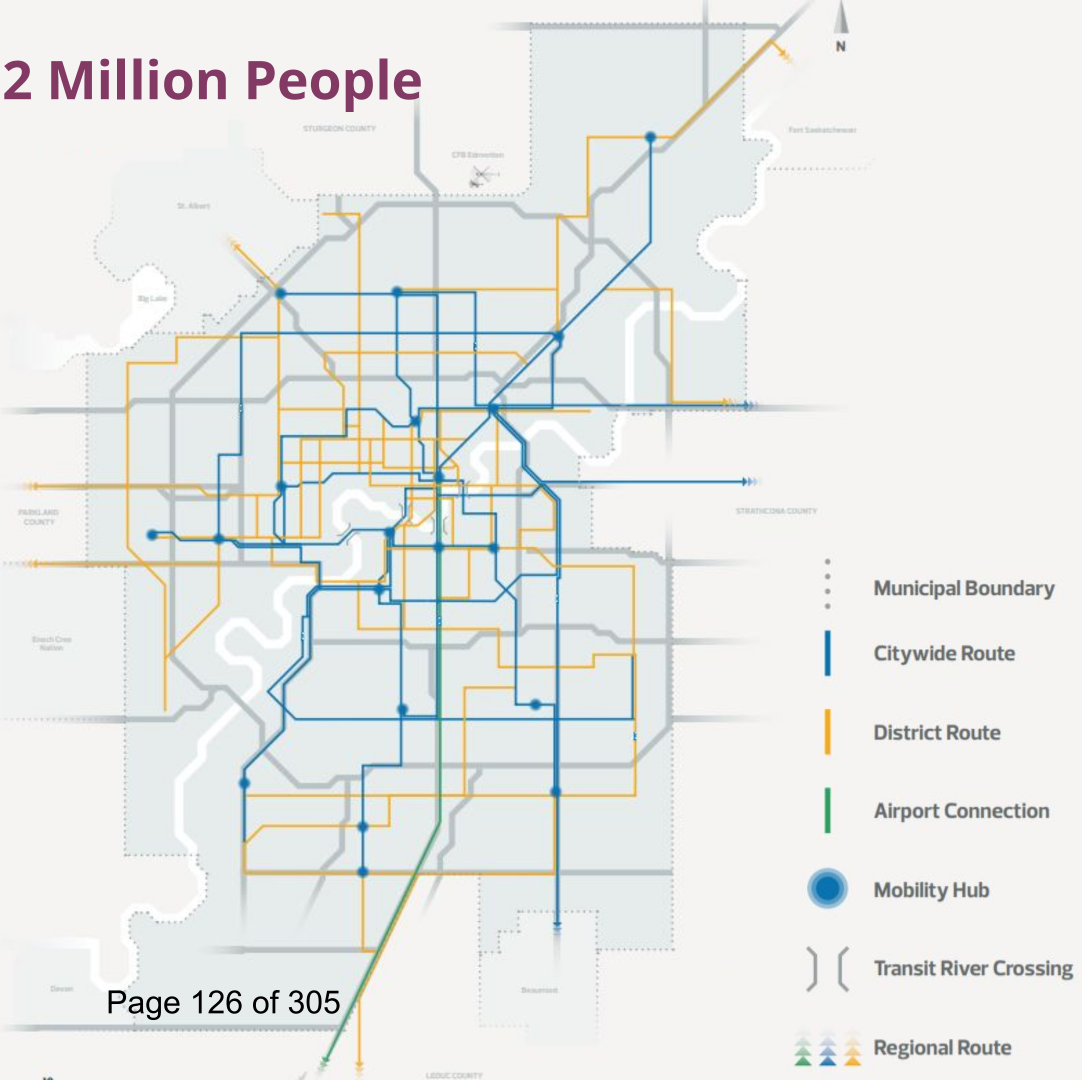
https://www.edmonton.ca/city_government/documents/PDF/CityPlan_Edmonton_Mass_Transit_Strategy.pdf

Mass Transit

Planning for 1.25 Million People

Urban Planning Committee
February 15, 2022

Mass Transit Network for 2 Million People



The City Plan Implementation Approach

	Planning, Policy & Regulation	Process & Service Delivery	Data & Measurement	People, Partnerships & Change Management
Examples	• District Planning • City Planning Framework • Zoning Bylaw Renewal	• Prioritized budgeting • Business planning • Operational service delivery	• Measures and targets • Transparent reporting	• Organizational change management • External relationships and partnership

Edmonton

1.25

1.5

1.75

2 Million

Mass Transit Process for 1.25 Million People

Strategy

Implementation

Design

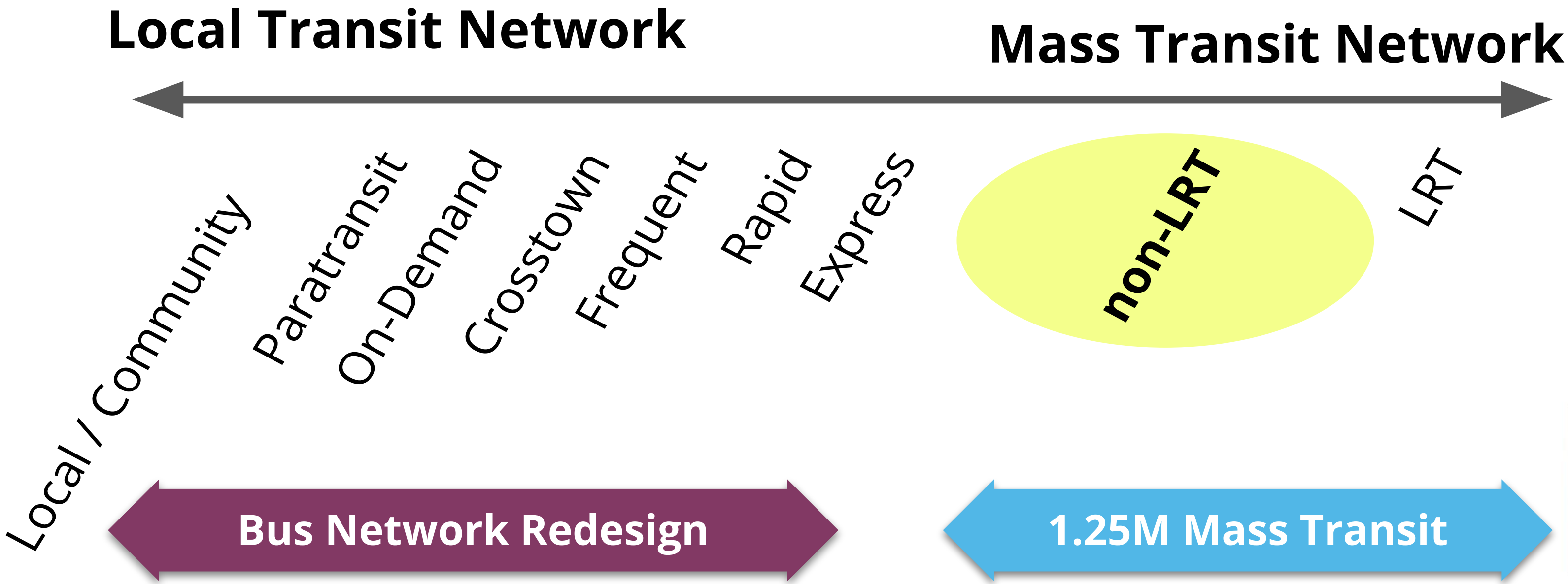
Construction

Operation

Present

Mass Transit in Edmonton

ETS



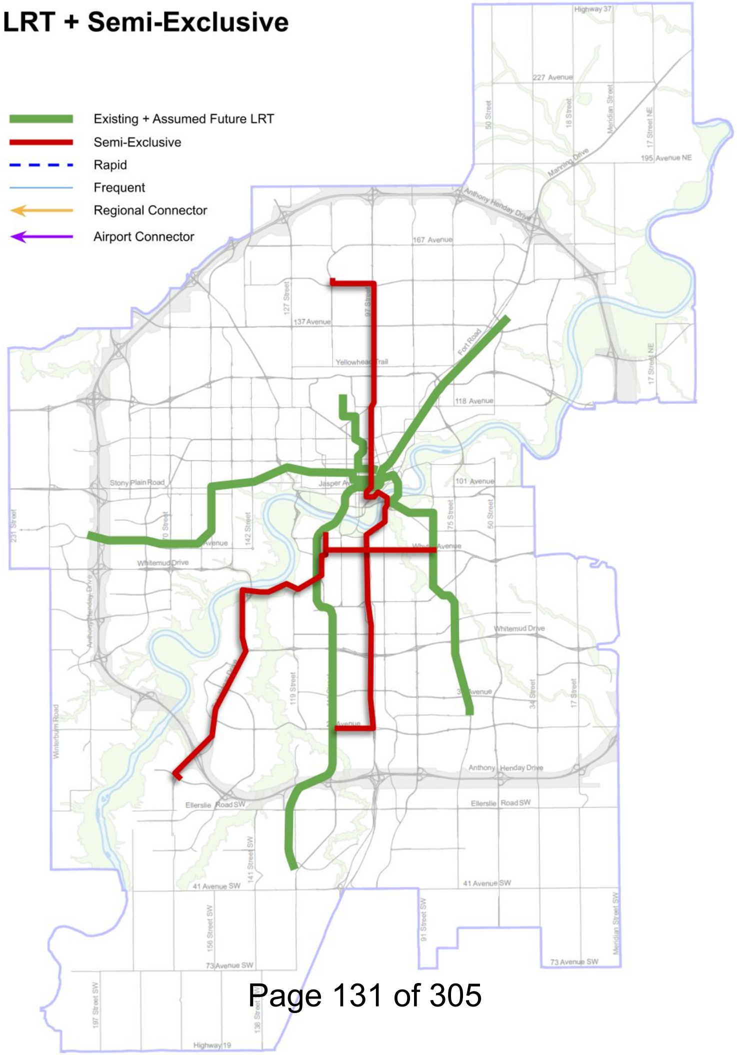
Edmonton

Mass Transit Success Factors for 1.25 Million

1. Mass Transit Priority
2. Future Development Opportunities
3. Filling in Network Gaps + Parallels
4. Parking Policy + Mobility Hubs

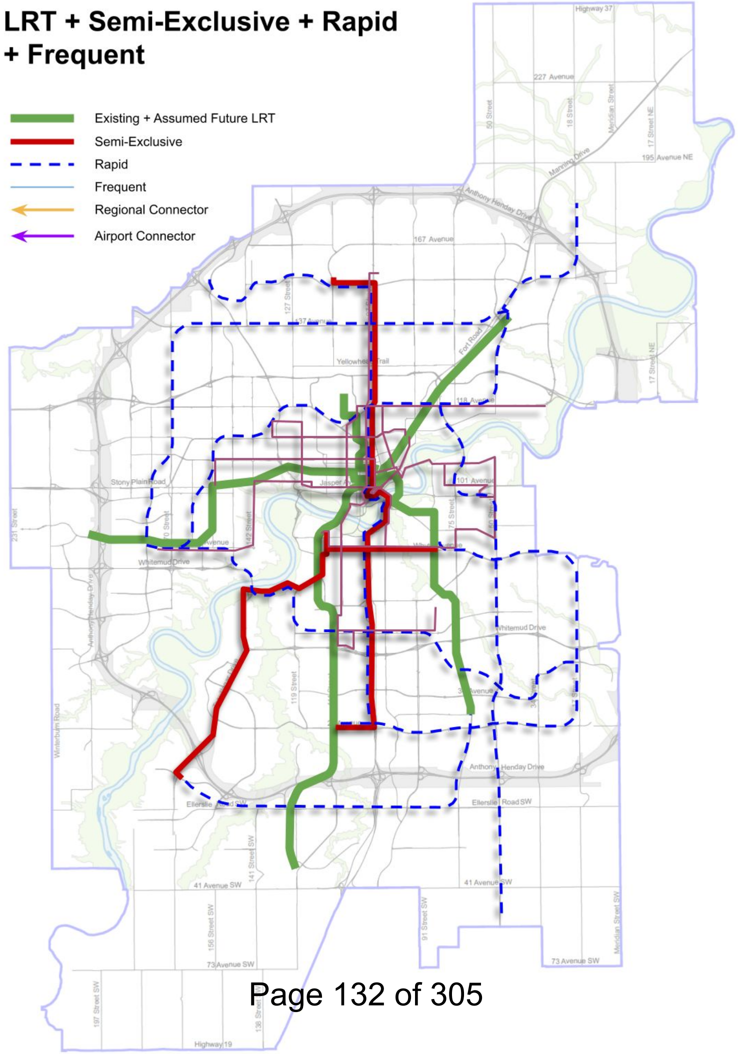
Edmonton

LRT + Semi-Exclusive

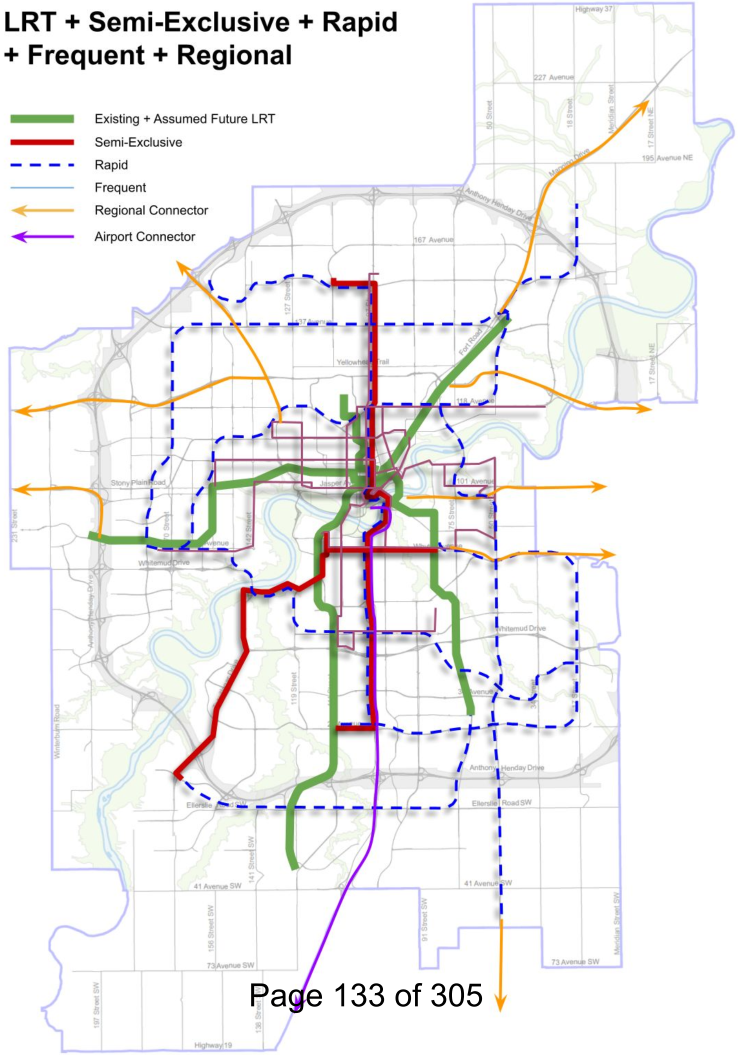


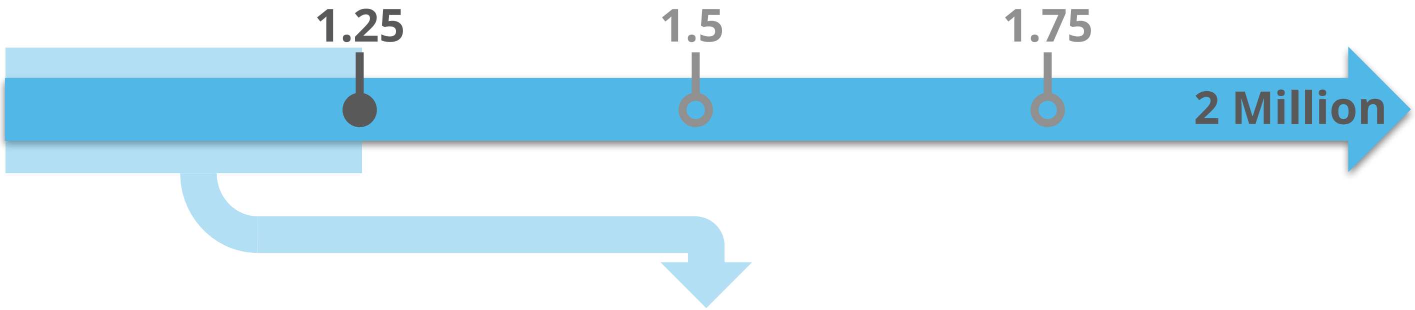
Edmonton

LRT + Semi-Exclusive + Rapid + Frequent



LRT + Semi-Exclusive + Rapid + Frequent + Regional





Mass Transit Process for 1.25 Million People

- Strategy
- Implementation
- Design
- Construction
- Operation

Next Step

Questions & Discussion

COUNCIL REPORT

THE BIKE PLAN IMPLEMENTATION GUIDE

RECOMMENDATION

That the February 15, 2022, Urban Planning and Economy report CR_7889, be received for information.

Report Purpose

Information only.

To inform Urban Planning Committee of the Bike Plan Implementation Guide 2021-2026 and next steps planned by Administration.

Previous Council/Committee Action

At the December 3, 2019, Urban Planning Committee meeting, the following motion was passed:

That as part of the Edmonton Bike Plan: Phase 3 Update, Administration includes a high level analysis from other cities' learnings of the potential economic impact of bike facilities.

Executive Summary

- The Bike Plan Implementation Guide represents one of the elements to advance The City Plan's Systems and Networks.
- The Bike Plan (September 2020) builds on the policy direction outlined in ConnectEdmonton: Edmonton's Strategic Plan and The City Plan. It guides the continued planning and design of a bike network that is accessible and intuitive for both experienced and inexperienced riders, supporting active transportation as an integral part of Edmonton's mobility system.
- A connected network focused on major nodes and corridors is essential to encourage people to use bikes, to make it safe for those who do bike and to attract and retain people and employers who are looking for an urban lifestyle. In addition, from a climate perspective, a connected network is key to achieve the City's goals by supporting a viable low carbon alternative to the personal vehicle.
- The Bike Plan Implementation Guide 2021-2026 focuses on five areas of implementation:
    - Implementation Resources and Timelines
    - Project and Program Prioritization
    - Bike Route Planning Process
    - All-Seasons Network

  - Monitoring and Evaluation
- Other considerations outlined include economic benefits of bike facilities (to address the motion made at Urban Planning Committee on December 3, 2019).

REPORT

The City Plan envisions a vibrant and prosperous city with an integrated mobility system that provides all users convenient, safe and inclusive options. As part of this vision, The City Plan provides direction to evolve three integrated mobility networks: active transportation, transit and roadway and goods movement.

The active transportation network, as described in The City Plan, will create opportunities for active mobility through the provision of high-quality infrastructure with an aim to reduce traffic congestion, create better environmental outcomes and improve public health. The Bike Plan (2020) provides a strategic planning framework to support the evolution of the active transportation network. This is achieved by outlining actions that invite Edmontonians to cycle for all reasons, in all seasons.

The Bike Plan Implementation Guide 2021-2026 continues to build on the strategic direction provided in the Bike Plan, outlining actions that pull on the policy, pricing/subsidy, investment, and partnership levers of change identified in The City Plan. The Implementation Guide provides direction regarding Implementation resources and timelines, project and program prioritization, the process to plan and build expansions to the bike network, considerations for an all-seasons network, and monitoring and evaluation.

Importance of a Connected Network

Building a connected bike network is an important part of developing vibrant urban places. These places have a range of accessible and comfortable transportation options that not only help meet the needs of Edmontonians, but can also contribute to the attraction and retention of employers and residents that seek an urban lifestyle. A well integrated city-wide bike network also provides residents with opportunities for recreation, physical activity and a low cost way to get around. Additionally, providing more travel options can reduce the reliance on the personal vehicle, helping the City meet its goals of reducing transportation sector greenhouse gas emissions. The Safe Mobility Strategy found that 87 per cent of bike-related serious injury or fatality crashes happen in locations without bike facilities; providing a network of safe infrastructure for people biking can help the City on the path towards vision zero.

Implementation Resources and Timelines

Table 1 summarizes the length of bike routes to be improved or added to the bike network as outlined in the Bike Plan. The areas noted reflect the different approaches to implementation in the development pattern areas (as outlined in The City Plan, generally describes the area bounded by Anthony Henday Drive). New and improved bike routes within the redeveloping area are anticipated to be completed by the City through capital projects while bike routes in developing and future growth areas (i.e. newly developed or undeveloped areas) will be completed by developers with new construction.

Table 1: Length of Bike Routes to be Improved or Added by Area

Area	Bike Routes to be Added or Improved by Length
Redeveloping Area	408 kilometres
Developing and Future Growth Areas	270 kilometres
TOTAL	678 kilometres

The pace of implementation in the redeveloping area will depend on the amount of funding allocated through the capital budgeting process and funding support from other orders of government. Initial analysis indicates a cost estimate of $12.7 million to $19.1 million (-50 per cent to +100 per cent) per year in order to complete the city funded portion of implementation in the redeveloping area in 10-15 years. This represents a significant increase when compared to previous budget funding allocations for active modes. The timelines and targets associated with Edmonton's Community Energy Transition Strategy would require accelerated implementation of the bike network to be completed by 2030.

The estimated cost does not incorporate changes in operations and maintenance costs and assumes that the bike network will be implemented without coordination with other capital projects. However, Administration will continue to look for opportunities to coordinate with other capital projects such as neighbourhood renewal and roadway renewal. These opportunities allow for greater efficiencies within the delivery of capital programs and a reduced implementation cost compared to the delivery of all bicycle projects individually.

The pace of implementing the bike network in developing and future growth areas will be driven by neighbourhood development. Planning the active transportation network as part of the mobility system in new areas will continue to be part of the neighbourhood planning process in alignment with The Bike Plan and the Complete Streets Design and Construction Standards. The cost associated with implementing the bike network in developing and future growth areas will continue to be required as part of the developer's cost of designing and constructing the roadway and pathway network in a new neighbourhood.

Project and Program Prioritization

The Bike Plan Implementation Guide identifies near term priorities as a starting point for implementation. The near term priorities include 36 kilometres of new and improved bike routes located in areas that generally align with The City Plan's 1.25 million population horizon priority growth areas. The near term priorities can be characterized by the following:

- Increasing the network density near Downtown and south-central areas;

- Continuing to extend the high-quality bike network out from the central areas with a focus on the south-central, west-central and east-central areas; and
- Providing stronger connections to North Edmonton by way of 127 Street, 97 Street, and Fort Road.

Bike Route Planning Process

The bike route planning process in the implementation guide is generally informed by three key inputs:

- **Policy Direction | Why is this project important?**

  Developed on a foundation of extensive engagement with the public, our policies and strategies guide and support the work we do by answering the question: why is this project important?

- **Design | What should we do and what can we do?**

  Translating policy into a project is not always straightforward. Often, there is a tension between policy direction and practical limitations. To appreciate what's possible, the project limitations and constraints must be understood and communicated.

- **Localized Public Engagement | What's important to the community?**

  Localized public engagement is an input to decision making regarding both route location and facility type. However, this input must be considered within a broader understanding of the bicycle network, the principles of the Bike Plan and other City policies.

Processes and case studies are provided in the Implementation Guide to support Administration and the public through various project delivery options.

All-Seasons Network

The Bike Plan Implementation Guide provides some additional discussion regarding the maintenance of Edmonton's all-seasons network, which is a significant part of realizing the Bike Plan's aspiration of inviting people to bike for all reasons, in all seasons. Envisioning Edmonton's all-season network in the Implementation Guide includes reviewing maintenance levels, identifying opportunities to expand the all-seasons network, and identifying financial implications.

Winter maintenance of the bike network is guided by The City's Snow and Ice Control Policy and accompanying operating guidelines. Currently, 38 kilometres of the bike network is prioritized for winter maintenance. The all-seasons network identifies an additional 57 kilometres of prioritized routes as candidates for all-seasons accessibility. Additional operational funding would be required to achieve the proposed levels of service for an expanded all-seasons network. Proposed changes to the all-season network will be a consideration in the management of the Snow and Ice Control Policy and procedure which guides snow clearing of the bike network.

Monitoring and Evaluation

Data collection on cycling in Edmonton provides valuable insight into the state of the network, including an understanding of people's diverse experiences using the network and identifying considerations for future planning and design of bike facilities. Data collection can also help understand overall trends in the mobility system. For example, household travel survey data shows that daily bike trips more than doubled from 25,300 to 54,800 between 2005 and 2015.

Permanent bicycle counters installed in various locations throughout the bike network provide real-time data on the number of users. This data is publicly available through the City's Open Data Portal. Data collection throughout the network can be used to understand the effects of localized improvements and identify trends. For example, local counts showed that the number of bike trips made downtown increased from 2,796 trips daily in June 2017 to 6,501 trips daily in June 2018 after the downtown bike network was installed.

Some of the busiest routes for bicycles include the High Level Bridge, which recorded around 280,000 bike crossings in 2021, and 83 Avenue west of 99 Street which recorded around 205,000 bike trips in 2021. The areas with highest usage have a well connected bike network and higher densities of population and employment. Monitoring usage can help understand how Edmontonians move in different seasons, with counts at the High Level Bridge suggesting that approximately one in six people that cycle during the summer months continue to cycle throughout the winter.

The bike network monitoring program highlighted in the implementation guide provides an opportunity to improve and build upon existing data collection. Metrics related to the bike network should be reported and shared annually to ensure consistency and to inform the Enterprise Performance Management process and help track progress towards the goals identified in The City Plan.

Next Steps

The advancement of bike plan implementation will continue in the following ways:

- Funding allocated for the planning and design of near term priority bike routes during the 2021 Fall Supplemental Capital Budget Adjustment will allow Administration to begin planning and design work on these priorities in 2022.
- Bike network expansion will be evaluated as part of the Mobility Network Assessment, the Community Energy Transition Strategy, the development of the 10 year Capital Plan and recommendations for the 2023-2026 Capital Budget cycle.
- Administration will continue to explore opportunities to expand the bike network through coordination with asset renewal plans and through funding from other sources such as grants.
- Other implementation actions outside of the network itself will be reviewed for alignment with other projects and initiatives to identify opportunities for partnerships and collaboration with internal and external stakeholders.

Economic Benefits of Bike Lanes

Bicycle lanes can bring economic benefits to cities and promote physical activity, serving as one of the more cost-effective approaches to preventative healthcare. To address the motion made at Urban Planning Committee on December 3, 2019, research and case studies from other municipalities across Canada, North America and the world is included in Attachment 2. The findings indicate that bike infrastructure may provide economic benefits including:

- **Physical Activity and Health -** Considering savings in health care alone, the research suggests the economic benefits of bike lanes outweigh the costs; obesity rates are lower in countries that have better bicycle infrastructure.
- **A Shift to Car Lite -** Nationally, spending on transportation is the second highest household expense after housing. Biking provides a low-cost transportation option with an estimated annual operating cost of approximately $350, 20 to 30 times less expensive than the typical cost to operate a vehicle.
- **Boosting Retail Sales -** People who bike and walk to stores tend to spend less per visit than those who arrive by car, but people biking and walking tend to visit more often, resulting in more spending over time.
- **Job Creation -** A larger portion of the costs associated with the construction of pedestrian and bicycle infrastructure tends to be dedicated to labour and salary expenditures when compared to vehicle only infrastructure where a larger portion of the costs are typically allocated towards capital costs like asphalt and heavy equipment. Besides construction jobs, indirect job creation can result from bike manufacturing, retail and hospitality sectors.
- **Increasing Property Values -** Bike paths tend to increase or have no effect on the value of adjacent or nearby properties. However, increases in property values are not seen as a benefit by everybody as bike lanes may, unintentionally, be a tool of gentrification that contribute to housing affordability issues.

COMMUNITY INSIGHT

The Bike Plan is the culmination of two years of engagement with Edmontonians. Through 62 public events, including workshops, pop up events, drop in sessions, surveys and community conversations, more than 11,500 Edmontonians provided feedback about biking in Edmonton. People with many different experiences, perspectives and attitudes participated. Participants included those who are avid cyclists, those who don’t support bike lanes, those who would love to bike more but are too nervous and those who indicated they will probably never ride a bike. All of their comments were considered in the development of the Bike Plan and were summarized in three What We Heard reports completed throughout the Bike Plan project and posted on the City’s website. These insights were also carried forward through to the development of the Bike Plan Implementation Guide 2021-2026.

GBA+

The development of the The Bike Plan included strategies intended to reach and engage with a diverse range of Edmontonians such as targeted workshops and focused community conversations. Learnings from the Bike Plan highlighted the importance of considering all users as part of planning, design, and engagement activities including children, seniors, women, racialized populations, people with low income, people with disabilities, people riding with bike share or scooter share and people moving goods or cargo. Diverse populations may have economic, physical, or social barriers to driving and can experience mobility challenges when they do not have access to perceived safe and comfortable transportation alternatives.

The processes included in the Implementation Guide provide opportunities to incorporate and build upon the learnings of the Bike Plan.

Administration will continue to use equity measures as criteria for prioritizing active mobility projects and the distribution of the all-seasons network.

Administration will also work to identify and address social inequities in the active transportation network and mobility system through the bike route planning process, which includes localized engagement. Considerations for this work include:

- Create awareness of the unique circumstances and needs of the broad, and evolving, range of potential active transportation network users and help project teams to identify and acknowledge their own biases.
- Review project-specific engagement tactics and communications to determine who is typically excluded from participating in engagement activities, what contributes to this exclusion, and identify measures to make engagement more inclusive.
- Understand how specific groups of people move around their neighbourhood and city, what they view as barriers or challenges in the City's mobility network, and what amenities and design features they value.

ATTACHMENTS

1. Bike Plan Implementation Guide 2021-2026
2. The Economic Benefits of Bike Lanes

The Bike Plan

Implementation Guide | 2021 – 2026

February 2021

SHARE YOUR VOICE
SHAPE OUR CITY

Edmonton


EXCEPT
BICYCLES

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winter city

Edmonton can become a place where biking is practical and inviting for people of all ages and abilities and where people can choose to bike for any reason, and in any season. The Bike Plan lays the foundation for a network that is accessible, predictable, and intuitive for both experienced and inexperienced riders and which supports active transportation as an integral part of Edmonton's mobility system.

The Bike Plan (September 2020) provides strategic direction for how the City plans, designs, implements, operates, and maintains bike infrastructure and programs. This Bike Plan Implementation Guide 2021–2026 continues to build on these directions, outlining next steps and processes to building out the bike network and implementing supportive programs and initiatives. Any referenced maps from the Bike Plan are also included in **Appendix A.**

The Bike Plan Implementation Guide 2021–2026 focuses on five areas:

+ Implementation Resources and Timelines
+ Project and Program Prioritization
+ Bike Route Planning Process
+ All-Seasons Network
+ Monitoring and Evaluation

The Bike Plan Implementation Guide 2021–2026 is intended to guide the implementation of the bike network and supporting programs leading up to and through the 2023–2026 Capital Budget. The guidance outlined in this document is based on practices and assumptions associated with bike planning and design in Edmonton. As these practices grow and evolve and assumptions are confirmed, the content in this document should also be updated to ensure that it continues to be applicable and allows Edmonton to be bold in expanding the bike network and initiating and sustaining supporting programs.

The guidance in the document focuses on practices around planning, designing and engaging on bike projects, but is also intended to guide capital programs and budget considerations. As such, the Bike Plan Implementation Guide should be updated prior to each Capital Budget cycle.

1.0 Implementation Resources and Timelines

EDMONTON'S FUTURE BIKE NETWORK

The district connector network (the Bike Plan, Figure 7, page 38) highlights existing and future district connector routes along with existing neighbourhood routes to illustrate connectivity between the neighbourhood routes and district connectors. The majority of future neighbourhood routes are not shown as they will be planned and designed at a local level based on network spacing requirements and input from residents. Potential future neighbourhood routes are identified where they provide continuous biking opportunities across neighbourhood boundaries.

Edmonton's bike network includes different route types including district connector routes, neighbourhood routes and routes in the River Valley (described in the Bike Plan, Section 7.0: The Future Bike Network). The Bike Plan and the Implementation Guide focuses on district connector routes and neighbourhood routes. A detailed version of the district connector network is illustrated in **Figure 1.**

The Future Bike Network Implementation Strategy (the Bike Plan, Figure 10, page 72) indicates the level of planning required for future bike routes. These route types—future bike routes, missing links, substandard bike routes and planned bike routes—also serve as the basis for much of the discussion in this Guide. A detailed version of the future bike network implementation strategy is illustrated in **Figure 2.**

FIGURE 1: District Connector Network (Detailed)

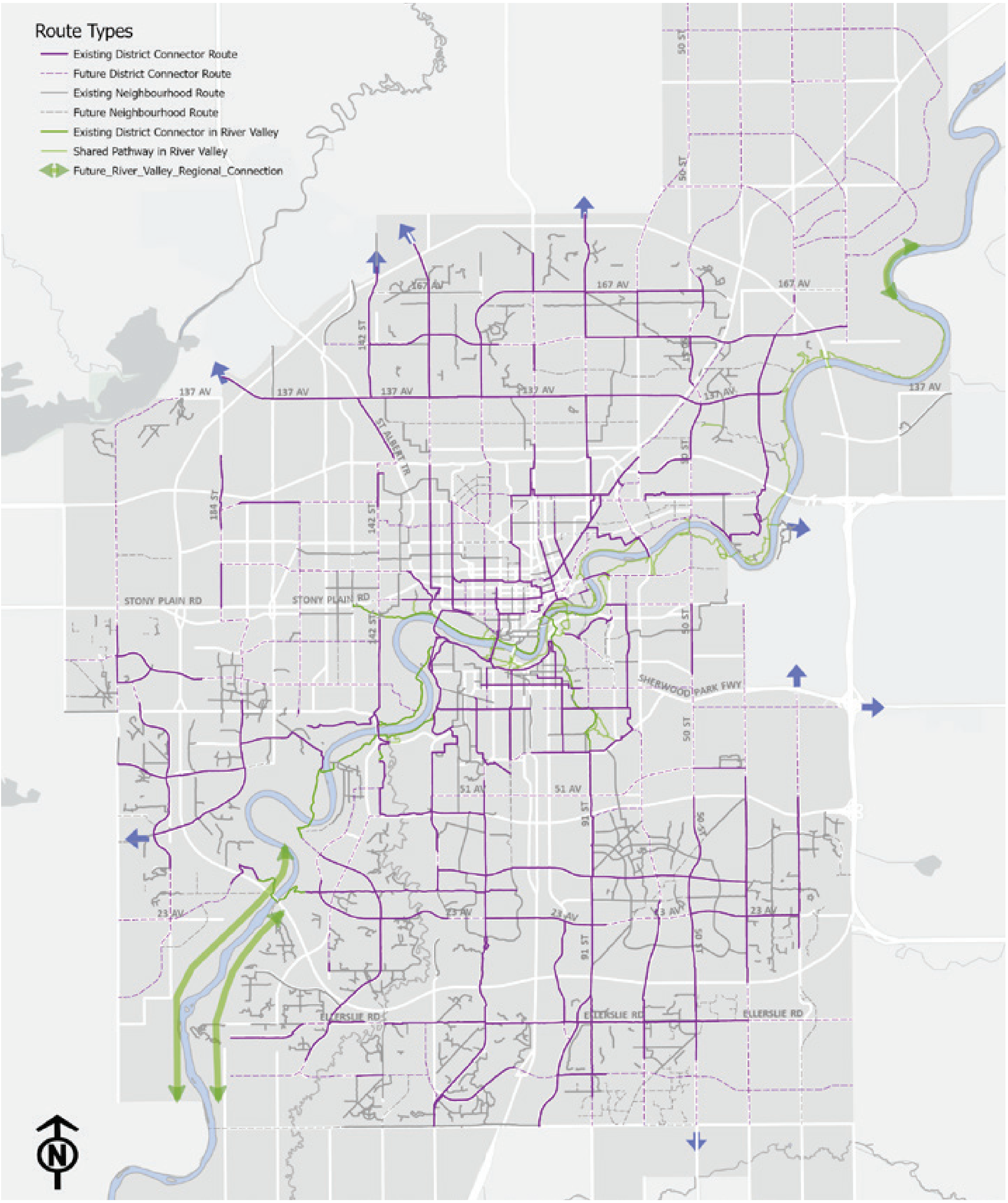
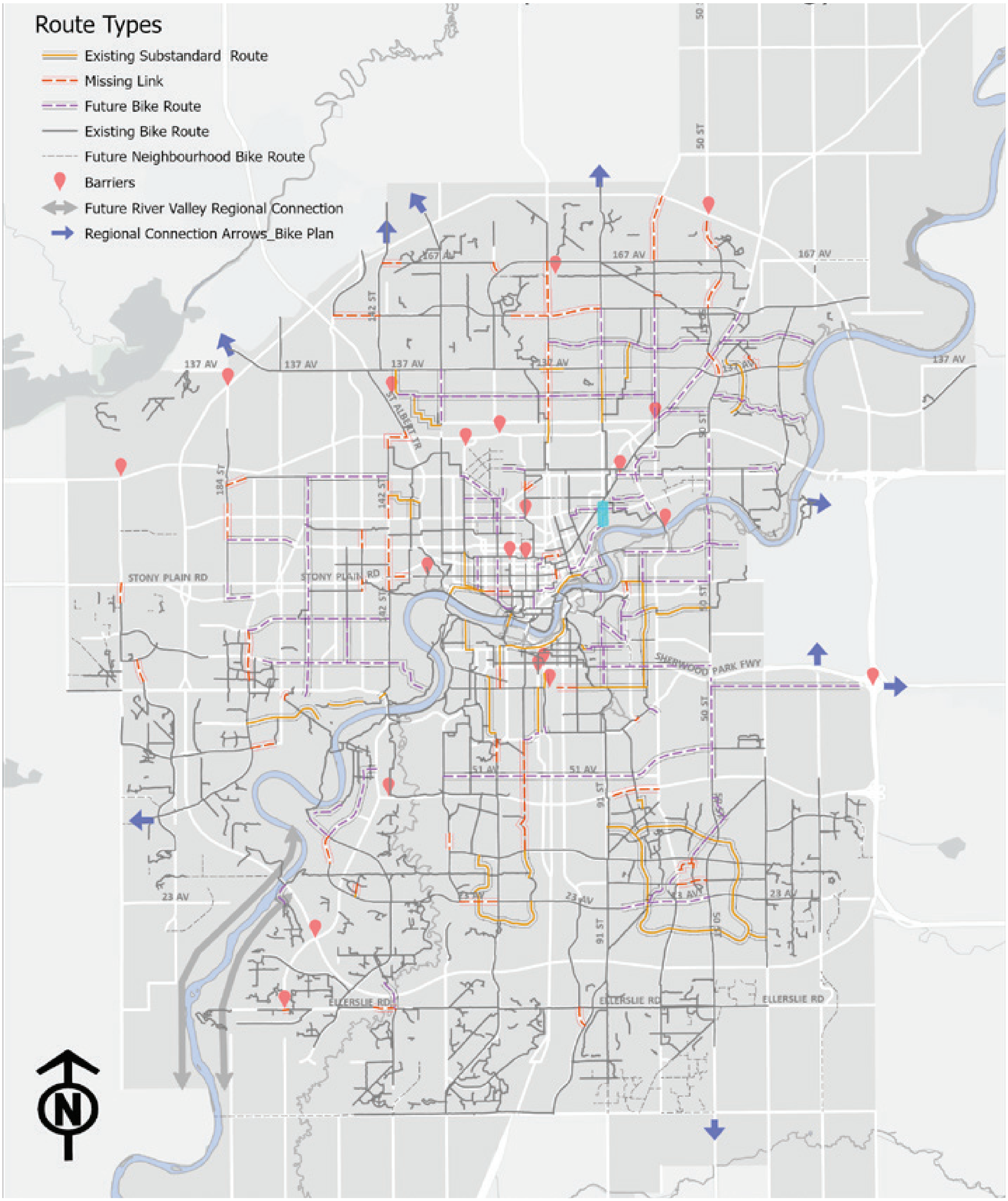


FIGURE 2: Future Bike Network Implementation Strategy (Detailed)



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1.1 How many kilometres of future bike routes are there?

Table 1 summarizes the number of kilometres of bike network additions and improvements that are identified or implied through the Bike Plan. All lengths are considered centreline length.

TABLE 1: Length of Future and Improved Bike Routes Identified or Implied through the Bike Plan

IMPLEMENTATION ROUTE TYPE	DISTRICT CONNECTOR ROUTES (km)	NEIGHBOURHOOD ROUTES (km)	TOTAL (km)
Redeveloping Area			
New Routes			
Future Bike Routes	88	39	**127**
Missing Links	31	10	**41**
Planned Bike Routes	28	5	**33**
New Routes Subtotal	**147**	**54**	**201**
Implied Neighbourhood Routes		151	**151**
Existing Substandard Routes	22	34	**56**
Redeveloping Area Total	**169**	**239**	**408**
Developing and Future Growth Area			
Routes Identified + Implied	120	150	**270**
Future and Improved Routes Grand Total	**289**	**389**	**678**

NOTE THE FOLLOWING ABOUT TABLE 1:

- **Redeveloping areas,** as outlined in The City Plan, generally describes the area bounded by Anthony Henday Drive.
- **Developing and future growth areas,** as outlined in The City Plan, describe the areas of the City which are newly developed or undeveloped. Most of these areas include Area Structure Plans to guide the development of the area and road network.
- **Substandard Routes** are part of the existing network but require improvements to meet the all ages and abilities threshold. Substandard routes were identified through a desktop review. The majority of the substandard routes identified through the Bike Plan are shared street – higher traffic routes plus other routes that are deemed substandard for a range of reasons including below standard pathway widths. The routes identified are not considered a complete list and more may be identified through project-level assessment.
- **Most neighbourhood routes,** such as those located within a single or a small cluster of neighbourhoods located between arterials, may not be identified on the district connector network (the Bike Plan, Figure 7, page 38) given the scope of the Bike Plan as a city-wide strategy. These routes are, however, implied through route spacing, as guided by the Route Spacing and Bike Trip Potential (the Bike Plan, Figure 9, page 41). For the purposes of the order of magnitude estimate, it is assumed that for every 1 kilometre of district connector route, there will be, on average, 1.25 kilometres of neighbourhood routes. This factor of 1.25 is based on the existing split of district connector and neighbourhood routes and applies to both developed areas and ASP areas.

The future bike network includes about 678 kilometres of new and improved bike routes to be added to Edmonton's bike network, of which 270 kilometres are comprised of the future bike network in developing and future growth areas. Considering Edmonton's current urban boundary, the Bike Plan outlines an additional 408 kilometres of bike routes to be added to the current network within the redeveloping area.

FUTURE ROUTES BY AREA

When implementing bike routes, context matters. The urban form of an area influences the alignment and design of a bike route. Some streets, often those in higher density and mature neighbourhoods, may have more constrained rights-of-way and other challenges, such as higher level of crossing control, requiring additional design and construction considerations. It is important that the impact these constraints may have on costs are reflected in the order of magnitude cost estimate.

Future and improved routes are grouped into three location categories:

+ **Central –** Central generally describes higher-density areas in the city in which there are the most competing demands associated with implementing bike infrastructure. Examples of neighbourhoods that exhibit these qualities include Downtown, Oliver and Strathcona.
+ **Urban –** Urban describes an urban form which includes a range of densities and a roadway network that, for the most part, follows a grid pattern. Examples of neighbourhoods that exhibit these qualities include Bonnie Doon, Strathearn, Alberta Avenue and Westmount.
+ **Suburban –** Suburban areas, generally, are lower density neighbourhoods that include meandering collector and local roads, framed by a gridded arterial road network. Bike routes in suburban areas are predominantly provided by way of shared pathways. Bike routes located in the area outside of the Yellowhead Trail–170 Street–Whitemud Drive–75 Street inner loop, including developing and future growth areas, are considered suburban routes.

Table 2 summarizes the length of new and improved bike routes by urban form category.

TABLE 2: Length of Future and Improved Bike Routes by Urban Form Category

IMPLEMENTATION ROUTE TYPE	LENGTH (km)			
	CENTRAL	URBAN	SUBURBAN	TOTAL
Future Bike Route	8	53	66	**127**
Missing Link	2	11	28	**41**
Planned	0	12	21	**33**
Substandard	8	10	38	**56**
Implied Neighbourhood	10	40	101	**151**
Developing and Future Growth Areas	0	0	270	**270**
Total	**28**	**126**	**524**	**678**

As summarized in Table 2, of the approximately 678 kilometres of new and improved bike routes, about 28 kilometres are located in the central context, about 126 kilometres are located in the urban context, and about 524 kilometres are located in the suburban context.

1.2 How much will it cost to expand the network?

In order to continue to grow Edmonton's bike network and improve biking through program initiatives, resources will need to be allocated to bike-related projects. An order of magnitude cost estimate provides a sense of the cost and level of effort required to implement the Bike Plan; as projects are initiated, more detailed cost and resource estimates will be prepared.

Given the flexibility afforded in the Bike Plan in terms of route alignment and facility design, the cost of the network cannot be assessed by simply adding the cost of each, individual bike route. Instead, blended unit costs for each urban form category have been developed and applied to the length of future and improved routes for each area by implementation route type. The blended unit costs developed for each implementation route type are based on context-specific unit costs for a range of bike facilities, in addition to the relative mix of bike facilities likely to be constructed in each context.

Table 3 summarizes the blended costs for each implementation route type by urban form category. The blended unit costs generally include all construction materials (e.g,. asphalt, concrete for medians, lane markings, and signs), signalization (for facility types where it has historically been required such as protected bike lanes) and transit stop. Costs associated with more substantial remedies needed to accommodate / improve a bike connection (e.g., bridge maintenance or upgrades) are not considered as part of the estimate. All blended costs are rounded to the nearest $10,000 while all total costs are rounded to the nearest $100,000. These costs represent the capital costs to construct bike lanes and do not include maintenance costs. Note that inflation is not factored into these costs.

TABLE 3: Bike Network Cost by Area

AREA	LENGTH (km)	BLENDED UNIT COST (PER km)	TOTAL COST
Central	28	$650,000 to $790,000	**$20,000,000**
Urban	126	$500,000 to $720,000	**$73,300,000**
Suburban			
Redeveloping Area	254	$365,000 to $495,000	$97,500,000
Developing and Future Growth Areas	270		$115,700,000
Suburban Subtotal	**524**		**$213,200,000**
TOTAL	**678**		**$306,500,000**

The expansion of the bike network is anticipated to cost in the order of about $306,500,000, of which, $115,700,000 is associated with implementing the bike network in the developing and future growth areas, a cost that will be predominantly borne by developers. The cost to implement bike routes within redeveloping areas, a cost predominantly borne by the City, is $190,800,000. As previously noted, these costs represent capital costs and do not include maintenance costs.

FUNDING AND DELIVERY METHODS

The network costs are based on the assumption that the bike network will be implemented as stand-alone, retro-fit projects; however, many bike route projects are implemented through a range of delivery methods including roadway and neighbourhood renewal, and other capital projects. One of the key bike route delivery methods is roadway and neighbourhood renewal projects, where the costs of the bike and other active transportation infrastructure (e.g., shared pathways) is often covered, in part, by the growth component of the project budget. Growth is investment in new assets (or projects) that enhance existing infrastructure by adding functionality. Enhancing infrastructure through growth provides an opportunity to deliver new infrastructure and/or improve the existing infrastructure for a lower cost than if the project was to be considered on its own.

+ + + +

The bike network is implemented through a range of delivery methods and requires funding approaches beyond the growth component.

+ + + +

In recent years, most new bike routes have been implemented through the growth program. However, this approach may not be sustainable as bike infrastructure is just one of the competing interests for the limited growth funding available and it may not be possible to implement extensive bike infrastructure within the current growth limits. In addition, implementing the future bike network predominantly through these methods leaves some gaps in terms of delivering a connected network that accommodates riders of all ages and abilities. For example, when routes are constructed along an arterial or through a neighbourhood, project limits may prevent a proper connection to the existing network.

One approach to mitigate these gaps is to initiate a capital profile to augment existing funding to find efficiencies in delivery, similar to active transportation profiles previously relied upon. Initiating a capital profile for bike network construction and improvements can support the implementation of the bike network by:

+ Aligning with engagement, design and construction processes driven by reconstruction, renewal and micro surfacing projects to develop a more complete network more efficiently and quickly. In some cases, the additional funds may augment renewal projects by providing necessary engagement opportunities.

+ Better facilitating spot or link additions and improvements to the network (such as improved crossings or filling in missing links), particularly in areas where other delivery methods such as roadway reconstruction or neighbourhood renewal is not available to support implementation.

One risk associated with this approach is solely relying on the capital profile rather than using it to augment capital projects. This may lead to competition amongst projects and, depending on the size of the capital profile, certain improvements not receiving funding, resulting in lost opportunities to construct the bike network as part of other capital projects. The most efficient way to construct future bike routes is to leverage opportunities to align with other capital projects, but not having to solely rely on those opportunities.

In terms of implementing the bike network in the growth and future development areas, Edmonton's Complete Streets Design and Construction Standards will guide how the roadway network is designed in these areas. Assuming that bike routes are incorporated into the design of the roadway network, these costs will be included as part of roadway construction, which is typically the responsibility of developers.

Funding for projects that will address barriers are not included in the order of magnitude cost estimate (Table 3). Given that these projects generally represent significant capital projects (such as a bridge), the need for them is often driven by another project, such as LRT. Barriers are simply noted to ensure that if there are changes in infrastructure, accommodations for bicycle traffic should be included to remove the barrier.

1.3 Implementation Timelines

THE CITY PLAN

The City Plan outlines how growth and change will occur city-wide but higher anticipated residential unit growth and higher density development will occur in the redeveloping area and, in particular, at nodes and along corridors. The development and redevelopment mix for housing more people within the current urban boundary means that more than 35 per cent net housing unit growth is anticipated to be realized through redevelopment for 1.25 million people. For 1.5 million people, 50 per cent net housing unit growth is anticipated to be realized through redevelopment. Focusing growth on redevelopment will require more efficient use of the land resources in Edmonton and will involve welcoming more people into areas that are already well served by mobility infrastructure such as the bike and active transportation network.

\+ + + +

As residential growth begins to reflect the shift in development outlined in The City Plan, the district connector network will serve as the base future bike network to allow for additional bike routes to be constructed in redeveloping areas, increasing network density to respond to growing demand.

\+ + + +

Although some specific locations in the city will see higher and more concentrated levels of development, it is anticipated and necessary that growth continues to happen throughout the entire city. Alongside the anticipated growth in all areas of the city, different types of activation will be initiated by the City to support intentional growth. In terms of the bike and active transportation network, it means investment in developing capital programs and completing related design concepts to construct the city-wide district connector network. As residential growth begins to reflect the shift in development outlined in The City Plan, the district connector network will serve as the base future bike network to allow for additional bike routes to be constructed in redeveloping areas, increasing network density to respond to growing demand.

Strategizing for 1.25 million people also means building momentum through advanced preparation and strategy development by completing technical studies, preparing business cases, developing area network plans and/or advancing other planning and funding strategies.

ENERGY TRANSITION STRATEGY

Implementation timelines for the Bike Plan are also connected to the *Energy Transition Strategy.* The *Energy Transition Strategy* outlines how we achieve the transformational change to a low carbon city as outlined in ConnectEdmonton and The City Plan.

Edmonton still has one of the highest per capita greenhouse gas emissions levels in the world (18 tonnes/person) with transportation accounting for 31 per cent of Edmonton's total emissions. The *Energy Transition Strategy* identifies actions to reduce transportation emissions, including building out the active transportation network. The strategy identified that with rapid and significant actions, Edmonton's emissions could be reduced by up to 85 per cent with up to 28 per cent of the reduction coming from transportation.

Increasing and improving walking and cycling infrastructure and offering customized transportation planning is anticipated to contribute in achieving this 28 per cent reduction. Preliminary modelling by the Energy Transition Strategy project team indicates that the district connector network described in the Bike Plan should be fully implemented by 2030. Modelling suggests that between 2030 and 2050, neighbourhood routes should be further expanded to increase the density of the network. Not only would this reduce greenhouse gas emissions, it would also generate average annual savings of more than 60 per cent of the average annual investment through avoided health care costs associated with inactivity, and savings to Edmontonians on vehicle fuel and maintenance and carbon tax. It would also improve air quality, reduce traffic congestion, and provide safer transportation options to people of all incomes and abilities.

Assuming a 10- to 15-year timeline, the cost to implement the future bike network is anticipated to be in the range of about $12,700,000 to $19,100,000 per year assuming that the bike network will be implemented by way of stand-alone, retro-fit projects. Numerous planning, design and construction efficiencies can be realized by implementing the bike network through the delivery methods associated with roadway and neighbourhood renewal and other capital and maintenance projects.

2.0 Project and Program Prioritization

Given the scope and breadth of the Bike Plan, funding and resources will not allow building the entire future network and implementing all program area actions at once. Instead, both network improvements and program area actions will be implemented over a period of years. The prioritization process aims to guide which actions should be implemented first to realize the objectives of the Bike Plan as quickly and effectively as possible.

The decision-making process to identify high-priority actions relies heavily on the alignment of each program area action or bicycle route in the network with the aspiration and values of the Bike Plan. The prioritization also integrates considerations of how effective each potential investment is in "moving the needle" towards the objectives of the Bike Plan while taking into account project dependencies and opportunities. The exercise relies both on quantitative analyses and judgment.

2.1 Bike Route Prioritization

Building out Edmonton's complete bicycle network will require a series of projects and interventions over time. The network prioritization process will determine which projects should be implemented first, a critical task to ensure the objectives of the Bike Plan can be realized in a timely and effective manner. The network prioritization process was completed in two stages, a preliminary assessment and a refined assessment. This process was documented to serve as both a record of what was done and provide a framework and guide for future bike network prioritization exercises.

The Bike Plan identifies close to three hundred network segments needing attention including future bike routes, substandard routes and missing links. All links are valuable to the network and prioritization is not a listing of what's important and not important. Rather, the prioritization helps to guide how the network should grow to best provide a connected, city-wide network recognizing that not all routes can go in at once. Identifying near-term priorities is not intended to limit future projects to only the routes highlighted. The implementation of bike routes that are not identified as near-term priorities may occur through opportunities presented by other projects through renewal and reconstruction.

The aspiration, values and network principles outlined in the Bike Plan are used to guide the prioritization of network projects. Specifically, the prioritization relies on four main considerations:

1 Equity

Equity is one of the values of the Bike Plan. Analysis of equity considerations such as age, gender, race, ethnicity and household income was completed as part of the Bike Plan. Household income was most strongly associated with a disproportionate exposure to crashes and lack of bicycle facilities. Giving higher priority to projects located in low-income neighbourhoods ensures the new infrastructure prioritizes access for historically disadvantaged individuals where safe transportation options may be lacking and affordable transportation is particularly important.

2 Ridership Potential

Not all areas of the city are likely to generate the same level of bike trips. Areas with a higher concentration of people, jobs, schools, and shopping are more likely to see cycling activity. The Bike Trip Potential map (the Bike Plan, Figure 6, page 30), illustrates the ridership potential, highlighting which high-quality bicycle infrastructure projects should be prioritized because they are more likely to generate and support higher cycling demand within today's land use patterns.

3 Safety

Providing a safe environment for cycling is embedded in the Bike Plan. Areas of the city where, historically, more crashes have occurred are given a higher priority as they have a high potential to improve the safety of people cycling. The High Injury Network developed as part of the *Safe Mobility Strategy* was used to assess projects that may address existing safety issues.

4 Connectivity

Connectivity was assessed through the Bike Network Analysis. The Bike Network Analysis provides a rating to measure how accessible key destinations are in each neighbourhood by way of the low-stress bike network. Neighbourhoods that are better connected have a higher Bike Network Analysis rating while neighbourhoods in need of connectivity rate lower. This scoring encourages a focus on projects that are more likely to improve connectivity in disconnected areas.

Higher priority projects were further assessed to confirm connectivity to the existing network and alignment with the nodes and corridors approach outlined in The City Plan. This type of assessment is a manual, visual exercise carried out by the Bike Plan project team. Assessing connectivity at this stage is also an opportunity to prioritize projects based on route dependency and to link projects with other upcoming construction projects (e.g., arterial renewal, streetscape projects, neighbourhood renewal, collector renewal, parks projects).

Figure 3 illustrates the near-term priorities identified through the Bike Plan. These routes are also summarized in **Appendix B.**

Generally, the near-term priorities align with The City Plan's 1 to 1.25 million population horizon priority growth areas and activation approach and can be characterized by the following:

+ Increasing the network density in Downtown and south central areas.
+ Continuing to extend the high-quality bike network out from the central areas with a focus on the south-central, west-central and east-central areas.
+ Providing stronger district connector routes to North Edmonton by way of 127 Street, 97 Street, and Fort Road.

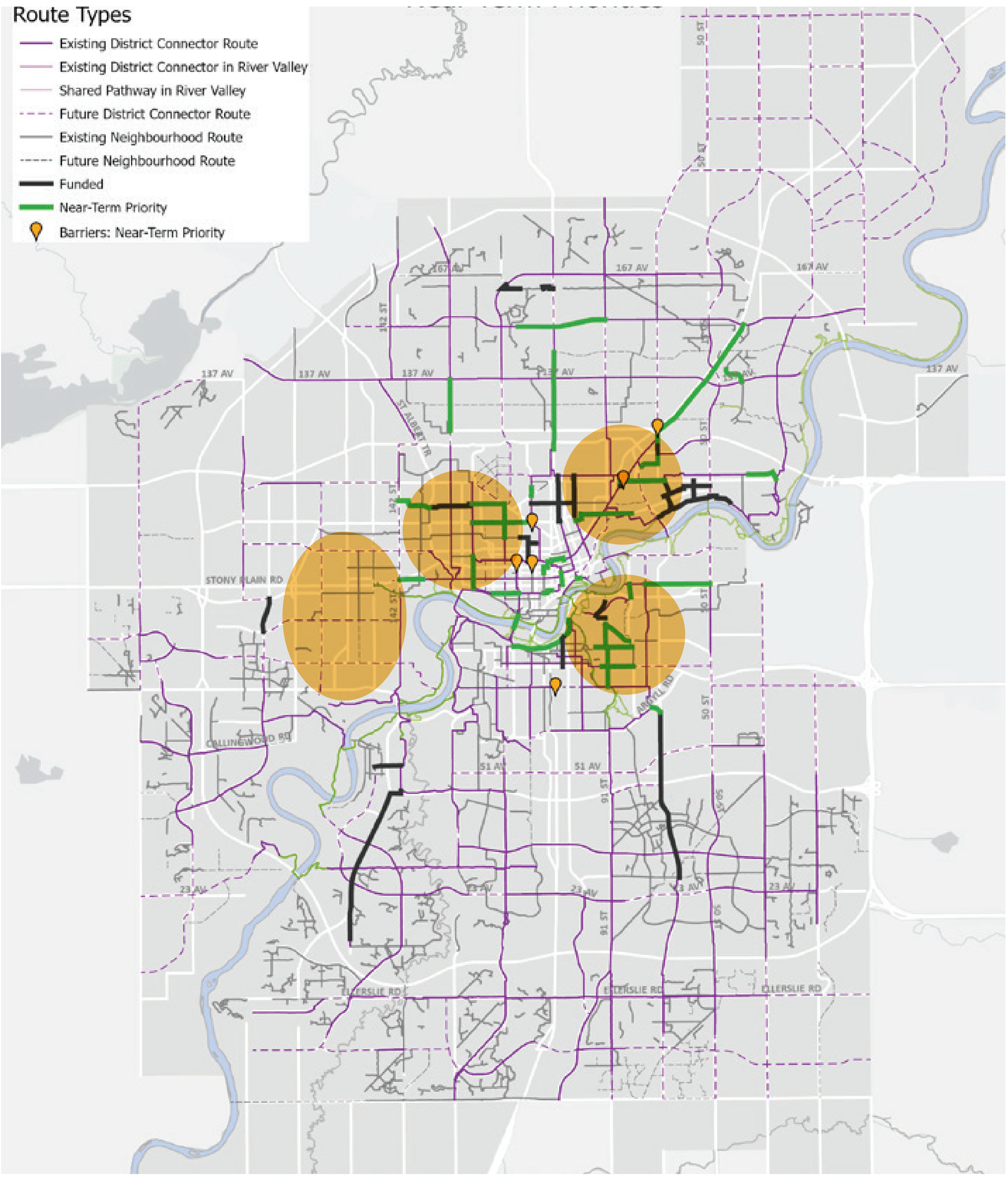
While these projects will be implemented through a range of delivery methods including transit and corridor capital projects, Building Great Neighbourhoods program, and renewal and micro surfacing programs, a cohesive planning framework is needed. While many projects can stand alone, other projects could be grouped together through an area network plan, providing the benefit of a single planning exercise to ensure alignment. Creating area networks for these clusters of neighbourhoods would ensure that planning is consistent and aligned across neighbourhood boundaries, even if individual projects may only be able to deliver discrete portions of the area network. This approach is further discussed in Section 3.

Areas where this approach could be applicable are circled and highlighted in Figure 3. They include:

+ South-central area (Bonnie Doon, Strathearn, Holyrood and Idylwylde)
+ West-central area (Oliver, Westmount, Glenora, North Glenora, Woodcroft and Inglewood)
+ East-central area (connecting areas east, west and north of the Northlands site)

The central-west area (Glenwood, West Jasper Place, Crestwood, Meadowlark Park, Sherwood, Jasper Park and Parkview) includes several future bike routes; however, many of these scored just outside of being deemed near-term priority routes. The City Plan indicates growth for this area from 1–1.25 million people, outlining a "strategize" activation treatment for several nodes and corridors. Strategizing for this area, from a bike and active transportation perspective, means developing an area network plan, completing supplemental technical studies and identifying funding strategies including leveraging opportunities with future capital projects in the area.

FIGURE 3: Near-Term Priority Bike Routes



2.2 Near-Term Implementation Cost

The near-term priority routes include 36.1 kilometers of bike network additions and improvements to substandard bike routes. **Table 4** summarizes the cost of implementing the near-term priority routes by context. The near-term implementation costs were developed based on the same process to develop the network costs.

TABLE 4: Near-Term Priority Implementation Cost

CONTEXT	LENGTH (km)	COST
Central	6.0	$4,400,000
Urban	18.5	$11,400,000
Suburban	11.6	$4,600,000
TOTAL	36.1	$20,400,000

The cost associated with constructing the near-term priority bike routes is anticipated to be in the order of $20,400,000.

2.3 Program Areas Prioritization

While each program area has an important role to play in developing and sustaining a culture of cycling in Edmonton, it is simply not possible to implement all at once. Therefore, this work also needs to be prioritized to better focus implementation.

The nine program areas and associated actions detailed in the Bike Plan all aim to support the aspiration and values in the plan (the Bike Plan, Section 9.0):

+ 9.1 Integration with Transit
+ 9.2 End-of-trip Facilities
+ 9.3 Bike Share and Shared Micromobility
+ 9.4 Wayfinding
+ 9.5 Lighting
+ 9.6 Maintenance
+ 9.7 Education
+ 9.8 Encouragement
+ 9.9 Laws and Policies

Note that each program area is preceded by its section number identified in the Bike Plan for ease of cross-referencing with the Bike Plan.

These nine program areas include 82 actions that are rolled up into 25 action groups. This prioritization is focused on action groups. An example of a program area, action group and specific actions is provided below for clarity.

Program Area	9.1 Integration with Transit
Action Group	9.1.1 Accommodating Bikes on LRT
Actions	(a) Consider initiating a pilot project to allow bikes on the LRT at all times, including weekday peak hours. A pilot project could help to better understand uptake, challenges and consequences by measuring impacts to ridership and collecting feedback from Edmontonians and operators. (b) Review how other municipalities accommodate bikes on LRT trains in terms of seat configurations, boarding requirements, bike placement and supporting equipment.

Two main considerations drive the prioritization of action groups: value and the ease of implementation.

PRIORITIZATION

VALUE

+ alignment with each of the four Bike Plan values
  » Fun and Functional
  » Equitable
  » Urban Vibrancy
  » Culture Shifting
+ potential to increase ridership
+ potential to improve safety

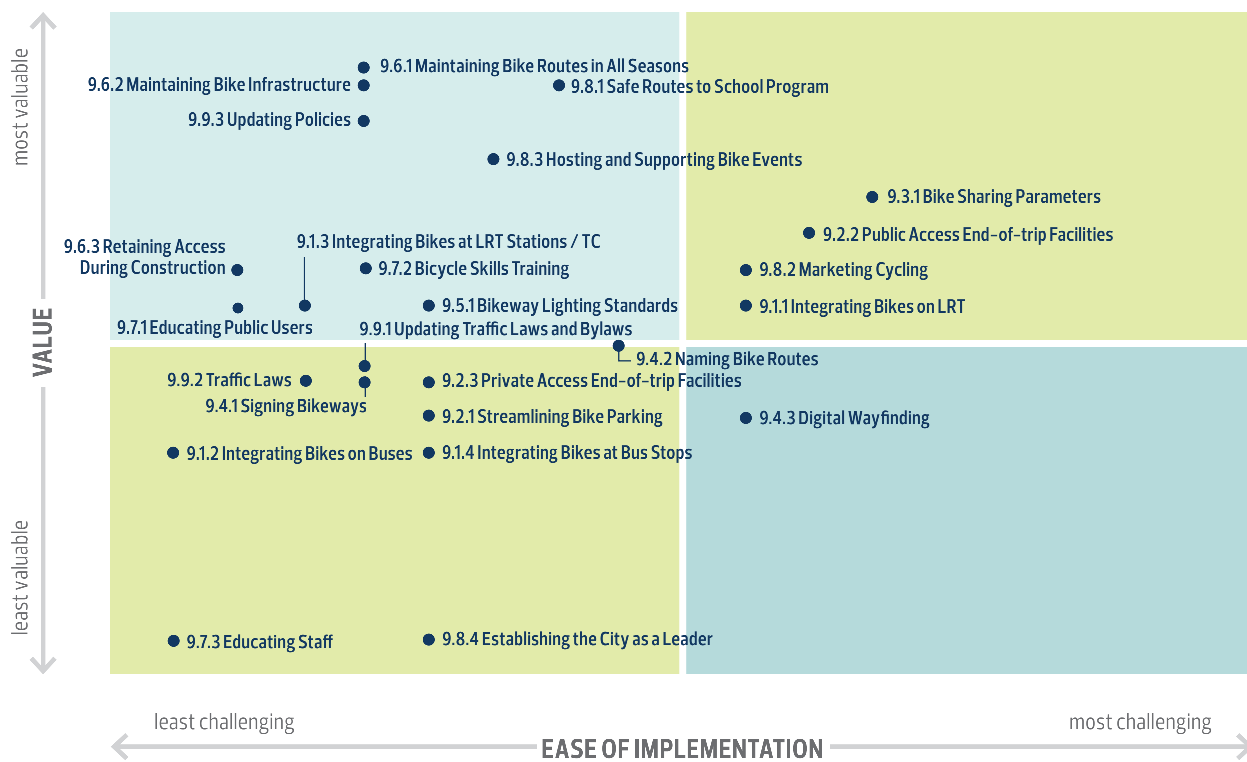
EASE OF IMPLEMENTATION

+ technical difficulty
+ City readiness
+ strategic alignment with existing policies
+ public support
+ estimated relative cost

Under ease of implementation, public support is divided between general support of biking and support from people who bike often based on the feedback provided during the Bike Plan Phase 3 engagement.

Each action group is plotted in a value–ease of implementation prioritization matrix, as illustrated in **Figure 4,** to guide, at a high level, the allocation of time and resources to actions based on their potential benefit.

FIGURE 4: Action Group Value-Ease of Implementation Prioritization Matrix



The highest priority is given to actions that have both a high value and high relative ease of implementation (upper left quadrant). The second highest priority is given to actions that are assessed as having a high value, but for which the implementation is not as easy (upper right quadrant). The third highest priority is given to "low hanging fruit," actions that are relatively easy to implement, but for which the value is not assessed as highly (lower left quadrant). Finally, the last priority goes to projects that have lower value and are harder to implement.

2.4 Assessing Higher Priority Program Areas

The program areas were further assessed to highlight the potential impact that each may have on developing and sustaining Edmonton's bicycle culture. This assessment differs from prioritizing the action groups in that its purpose is to identify those program areas that have the potential to significantly "move the needle". The assessment was completed by a panel of experts with experience in implementing similar plans and initiatives in other cities throughout Canada and the United States, but have not been directly involved in the development of the Bike Plan.

The assessment exercise was first carried out by expert panel members individually. The panel then met to compare outcomes and come to a consensus regarding relative levels of priority between program areas. **Table 5** summarizes the relative ranking of the program areas in developing and sustaining cycling culture.

TABLE 5: Ranking of Program Area Potential to Develop and Sustain Cycling Culture

PROGRAM AREA	RELATIVE RANKING
9.3 Bike Share and Shared Micromobility	high
9.6 Maintenance	high
9.5 Lighting	medium (high)
9.8 Encouragement	medium
9.9 Laws and Policies	medium
9.2 End-of-trip Facilities	medium (low)
9.1 Integration with Transit	medium (low)
9.4 Wayfinding	low
9.7 Education	low

Each of these prioritization assessments are independent. The prioritization of the action groups may outline a more practical approach to implementing the actions while the further assessment highlights the "big moves" needed to develop and sustain a culture of biking in Edmonton. As part of the implementation process, each action should be reviewed further to highlight opportunities, either through partnerships (internally or externally) and/or alignment with other projects, and establish a pathway to completing the action.

3.0 Bike Route Planning Process

There are different types of projects that may include the planning and delivery of bike infrastructure and different levels of route planning completed as part of the Future Bike Network Implementation Strategy (the Bike Plan, Figure 10, page 72). This section provides specific guidance by both project type and route implementation type to help inform how the process might unfold and some of the key planning considerations to be included.

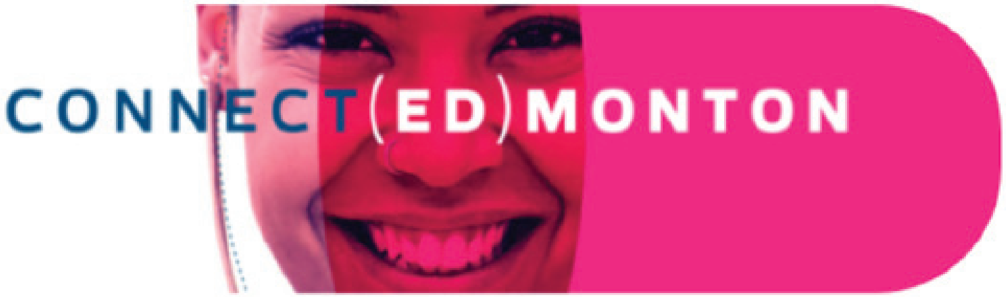
The bike route planning process is generally informed by three key inputs:

1 Policy Direction | Why is this project important?

The City's policy structure, starting with ConnectEdmonton: Edmonton's Strategic Plan and the City Plan, has been designed to advance the vision, guiding principles and strategic goals that align with how people would like to experience and engage with their city. Developed on a foundation of extensive engagement with the public, our policies and strategies guide and support the work we do by answering the question: why is this project important?

The City Plan highlights how active mobility contributes to a high quality of life in cities. Communities that are bike, walk and roll-friendly result in greater joy, fitness and a wider range of transportation options for people and businesses. The provision of high quality bike infrastructure, integrated with public spaces with an aim to reduce traffic congestion, creates better environmental outcomes and improve public health.

The City Plan outlines numerous outcomes, intentions and directions to ensure that Edmontonians live closer to what they need and are supported by active transportation networks and greater connectivity across all travel modes. Those outcomes, intentions and directions serve as the foundation for the Bike Plan and Implementation Guide.



The City Plan

+ What kind of city will Edmonton be in the future?
+ 2 million people
+ The City Plan will replace The Ways documents

The Bike Plan

+ sets the direction for biking in Edmonton
+ future bike network map
+ program areas and actions

The Bike Plan Implementation Guide

+ project prioritization
+ costs
+ monitoring and evaluation

Implementation Projects

+ new bike routes
+ program initiatives
+ additional engagement required

Other strategic documents, such as the Bike Plan, Gender Based Analysis +, WinterCity, Safe Mobility Strategy, the Complete Streets Design and Construction Standards, and the Accessibility Policy (Access Design Guide), build on the direction outlined and provide the steps to achieve that shared vision. The direction provided in the Bike Plan guides how to make biking in Edmonton better from a city-wide perspective by identifying the role of a particular route in the broader context of the network.

While this is a critically important consideration to understand why a project is important, it is complementary to other inputs including design opportunities and constraints and localized feedback from the public and stakeholders.

The section Planning & Design Considerations by Implementation Type provides further guidance as to how the direction outlined in the Bike Plan should be interpreted and applied.

2 Design | What should we do and what can we do?

Translating policy into a project is not easy. Often, there are realities that need to be reconciled between policy goals and practical limitations. To identify what's envisioned, the City's policy must be applied appropriately. To appreciate what's possible, the project limitations and constraints must be understood and communicated. These may include resource limitations, usually identified through the project scope, and right-of-way opportunities and constraints, usually identified by assessing the physical space of the roadway and public realm.

The section Process by Project Type identifies numerous considerations to guide the application of policy and to communicate what's possible for a range of implementation delivery methods.

3 Localized Public Engagement | What's important to the community?

While the City's strategies are developed through extensive engagement, it is important to differentiate between city-wide engagement and project engagement. Engagement at the city-wide level focuses on people's experiences and preferences more broadly to shape the direction and approach in achieving the City's strategic goals. Engagement at the project level provides local context and understanding that is often difficult to incorporate into planning decisions at the city-wide level.

Localized public engagement should be an input to decision making regarding both route location and facility type. However, this input must be considered within a broader understanding of the bicycle network and the principles of the Bike Plan and other City policies. Both types of feedback are necessary to support planning and designing projects, and one cannot replace the other (i.e., city-wide engagement cannot be substituted for localized engagement).

Public engagement best supports informed decision-making when there is a process that considers localized tradeoffs holistically with community needs and desires while ensuring that the solution is safe and aligned with the bicycle network principles.

The section Notes on Localized Engagement for Bike Routes provides engagement considerations to ensure that the input of the public and stakeholders is considered as an essential part of the bike route planning equation.

3.1 Planning & Design Considerations by Implementation Type

The components of the future bike network are identified in the Future Bike Network Implementation Strategy (the Bike Plan, Figure 10, page 72). The identified implementation type for each route provides a starting point in identifying the relevant considerations in the planning and design process. This section requires guidance on what to consider based on the type of bike route. The processes outlined in this section are intended to guide rather than be prescriptive. Each project includes a unique set of circumstances and conditions and the process may have to be adjusted to meet the specific needs of each project.

EXISTING BIKE ROUTES

The existing bike network layer shows bike routes of various facility types that currently exist including a range of facilities from shared roadways to protected bike lanes. The goal of implementing a project along an existing bike route is to verify if the route supports all ages and abilities and considers opportunities for improvement.

Planning considerations for projects incorporating existing bike routes include:

Review Context

Review route type, including traffic volume and speed data. Does the existing infrastructure type meet the requirements of the Complete Street Design and Construction Standards? If no – the existing route should be treated as a substandard route.

Opportunities for Improvements

Consider opportunities for adjustments that will improve alignment with the Bike Plan. Opportunities may include signage/wayfinding, intersection and crossing treatments, upgraded facility types, removal of obstructions to improve sight lines, etc. along the current route. Alternatively, this may include an investigation of potential alternative routes that will provide a similar or improved level of connectivity.

Engagement

Employ opportunities for engagement to review options for improvements and identify any other existing safety/operational concerns to be addressed.

SUBSTANDARD ROUTES

Substandard routes are routes that are currently designated as part of the bike network but do not meet the current City of Edmonton standards. These routes often require upgrades, improvements, or relocation to ensure they are inviting to users of all ages and abilities.

The goal of implementing a project along a substandard bike route is to find a way to ensure that the network connectivity is maintained and enhanced to support users of all ages and abilities.

Planning considerations for projects incorporating existing bike routes include:

Review Context

Review route type, including traffic volume and speed data. Identify any deficiencies in the current design based on the Complete Streets Design and Construction Standard.

Consider Alternatives

Determine if there are alternative facility designs or route options that would provide similar, or improved route connectivity.

Develop Options

Consider alternative facilities along the existing route that would meet current standards and new facilities on alternative routes if applicable. All routes proposed should be technically feasible, and consistent with network principles.

Engagement

Employ opportunities for engagement to review trade-offs and impacts of route improvement options.

Select a Design

With input from engagement, select and implement route and facility type that best addresses community needs, technical requirements, and network principles.

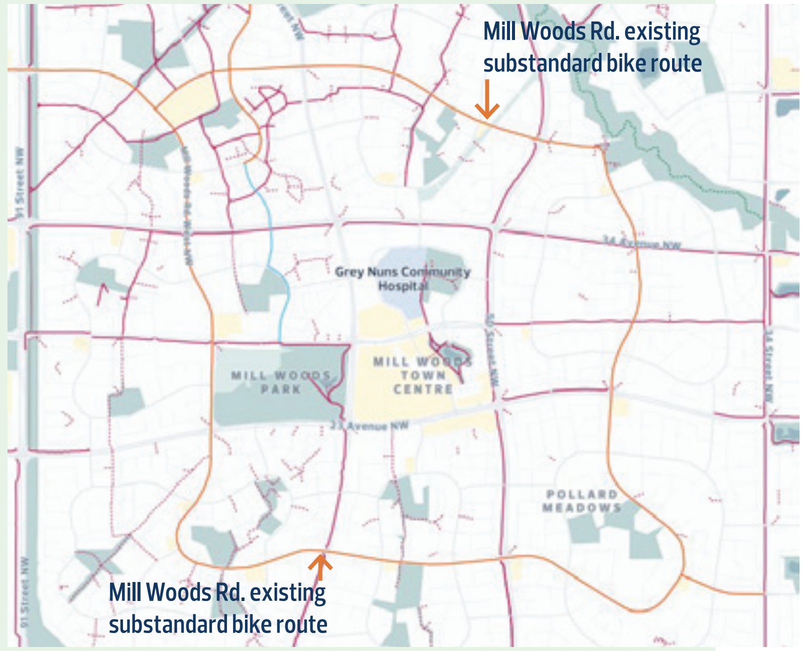
EXAMPLE 1: Project on Mill Woods Road

Mill Woods Road is an existing on-street bike route along a collector road. The route treatment includes a combination of arrows and signage. Due to vehicle speeds and volumes along Mill Woods Road, in addition to poor speed limit compliance along certain sections, it is not in alignment with the direction provided in the Complete Streets Design and Construction Standards and is therefore shown as a substandard route.

Checking traffic volumes shows that most segments of Mill Woods Road have an average of 5,500 to 6,000 vehicles per day. There are existing bus routes along portions of the road, and parking is permitted in some areas. A review of the design and construction standards suggests that a protected bike lane or shared pathway would be required on a roadway with this volume and curbside activity. Design and construction standards should also be reviewed with respect to the current design for other modes such as pedestrian space and lane widths. In this case, the road appears to be wider than necessary, providing an opportunity to consider re-allocation of space.

Mill Woods Road as a bike route provides access to many schools, neighbourhood commercial areas and provides opportunities to cross arterial roadways. Given the circuitous nature of the roadway network in this area, there are limited opportunities to provide alternative routes with the same level of connectivity.

Considering the context and the directions of the design and construction standards, the options to be investigated for Mill Woods Road might include protected bike lanes, raised bike lanes, or a shared pathway (which would also require a review of pedestrian volumes to confirm suitability).



The conceptual trade offs of the redesigned options can be discussed as part of public engagement to confirm the preferred solution for design and delivery.

Given the length of Mill Woods Road relative to other reconstruction projects, it may not be possible, from a coordination or funding perspective, to reconstruct the corridor as a single, stand-alone project. One way to mitigate this challenge would be to develop a plan for the entire corridor, and then construct as neighbourhood renewal is completed throughout the area.

PLANNED ROUTES

Planned routes include any bike-related infrastructure (e.g., shared pathways, on-street bike lanes) that are currently planned or designed through the engineering design process but are currently unfunded and are waiting to be constructed.

The goal of implementing a project along a planned route is to ensure that the engineering design supports all ages and abilities and is integrated with the rest of the bike network.

Planning considerations for projects incorporating planned bike routes include:

Review Context

Review proposed route type, including traffic volume and speed data. Confirm that proposed infrastructure type is in alignment with Complete Streets Design and Construction Standards.

Opportunities for Improvements

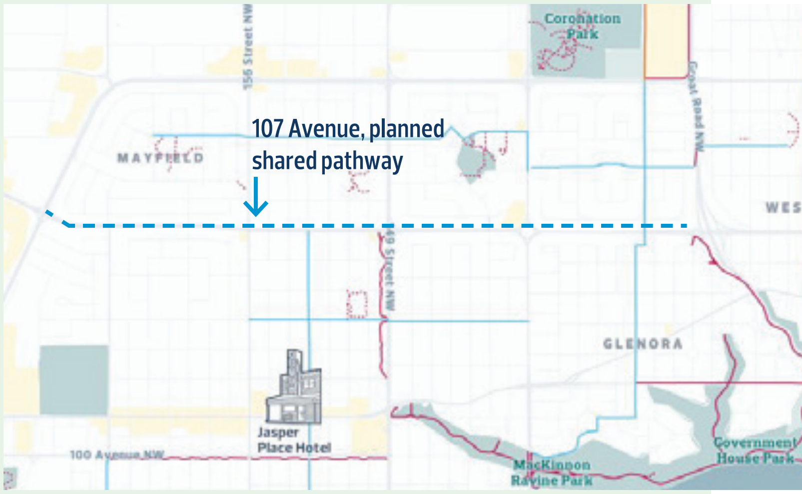
Consider opportunities for design improvements to better improve safety and operations along the route. Considerations may include separating movements between people walking and people biking, adding signage/wayfinding, intersection treatments, etc.

Confirm Connections to Existing and Future Network

Review key connection points from the planned route and the rest of the bicycle network for potential improvements that ensure the planned route is well integrated and connected to adjacent and intersecting routes.

EXAMPLE 2: Project on 107 Avenue

There is an existing concept plan in place for 107 Avenue which includes a shared pathway between Mayfield Road and Groat Road. Because the cycling facility is separated from traffic, the shared pathway as proposed already aligns with the Complete Streets Design and Construction Standards. The concept plan is also consistent with typical practice of including shared pathways along arterial roadways. The facility type and location proposed are both valid.



The future bike plan implementation strategy shows potential tie-ins with existing bike routes at Groat Road, 136 Street, 149 Street, and 153 Street. A future connection is also expected at 142 Street.

Engineering design of 107 Avenue should ensure functional connections with all intersecting routes, and consideration for future connections for routes that do not yet exist. The western terminus is identified as a future bike route, so the detailed location and facility type is not yet confirmed. However, the eastern terminus at Groat Road should also consider the opportunities to cross over Groat Road and provide connectivity to the bicycle network in the Westmount neighbourhood.

MISSING LINKS

Missing links are segments that connect to an existing bike route on one or both ends. Missing link connections are also described as being location specific meaning that the connection should be located along the road specified on the map in order to maintain network principles of directness and connectivity.

The goal of implementing a project along a corridor identified as a missing link is to complete the link in a manner that is integrated and consistent with the network on both sides of the link.

Planning considerations for projects incorporating planned bike routes include:

Review Connections

Review the connections on both sides of the missing link, consider first if it is feasible to implement a consistent facility type along the length of the missing link.

Confirm Alignment with Design and Construction Standards

Confirm that the facility type meets the requirements for all ages and abilities as specified in the Complete Streets Design and Construction Standards.

Identify Alternatives

Identify alternative facility types, if necessary. Focus on facilities that will minimize disruptions and transitions to and from the existing network on either side.

Engagement

Review trade-offs for facility options if necessary, and employ public engagement to discuss alternatives if applicable.

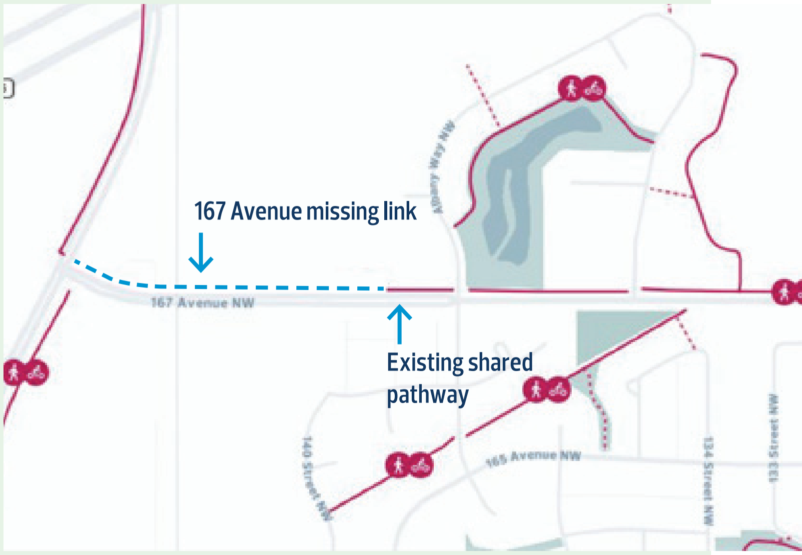
Select a Design

Incorporate the preferred design as part of the design and delivery process.

EXAMPLE 3: 167 Avenue and 142 Street

The north side of 167 Avenue includes a shared pathway along most of the corridor between 127 Street and 148 Street, except for a 300-metre section between west of 138 Street to 142 Street.

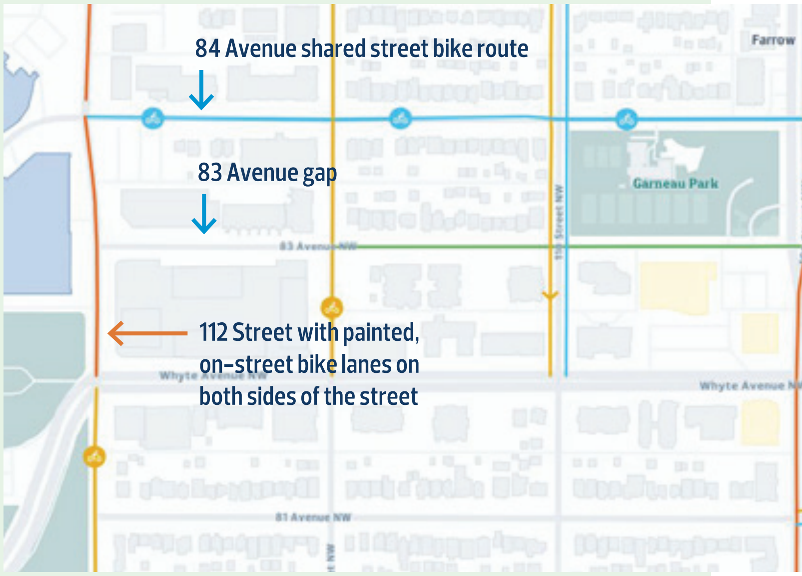
Shared pathways are separated from traffic and are therefore appropriate facilities along arterial roadways. Because the connections on both sides of the missing link are shared pathways, the preferred solution would be to complete the missing link with a shared pathway for consistency.



EXAMPLE 4: 83 Avenue from 110 Street to 112 Street

The existing protected bike lane along the north side of 83 Avenue extends from 96 Street to 111 Street, resulting in a missing link in the connection to the 112 Street on-street shared bike lanes.

Continuing the 83 Avenue bike lane to 112 Street was not feasible because of utility conflicts along the segment between 111 Street and 112 Street. In addition, there was no desire to add another crossing to tie-into the southbound bike lane on the west side of 112 Street. Recognizing the challenges of completing the missing link on 83 Avenue, alternative alignments were considered. Specifically, 84 Avenue between 111 Street and 112 Street, via a new bike route on 111 Street between 83 Avenue and 84 Avenue.



This alignment provides an opportunity to connect to 112 Street, taking advantage of the crossing at the 84 Avenue / 112 Street intersection. The 111 Street route also provides better access for the higher density buildings along 82 Avenue and 111 Street, as well as maintains the option to use the existing crossing at 111 Street and 82 Avenue.

FUTURE BIKE ROUTES

Future routes are new bike routes that would contribute to creating a comprehensive city-wide bike network. Future routes are mostly new district connector routes in areas currently underserved by bike infrastructure, but also include neighbourhood bike routes, connections to the River Valley and ravines and routes required to achieve the recommended network density.

The goal of implementing a project along a future bike route corridor is to confirm the preferred location of the bike route, potential facility types, and implement the bike route.

Planning considerations for projects incorporating future bike routes include:

Identify Connections to Existing and Future Bike Network

Review any connections that exist along, or on either side of the future bike route.

Identify Potential Route Alignment Options

Review context, and alternative routes that may provide the same connectivity while still generally aligning with the route spacing requirements (the Bike Plan, Figure 9, page 41).

Develop Options

Review context on all alternative routes to confirm which facility types could be provided in alignment with the Complete Streets Design and Construction Standards, including consideration of intersections and connections to existing bike routes.

Engagement

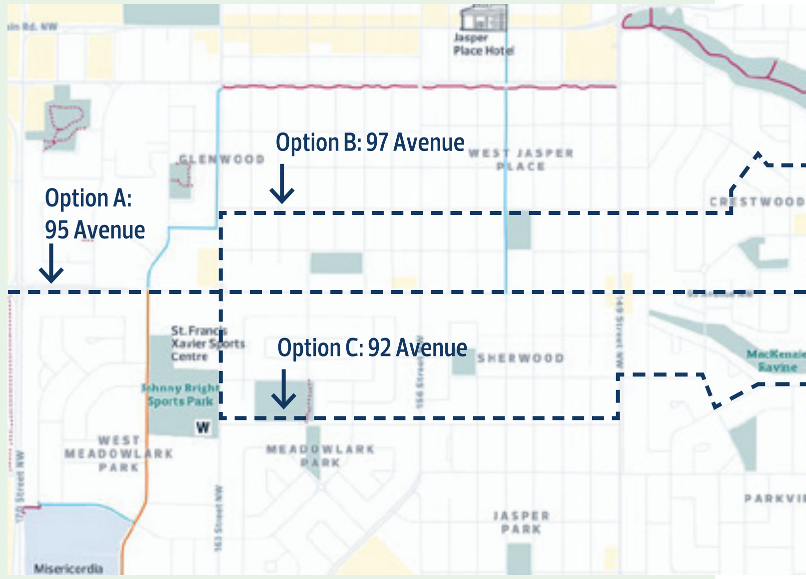
Employ public engagement to review both bike route locations and facility type options.

Select a Design

Incorporate the preferred design as part of the design and delivery process.

EXAMPLE 5: 95 Avenue

There is currently an east–west connectivity gap within west Edmonton. There are no consistent and direct connections between the neighbourhoods around 170 Street, and the areas near 142 Street and the bike network in the central area. Based on the required network spacing, an east–west route in the vicinity of 95 Avenue would help improve the network in this part of the city. This route could be constructed along 95 Avenue, but there may also be alternative routes on adjacent roadways that will provide the same network connections.



A project along 95 Avenue should consider how the route might be provided along 95 Avenue to align with the Complete Streets Design and Construction standards and Bike Plan network principles. The project should also consider what other routes might work, such as 97 Avenue and 92 Avenue, and consider how each of the routes align with the network principles. For example, due to inconsistencies in the local street network, 97 Avenue or 92 Avenue would provide a less direct route, but may be more attractive.

When considering alternative route alignments and facilities, the role of the route in the network must be considered. For example, district connector routes prioritize the network principles of directness and connectivity over attractiveness. Therefore, if the route is identified as a district connector route in the Bike Plan, any alternative route alignments and facilities considered should align with those principles. Alternatively, neighbourhood routes prioritize the network principles of attractiveness and health and comfort. Therefore, if the route is identified as a neighbourhood route in the Bike Plan, any alternative route alignments and facilities considered should align with those principles.

Ensuring that a proposed bike route aligns with the principles of its designated route type, and the values and preferences of the community, should guide the route alignment and corridor design.

BARRIERS

Barriers are locations where there is an obstacle in the way of a well connected network which is unlikely to be overcome for bicycle projects alone. Examples of barriers include railway crossings and bridge/interchange connections. Overcoming a barrier may not necessarily be driven solely by the need to complete a cycling connection; rather, the need may be driven by the accommodation of another mode (e.g., a train or vehicle bridge). Barriers are noted to ensure that if there are changes in infrastructure, accommodation for bicycles should be included to remove the barrier. While some barriers present an obstacle over an extended distance, such as freeways and ravines, only the locations where bicycle accommodation is needed for connectivity are identified. Smaller barriers such as complex intersections may be identified and mitigated as part of individual infrastructure projects.

The goal of implementing a project at a barrier location is to ensure that people on bicycles are able to cross the barrier. If cycling connections to the new infrastructure are not present, the project should complete the connections, even through the implementation of temporary infrastructure.

If a project results in the potential creation of a barrier, such as an intersection closure, the project is responsible for mitigating any negative network impacts through additional pedestrian/bicycle infrastructure or a route diversion.

Planning considerations for projects addressing barriers include:

Identify Potential Approaches

Review the barrier to be addressed and identify design opportunities that will allow for people on bicycles to cross the barrier.

Identify Design Criteria

Confirm if the location is also a barrier for accessible access and confirm how design can address both universal accessibility and cycling.

Connect to the Bike Network

Establish options to tie into the existing bike network on both sides of the barrier, if possible (these connections might be temporary through the use of adaptable infrastructure, until permanent connections can be constructed).

Engagement

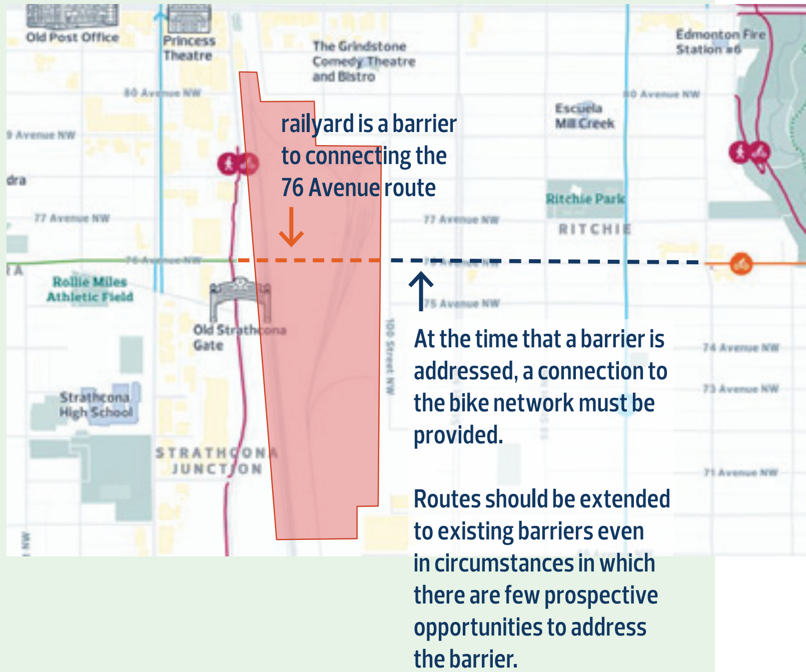
Incorporate options into the project engagement process if required.

Select a Design

Incorporate the preferred design as part of the design and delivery process.

EXAMPLE 6: Rail & 76 Avenue

76 Avenue is an existing bike route that provides connections from the River Valley in Belgravia to Gateway Boulevard. The major barrier preventing continuity of a 76 Avenue route to the east is the railyard east of Gateway Boulevard, and associated land permissions required. Any project that addresses this location should ensure that people riding a bicycle are able to cross this barrier, even if there is not yet a bike route immediately east of the tracks. If the project includes a roadway, crossing solutions may include continuation of the protected lanes to the east. Even if a motor vehicle crossing is not part of the project, separated bicycle and pedestrian facilities, or a shared pathway crossing if space constraints exist, would be solutions considered to cross the barrier.



REGIONAL CONNECTIONS

Regional connections represent conceptual opportunities to ensure that the bicycle network provides access not only within Edmonton, but also includes broader connections to form a regional network. Regional connections allow users to access regional destinations, expanding the reach of bicycle trips for both recreation and transportation. Regional connections are shown based on apparent opportunities where the bicycle network may align across jurisdictional borders while also considering opportunities to traverse some of the most significant barriers between the City of Edmonton and adjacent municipalities and counties. Addressing regional connections will require collaboration with adjacent municipalities through a process similar to implementing a future bike route.

3.2 Process by Project Type

There will be opportunities to implement portions of the future bike network as stand-alone bikeway infrastructure projects to improve cycling connections. There will also be implementation opportunities through coordination with capital projects such as roadway reconstruction, neighbourhood renewal, open space projects, and major transit and corridor projects like LRT expansion.

AREA BIKE NETWORK PLANS

The individual project-types described in this section outline general approaches to expanding the bike network on a single route or corridor. It is important to recognize that the decisions made on a project could have a domino effect on future bike-related projects, potentially limiting planning and design opportunities. While coordinating the different delivery methods is very important for implementing the future bike network, it could also stall the process as projects wait for the first "domino" to fall, particularly given the flexibility that is afforded in the Bike Plan in terms of route alignment and facility design.

One way to help projects advance is to consider an area beyond the subject corridor to plan and design an area bike network. Expanding the planning purview may:

+ Better consider how the area is best served by bike-related infrastructure
+ Leverage opportunities where active transportation modes can be prioritized on certain streets or corridors (i.e., alternative routes)
+ Establish more connectivity points to the existing network
+ Rationalize design limitations on a given street or corridor

Expanding the planning scope does not does not necessarily mean expanding the construction scope of a project. Even if the planned routes remain out-of-scope for a particular project, this approach establishes a single, cohesive plan for how biking will be accommodated in the area in the future.

It's not always obvious when this approach should be employed, but here are a few potential scenarios in which it could benefit implementation:

+ the Bike Plan identifies and prioritizes numerous future routes in an area
+ multiple roadways in the area are scheduled for renewal and/or rehabilitation
+ major development(s) or redevelopment(s) in the area have been initiated
+ multiple adjoining neighbourhoods are scheduled for renewal
+ Major infrastructure projects that will impact the local mobility system (e.g., LRT)
+ Or any combination of the above

Examples of projects where this type of approach has been successfully employed include:

+ The Downtown Bike Network (Bicycle Grid for Downtown Edmonton Feasibility Study: Edmonton FastTracks)
+ The Southside Neighbourhoods Bike Network (Southside Core Neighbourhoods Bike Network Feasibility Analysis)
+ 127 Street protected bike lane where the entire corridor was designed, then implemented neighbourhood by neighbourhood through renewal

The studies for each of these area networks supported discussion and decisions on a minimum grid of protected bike lanes by including:

+ A practice and policy review
+ Current state analysis
+ Assessment of suitable routes, including a gap assessment, facility design assumptions and route screening analysis summary
+ Financial assessment
+ Engagement approach considerations
+ Recommendations

MAJOR TRANSIT AND CORRIDOR CAPITAL PROJECTS

Major Transit and Corridor Capital Projects include new infrastructure, reconstruction and major renewal on arterial roadways, major collector roadways, addition of mass transit, or other projects that will have a substantial impact on the city-wide mobility system. Because they typically consider mobility networks beyond a local neighbourhood level, these projects often impact the district connector bike routes, but may sometimes provide opportunities for neighbourhood route connections as well.

Accommodating the movement of people walking and biking will, and should, influence other aspects of a project such as traffic operations, road operations (e.g., on-street parking), intersection operations, crossings, and landscaping (among others). The delivery of an effective and valued active transportation link relies upon prioritizing walking and biking.

1 Project Scoping & Strategic Direction:

+ Where are the connections to the existing bicycle network and key destinations? Don't stop at the intersections—does a crossing need to be improved to connect to the existing bicycle network?

+ Review current conditions along existing routes (such as roadway characteristics, vehicle volumes and speeds). Do the routes meet the all ages and abilities standard outlined in the Complete Streets Design and Construction Standards?

+ Does this project present an opportunity to complete a missing link, establish a future route, upgrade a substandard route, or transcend an existing barrier? Are there opportunities to improve consistency and integration to links on either end of the route by improving transitions or crossings? Will the route serve as part of the all-seasons network?

+ Does the recommended route spacing suggest a need for an additional cycling connection in the vicinity of the project?

+ Does the scope of the capital project in question allow for the completion of a portion of the network that provides value according to the bike network principles? If not, justification for not including bike infrastructure should be well-documented and viable alternatives should be identified through a process which includes all other internal stakeholders that may be impacted.

Definition of alternatives:

+ What alternatives may exist (if any) for the bike infrastructure needed in the area and which of these alternatives would be in/out of scope for the existing capital project? Alternatives may include different route alignments and/or different facility types.

+ What constraints (e.g., right-of-way limitations) or conditions (vehicle speed and volumes) exist for the alternatives, and considering these constraints or conditions, how might these alternatives align with the Bike Plan's network principles?

+ Which alternatives are both technically feasible and aligned with strategic direction?

+ If any options would be out of the scope of the current project, what options may exist for future implementation? What are the timelines for these options? Can the design

include measures that might help to better accommodate future implementation of a bike route (e.g., constructing wider curb ramps, installing extra conduits for future bike signals) and avoid measures that would limit future implementation?

2 Engagement & Alternative Selection:

+ What do area and local residents and business owners / operators value from a transportation perspective? What are the competing community values?

+ With an understanding of the parameters and tradeoffs, do the alternatives align with public and stakeholder values? Why or why not? How can the ideas and opinions of the public and stakeholders be incorporated into the design so the alternatives better align with the values?

+ What other information or input is needed to select a preferred alternative? Are there secondary operational impacts such as crossing improvements for bikes that may impact intersection or roadway operations? How Can those impacts be mitigated if possible? What are the costs associated with the alternatives?

Design and Delivery:

+ How can the decisions and findings be incorporated into the design and delivery of the capital project? Or,

+ How can the decisions and findings be summarized and preserved for incorporation in future work (if delivery is out of scope)?

NEIGHBOURHOOD LEVEL PROJECTS

Neighbourhood level projects typically include work on local and collector roadways or other projects that are planned and designed within a local neighbourhood context. Neighbourhood level projects will likely include some district connector routes and the majority of neighbourhood level routes.

1 Project Scoping & Strategic Direction

+ Where are the connections to the existing bicycle network and key destinations? Don't stop at the intersections—does a crossing need to be improved to connect to the existing bicycle network?
+ Review current conditions along existing routes (such as roadway characteristics, vehicle volumes and speeds). Do the routes meet the all ages and abilities standard outlined in the Complete Streets Design and Construction Standards?
+ Does this project present an opportunity to complete a missing link, establish a future route, re-consider a substandard route, or transcend an existing barrier?
+ Does the recommended route spacing suggest a need for an additional cycling connection in the project area? Recommended route spacing can be determined from the Route Spacing and Bike Trip Potential (the Bike Plan, Figure 9, page 41).
+ How do local residents envision an improved mobility network in the area? What do they value?
+ Does the scope of the project in question allow for the completion of a portion of the network that provides value according to the bike network principles (upgrading outside of road right-of-way pathways can improve health and comfort; completing links through parks can make routes more attractive; improving roadway crossings can increase connectivity)?

2 Definition of alternatives

+ What alternatives may exist (if any) for the infrastructure identified on the future bike network implementation strategy, and which of these alternatives would be in/out of scope for the existing capital project? Alternatives may include different route alignments and/or different facility types.
+ What constraints (e.g., right-of-way limitations) or conditions (vehicle speed and volumes) exist for the alternatives, and considering these constraints or conditions, how might these alternatives align with the Bike Plan's network principles?
+ Which alternatives are both technically feasible and aligned with strategic direction? What are the costs associated with the alternatives?
+ If any options would be out of the scope of the current project, what options may exist to aid future implementation? What are the timelines for these options?

3 Engagement & Alternative Selection

+ How can the needed bike infrastructure support the values of the community? What are the competing community values?
+ With an understanding of the parameters and tradeoffs, do the alternatives align with public and stakeholder values? Why or why not? How can the ideas and opinions of the public and stakeholders be incorporated into the design so the alternatives better align with the values?

- What other information or input is needed to select a preferred alternative? Are there secondary operational impacts such as crossing improvements for bikes that may impact intersection or roadway operations? How can those impacts be mitigated if at all?
- Note: If stakeholders suggest/request additional cycling connections, these may be considered in addition to those required to meet the direction for the minimum network proposed in the Bike Plan. The Bike Plan does not preclude the addition of cycling connections where desired and supported by local communities.

4 Design and Delivery

- How can the decisions and findings be incorporated into the design and delivery of the capital project ? **Or**
- How can the decisions and findings be summarized and preserved for incorporation in future work (if delivery is out of scope)?

RENEWAL AND OTHER LIMITED SCOPE PROJECTS

The roadway renewal program and micro surfacing program may provide limited opportunities to improve the cycling network due to their constrained scope, lack of engagement activities, and/or minimal planning. Rather than assessing each limited scope project for opportunities to implement the bike network, the program should be reviewed in the context of the existing and future bike network to identify candidate corridors for further consideration. Candidate corridors may require additional resources to augment the scope of work.

1 Review Program Projects

- Are any projects located along an existing or future bike route as defined in the future bike network implementation strategy?
- What are the limitations of the scope of those project and to what extent might the scope meaningfully improve the bicycle network?
- Is there anything within the project's scope that should be considered to allow for future implementation of bike routes?
- Does the scope/context of the project suggest a further review of opportunities is needed?
- Are there opportunities to reconsider the scope of the project to support more substantial changes to support bicycle network implementation?
- If a limited scope project presents an opportunity to complete bike route implementation in any substantial way, additional resources may be needed to augment the project scope, bumping it to a corridor capital project or neighbourhood level project depending on the context.

DEVELOPING AREAS

Developing areas provide a key opportunity to implement bike plan principles as part of construction of new neighbourhoods. Applying the bike plan principles as part of the planning process will ensure effective integration of new neighbourhoods into the city's bicycle network.

1 Review active network proposed with area and/or neighbourhood structure plans considering the bike plan principles.

- Does the roadway meet Complete Streets Design and Construction Standards?
- How do network spacing requirements impact the need for additional cycling facilities? Note that bicycle trip potential (the Bike Plan, Figure 9, page 41) may not yet be available for developing areas. Assume Tier 1 for developing areas with higher density, and mixed uses and Tier 2 for lower density residential uses.
- Are cycling connections available between neighbourhood destinations such as commercial centres, schools, parks, higher order transit facilities and the arterial/district connector network?
- Are cycling network connections available for recreational use that provide connections to Storm Water Management Facilities, River Valley Access Points, and parks?
- What bicycle infrastructure is required, in addition to shared pathways along arterial roads? Additional network density may be required and may be achieved by adding protected bike lanes and shared roadways to fulfill connectivity and permeability needs?

STREET CROSSINGS

As outlined in the City of Edmonton *Safe Mobility Stategy 2021-2025*, street crossings can be places of vulnerability for people walking, rolling and biking due to conflicts with vehicles. Street crossings that are bike-friendly play a critical role in creating a network that is connected and accessible for everybody.

The objectives of designing bike-friendly crossings are to:

+ better organize intersection movements in a way that increases safety or highlights conflicts between people walking, biking and driving
+ eliminate or minimize delay for people biking (and using other active modes)

Bike-friendly crossings can create more awareness of the different ways people pass through an intersection and provide clarity to road users about how to navigate the intersection. Bike-friendly crossings typically provide shorter crossing distances, reduce turning conflicts and make intersections more intuitive to pass through. Bike-friendly intersections also may improve the pedestrian experience.

Most importantly, designing and constructing bike and pedestrian-friendly crossings sends a message to people: walking, rolling and biking are recognized and valued as ways that people move through and experience our city.

NACTO Urban Bikeway Design Guide outlines three ways to change the street. These also apply, generally, to implementing bike-friendly intersections:

Change the Crossing or Intersection Design

+ **Shorten crossing distances** by reducing the carriageway of the road (i.e., removing vehicle lanes), modifying intersection geometry (i.e., adding curb extensions, adding refuge islands, or reducing curb return radii).
+ **Reduce traffic stress** by better organizing vehicle movements (removing vehicle lanes, repurposing through-left lanes to left-turn only lanes or bays, restricting particular vehicle turn movements).
+ **Slow vehicle traffic** by raising the intersection or crossing, narrowing lanes, eliminating or mitigating vehicle weaving and lane changes (by removing vehicle lanes), reducing the curb return radii to slow turning speeds.
+ **Make people who bike and walk visible** by adding curb extensions, restricting or removing curbside parking near the intersection, providing lighting.

Change the Crossing or Intersection Operation

+ **Reducing conflicts and traffic stress** by introducing or upgrading traffic control (crossings may require signalization but other types of traffic control can be considered depending on the operating characteristics such as vehicle volume, operating speeds, etc.) and restricting particular vehicle turn movements.

- **Make it easy for people biking** by installing signal detection and activation to improve intersection efficiency, increase convenience and reduce delay for people biking, encourage compliance (detection tends to discourage red-light running), and better recognize biking as a way that people move around Edmonton.
- **Make people who bike and walk visible** by implementing measures such as leading bicycle (and pedestrian) intervals at intersections with high vehicle turn volumes to give people biking and walking a head start before vehicles get a green signal.

Change the Network

- **Reduce traffic stress and create capacity** to better accommodate people walking and biking by diverting vehicle traffic from a street or changing upstream or downstream intersections (i.e., restricting turns) to better manage queues spilling back.

For each of these approaches to be applicable, it is key that crossings, particularly arterial crossings, are identified early in the project and the design and operations of the crossings are integrated as part of the planning and design process. If addressing the crossing is left too late in the process, opportunities to change the intersection geometry and/or network, may be challenging, resulting in changing the operations as being the only remaining approach.

PROJECT COORDINATION

When a capital project is initiated along or near the bike network, the scope of the project should be reviewed at an early stage to identify the extent to which the project can and should support the planning and design of bike routes. Depending on the type of project, scope, timing (of the project and relative to other projects), and proximity to other capital projects, this process may differ. The process should consider the following:

Project Awareness

What related work is planned nearby? What is the timing of that work? Which groups are leading that work?

Opportunities for Collaboration

Are there opportunities for collaboration? Does collaboration potentially result in cost savings or better use of City resources (i.e., combined engagement)?

Decision-Making

How can we make decisions? Is there a process or tool that can help the decision-making process? Which criteria should be used to guide decision making? Who should participate in this process? Does feedback from the public have a role in the decision-making process?

Communicate the Decision

How can we document the decision so it can be easily communicated internally and publicly?

To address these questions, collaboration at the project level should continue to be emphasised, along with implementing a project-specific process that encourages decision-making through a transparent and well thought out process. Depending on the type of project, scope, proximity and timing relative to other capital projects, this process may differ.

WHEN IS ADDING A BIKE ROUTE A NO-GO?

Capital projects are often the most cost-effective ways to implement a bike route, or a portion of a bike route. However, there may be situations where it is not appropriate to complete the route. These situations might include:

Construction of disconnected bike routes

If the route does not connect to the rest of the bike network, construction may result in a disconnected portion of infrastructure with little practical use. Potential disconnected bike routes need to be considered in the context of the existing and future bike network and the potential timing of adjacent future projects.

Construction of a short segment of an extended corridor

If the scope of a project only includes a short segment of a bike route extension, the scope of the project may limit the ability to implement an appropriate bike facility. For example, a shared pathway may be the only feasible design in the context of the shorter segment, but the corridor may be better served by adding a protected bike lane. In this case, the addition of the shared pathway may limit design options of the bike route in the future. In such a case, the project may proceed without considering a bike route. If possible, consideration could be given to delaying the project until such time that the corridor is to undergo a more significant renewal or reconstruction.

Limited Project Scope

The corridor requires substantial additional planning work, engagement, and trade-off discussions that cannot reasonably be incorporated into the scope of the project, such is often the case with renewal and micro surfacing projects. Rather than review bike network implementation opportunities on a project basis, these programs should be reviewed annually, and at least one year in advance of construction, to identify candidate projects that should be elevated to a more significant renewal or reconstruction.

While retrofitting bike routes is challenging, implementing bike routes as part of some capital projects can be cost-effective, offering efficiencies in the planning, design and construction processes. While every project should endeavour to add to the bike network, there are instances in which that is simply not possible. If a project proceeds without the inclusion of bike accommodation, justification for doing so should be well-documented and viable alternatives should be identified through a process which includes all other internal stakeholders that may be impacted. The results of this process must be clearly communicated and coordinated.

In addition, the design should consider measures that might help to better accommodate future implementation of a bike route (e.g., constructing wider curb ramps, installing extra conduits for future bike signals) and avoid measures that would limit future implementation.

3.3 Notes on Localized Engagement for Bike Routes

The Bike Plan recognizes that the input of the public and stakeholders is an essential part of the equation to ensure bike routes align with the aspiration and values of the Bike Plan. Engagement provides local context and understanding that is often difficult to incorporate into planning decisions at the city-wide level. While local engagement opportunities may be more apparent when planning neighbourhood routes, district connector routes are not divorced from their local context. Localized neighbourhood understanding can provide valuable insight to the planning and design of all route types.

Public engagement should be an input to decision making as local knowledge can inform route selection, facility type, and considerations for design. However, this input must be considered within a broader understanding of the bicycle network and the principles of the Bike Plan. Public engagement is best incorporated into informed decisions where there are multiple options that are both technically feasible and strategically aligned. Engagement is a process to ensure that localized tradeoffs are considered holistically with community needs and desires while ensuring that the solution is safe and aligned with the bicycle network principles.

The following steps provide a guide for how to approach transportation projects such as future bike routes:

STEP 1 APPLY GBA+

As outlined in the City of Edmonton's *The Art of Inclusion: Our Diversity and Inclusion Framework*, to better understand our own perspectives, who we've talked to, and who we need to hear from, the City adopted Gender-Based Analysis Plus (GBA+) as a process that can be used to become ready, willing and able to take individual and collective action toward our Shared Goal for Inclusion.

By using GBA+ we can better understand diverse perspectives, experiences and needs and create services that best serve everyone. The goal of GBA+ is to reduce inequality, reduce discrimination and ensure equality of outcomes for the communities we serve. The "plus" in GBA+ is critical, because it emphasizes that there are many identity factors to consider – all of which combine and layer to make up diversity.

GBA+ is a process that prompts us to:

+ reflect on our own perspectives and biases
+ understand how perspectives and biases can impact our work
+ understand the experiences of groups and individuals who are marginalized
+ identify how we can do our work in more inclusive ways

We use it to assess how our work might impact diverse groups of people and ask:

+ Who is excluded?
+ What contributes to this exclusion?
+ What will we do about it?

A The GBA+ process starts by understanding who we have talked to and who we need to talk to. Start by assessing and researching:

+ What perspectives the project team brings and, perhaps more importantly, which perspectives are not present.
+ The diversity of the people in the subject area or neighbourhood through demographic data and meeting with community organizations and leaders.
+ Who we heard from through engagement on related projects, from strategy-level to corridor projects, by reviewing What We Heard reports.
+ Any findings through academia or technical guides about individuals or groups of people whose perspectives need to be heard.
    » These might be from specific bike-related research work, more broad and general research and publications, or even research or publications about another topic where key principles can be applied.

The Bike Plan, section 8.1 "Who are we planning for" is a good starting point for this work. However, it is important to understand that it is not a checklist; rather, it identifies groups of people whose perspectives are important to understand and/or groups of people who we may not hear from through traditional engagement approaches. It is the responsibility of each project team to identify the groups of people whose perspectives and experiences need to be heard and understood for their project. It may include all or some of the groups listed in the Bike Plan, but it is also not limited to just those groups.

B **Identify factors, or intersectionalities, that overlap and contribute to the ways in which people experience our city and engage with people who have those identity factors to gain a fuller, more complete understanding of the barriers of inclusion.**

For example, from the City of Edmonton's *The Art of Inclusion: Our Diversity and Inclusion Framework*, an organization may focus on increasing the representation of women in leadership. However, without understanding the different needs of racialized women or women with disabilities, there may be barriers to inclusion that are not addressed. GBA+ leads us through a process to understand and address intersectionality.

When exploring these intersectionalities, more intimate engagement tactics should be considered such as a community conversation, where the project team engages directly with a small group of people by way of an intimate conversation. Community conversations can be held with a group of individuals, a community organization, and organizations that represent or work with a group of people (while no single organization can speak for the entire neighbourhood, these organizations can help to better understand the community but cannot replace community conversations with members of the community). It's also important for the project team to understand and appreciate ongoing conversations in the community (Neighbourhood Resource Coordinators are a good resource for this, as well as other project teams with experience in the area). The conversation could include topics and questions such as:

+ How do they experience the neighbourhood or other parts of the city?
+ What parts of their neighbourhood's social and physical environment makes them feel uncomfortable? What parts make them feel comfortable?
+ Which parts of their neighbourhood's social and physical environment support their needs and activities? What parts create barriers or challenges?
+ What amenities / design features do they value in their neighbourhood and other parts of the city?
+ How do they travel within their neighbourhood and to other parts of the city?
+ What parts of their neighbourhood make them feel uncomfortable travelling through? What parts make them feel comfortable travelling through?

STEP 2 VALUES AND VISION

Livability is the combination of factors that add up to the quality of life that a neighbourhood can provide. The way that neighbourhoods are planned, designed and built can enhance or detract from liveability. Transportation is one of the factors that contribute to liveability. Whether it enhances or detracts from liveability depends on the efficiency of the transportation network, and also the level of stress that the transportation network may cause for people using it.

Learning and understanding what people value for their neighbourhood is the foundation of the planning and design process. To achieve liveability, we need to understand the needs and values of people that live in the neighbourhood and how they envision their streets working.

A **Start by reviewing existing conditions with people from the neighbourhood to more fully understand how people use the transportation network, what works well, and what needs to be improved.**

B **The network principles outlined in the Bike Plan are a good place to start the conversation about what people value for their neighbourhood. It also provides an opportunity to share more about the broader bike network and the role that a particular route might have for people that do not reside in the neighbourhood (i.e., commuters). Do people value being comfortable and feeling secure when walking to destinations in the neighbourhood which might mean safe crossings and slower vehicle speeds (walkability)? Is it being able to drive out of the neighbourhood without significant amounts of delay (drivability)? Is it being able to bike throughout the neighbourhood and beyond without having to ride with vehicle traffic (bikeability)? Is it ensuring that there are adequate places to park on the street to support local businesses / neighbourhood amenities?**

At this point, specific plans are not discussed as it may negate the opportunity to learn about what people in the neighbourhood value. Centering the discussion on values is important to ensure that the feedback guides the technical work rather than replaces it. For example, the feedback, "I value walkability" vs. "I want a shared pathway" may elicit two quite different responses from the project team and how they approach the design of the corridor, street or neighbourhood.

Understanding people's attitudes about biking can also help focus the conversation around new bike routes. First, it is important to differentiate between identity factors, as outlined in Step 1, and attitudes. For the purposes of engagement, identity and attitude are not connected. Focusing on identity factors is a process for inclusion whereas focusing on attitudes helps to understand what people value.

The Bike Plan engagement and survey results showed differences in attitudes about biking, which provides insights into how people might support (or be challenged by) changes to the transportation network in their neighbourhood. The Bike Plan describes people's attitudes about biking by considering four different population segments:

+ **Champions** are generally active riders themselves, and are often well-connected community advocates for biking infrastructure.
+ **Supporters** understand and promote the benefits of biking infrastructure to the wider community, and includes people who are active riders and those who don't ride.
+ **Concerned** are people that appreciate the benefits of biking infrastructure but they also express some concerns about the potential impacts of bike infrastructure on other modes of transportation.
+ **Non-Supporters** are people that do not see the value of biking infrastructure and would prefer that the City not prioritize spending on bike infrastructure and programs.

By understanding the attitude of a person, group of people, organization, or the community in general, we can have more focused and constructive conversations around biking.

For example, talking to "concerned" people is an opportunity to understand what the limits for their support are (e.g., will accept one-way travel but won't accept a loss of on-street parking). Concerned people generally understand trade-offs but don't want their support to be taken advantage of and pushed to its limits. Conversations with "supporters", on the other hand, might be more focused on what improvements can improve the biking experience. "Champions" are often deeply knowledgeable about different routes and facility types and can help to anticipate challenges and identify solutions based on their own experience and that of others they're connected with. "Non-Supporters" will want to understand how impacts can be mitigated.

STEP 3 DEVELOP OPTIONS AND SHARE

It's time for the planners, engineers and designers to translate the feedback received into design options through the design process including:

+ Exploring and understanding the design opportunities and constraints
+ Researching best practices and other bike route designs
+ Identifying potential design measures to address the barriers to inclusion, support what people value, and align with role of the route in the network
+ Developing design options for consideration
+ Reviewing, refining and assessing design options

Through the course of this work, it's likely that many options may be developed. When sharing back with the public, only feasible options, those that align with policy direction and are technically feasible, should be shared. When presenting options, the conversation should be framed around barriers to inclusion and values.

The goal of those conversations are to:

+ Confirm what we heard around barriers to inclusion and values
    - » Barriers to inclusion and values should be clearly highlighted in the What We Heard report, along with who was engaged, and how.
+ Confirm whether the measures to address inclusion barriers are reflected in the plan
    - » Highlight the measures used to address barriers to inclusion.
    - » Ask questions:
        - Is the measure used to address the inclusion barrier appropriate?
        - If not, how else can this be addressed?
        - Are there any unforeseen consequences that may result from the implementation of this measure?
+ Confirm that the design aligns with the values of the community
    - » Highlight the design elements that align with the stated values.
    - » Ask questions:
        - How does this plan align or not align with the community values?

If the conversation is not centered on addressing barriers to inclusion and values, the discussion could be perceived as a vote. This is problematic because other considerations in the decision-making process are overlooked (i.e., policy alignment, design constraints), thereby mismanaging people's expectations about how their feedback may influence the project.

STEP 4 REVISE AND REVISIT

For some projects, it may be necessary to revise the design options or develop additional options based on the feedback received during Step 3.

If multiple options are initially shared with the public, the preferred option should be shared publicly once decided upon and the decision-making process should be transparent, well documented, and easily communicated. Analysis tools, such as Multiple-Criteria Decision Analysis (MCDA) are usually a good approach to sound decision making, allow the process to be well documented, and are relatively straightforward to communicate out.

Other Considerations: Pop-Up and Pilot Bike Lanes

Pop-ups and pilots are ways of temporarily reconfiguring a street to show the value of bike lanes by providing a new way for people to experience it. Pop-ups serve as demonstrations for a short period of time, like one month or less, helping people reimagine the street design while pilots are used to prove the viability of a project for a relatively longer period of time, like less than one year. Both approaches use low-cost, non-permanent materials including, but not limited to, pylons, barricades, curb stops, concrete barriers, flexposts and chalk / paint.

Pop-ups and pilots are especially effective at highlighting design benefits to vulnerable road users and the extent of inconveniences to vehicle travel. Candidate projects are typically those with the objective of making the street more accessible for people walking and rolling including improved street crossings, traffic calming, road diets and bike lanes.

Pop-ups and pilots can serve as a way to more actively engage a community on a project by:

+ Encouraging residents, local businesses and community organizations to participate and collaborate in the design and implementation (perhaps more in the case of pop-ups) of the demonstration, which can strengthen relationships within the community and with the City.
+ Providing an opportunity for people to better understand their community's needs.
+ Highlighting any gaps or shortcomings in policy and design practices.

Effective pop-ups and pilots include a few common elements:

+ A clearly stated purpose, generally agreed to by the community. Is it to demonstrate what is possible? Is it to get community buy in? Is it to test a new idea?
+ Work with the community—use it as an opportunity to actively engage residents, local businesses and community organizations.
+ Gather real-world data before and after to communicate project benefits and impacts.
+ Manage expectations—what is the path to a permanent solution?
+ Have fun and celebrate!

4.0 Maintaining an All-Seasons Network

Maintaining Edmonton's all-seasons network is a significant part of realizing the Bike Plan's aspiration of inviting people to bike for all reasons, in all seasons. The Bike Plan provides an opportunity to strategically consider how Edmonton's all-season bike network could better serve those that do ride in the winter and to make winter riding a practical choice for those who may not ride year-round right now. Envisioning Edmonton's all-season network includes reviewing maintenance levels, identifying opportunities to expand the all-seasons network, and identifying financial implications.

4.1 Bike Network Principles and the All-Seasons Network

The bike network principles and how they relate to maintaining the all-seasons network are highlighted below.

BIKE PLAN PRINCIPLE	AS IT RELATES TO THE ALL-SEASONS NETWORK
HEALTH AND COMFORT	
Providing a bike network grounded in safety provides people with a comfortable and secure way of getting around by bike. The network minimizes stress, anxiety, or concerns over personal safety and security and other health and safety-related issues such as noise, vehicle pollution, headlight dazzle and spray from passing vehicles.	In the winter context, the principles of health and comfort are paramount. For biking to be inviting in the winter, the network needs to provide predictable riding conditions by way of routes that are maintained to minimize slipping, ruts and other hazards. Bike-car conflict points need to be clearly highlighted through lighting and design (i.e., clear sight lines, highlighting street crossings through lighting).
CONNECTIVITY	
The cycling network provides access to places where people want to bike without gaps or missing links. The network provides a diverse range of route options and experiences for users and opportunities to link to other modes of transportation.	The all-seasons network is best considered as a sub-network of Edmonton's bike network, generally consisting of the district connectors. While the all-seasons network may not be able to provide as diverse a range of route options and experiences, it must be connected.
DIRECTNESS	
The cycling network prioritizes direct and straight routes and minimizes out-of-direction travel and unnecessary stops.	The all-seasons network will consider directness in route selection, however there may be instances where other principles, such as health and comfort are prioritized over directness in the context of the all-seasons route.
NETWORK DENSITY	
Grid size (distance between parallel routes in a network) is dependent on demand—higher demand areas have higher density.	To ensure effective resource management, only select routes will be designated for priority maintenance, particularly in the winter. As a result, the all-season bike network may have reduced network density but should still ensure basic connectivity and support high-demand routes.
ATTRACTIVENESS	
The cycling network is composed of routes that are aesthetically attractive, interesting, or pass through sociable places.	It's not uncommon for people riding in the winter to prioritize comfort (i.e., a cleared route) over attractiveness; therefore, principles such as health and comfort may be prioritized over attractiveness in the context of the all-seasons network. Recognizing that many people do ride for recreation year-round and value the benefits of an attractive route, reliable all-seasons routes to recreation destinations, such as the River Valley, is important and will continue to be included.

BIKE PLAN PRINCIPLE	AS IT RELATES TO THE ALL-SEASONS NETWORK
INTEGRATION	
The function, design and use of a bike route is carefully considered so that it provides added value to the neighbourhood and users from an economic, social and safety perspective. Bike routes fit into an area's and/or street's context and are integrated into the road network in a way that makes sense to people who walk, roll, bike, take transit or drive.	The value that bike routes add to a neighbourhood should be considered and evaluated for all four seasons. Bike routes, particularly shared pathways, also serve more than just people biking. People walking and wheeling also benefit from a well-maintained bike network as shared pathways provide valuable connections into, out of and through many neighbourhoods.

4.2 Maintenance Levels

Similar to snow clearing the roadway network, maintenance for the bike and active modes network will be organized into a hierarchical classification system. This approach is similar to current practices, which are summarized in Appendix C. District connector routes are best compared to arterial roadways, and the seasonal maintenance requirements should be considered in a similar manner, ensuring reliable connectivity along major routes.

Generally, the maintenance levels are applied to the network by way of the following:

+ **Level 1** is comparable to the current (2020-2021) maintenance level associated with prioritized bike routes with additional maintenance considerations in the shoulder season. Routes that are maintained to a Level 1 maintenance standard will generally include key district connector routes and River Valley district connector routes.

+ **Level 2** is comparable to the current standard associated with most shared pathways with additional maintenance considerations in the shoulder season for select routes. Routes that are maintained to a Level 2 maintenance standard include all other district connector routes and most shared pathways. Most shared pathways are currently cleared, and will continue to be cleared, within 48 hours. Level 2 routes are considered part of the all-seasons network. Discussions to prioritize some of these routes within the Level 2 category is recommended..

+ **Level 3** is comparable to the current standard associated with non-prioritized on-street bike routes. Level 3 routes are not considered part of the all-seasons network and include most neighbourhood routes.

Although each season may present unique maintenance challenges from snow clearing to sweeping, the greatest barriers are typically associated with issues of clearing snow and ice to ensure that the bike routes are passable. **Table 6** outlines proposed maintenance levels. The details associated with each maintenance level will require further refinement in coordination with the operations teams.

TABLE 6: Proposed Maintenance Level Classification

	ALL-SEASONS NETWORK STANDARDS		
SEASON	**LEVEL 1**	**LEVEL 2**	**LEVEL 3**
Spring	sweeping (ideally completed in early spring to ensure safe riding conditions at the start of the fair-weather riding season)	sweeping, likely at the same time as roadway sweeping, and early spring snow / slush management	sweeping, likely at the same time as roadway sweeping
Summer	not applicable	not applicable	not applicable
Fall	bike routes with significant tree canopies are swept and encroaching vegetation is cleared back	bike routes with significant tree canopies are swept and encroaching vegetation is cleared back	not applicable
Winter	**Snow Clearing** maintain level 1 bike routes and shared pathways to bare pavement within 24 hours from end of snowfall, including freeze/thaw ruts & slush management **Brining** brining does not take place on routes that are adjacent to or through the River Valley, ravines and natural areas **Sanding** includes sanding	**Snow Clearing** maintain level 2 bike routes and shared pathways to bare pavement or a maximum 2 cm snowpack within 48 hours from end of snowfall (context sensitive), including freeze/ thaw ruts & slush management **Brining** does not include brining **Sanding** includes sanding	**Snow Clearing** plow or blade snow from designated bicycle routes with the roadway plowing, to the same service level designated for that roadway **Brining** does not include brining **Sanding** includes sanding as part of roadway sanding

4.3 The All-Seasons Bike Network

The current priority network has been established based on protected bike routes and other high-quality bike infrastructure projects coming online. That approach has worked well as much of the high-quality bike infrastructure is located in the central areas and is somewhat connected. As more high-quality bike infrastructure projects come online, particularly those in neighbourhoods beyond central Edmonton, a strategic approach for designating bike routes as part of the all-seasons network is needed to ensure that:

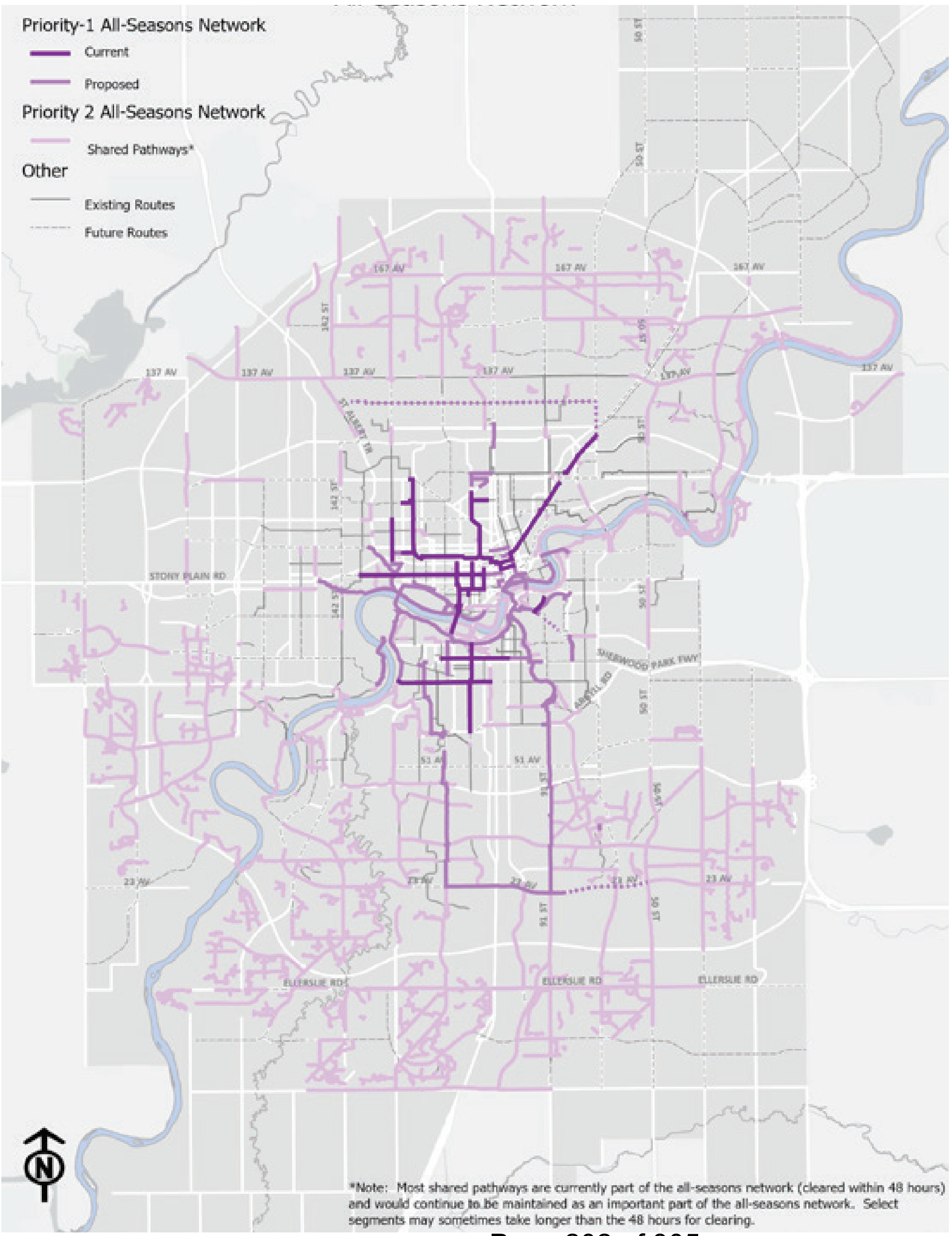
+ a connected network is provided to allow people to comfortably get to where they want to bike

+ system efficiencies, from a maintenance operations perspective, are leveraged

All routes play an important role in a well-connected network; however, only some will be designated an all-seasons route because of the realities of resource management and other constraints, such as the design of the facility. The district connector network outlined in the Bike Plan can be considered the all-seasons network outline, providing guidance about the general alignment and spacing for new bike routes.

The next step for Edmonton's all-season network is to continue to extend and expand the network of Level 1 routes from Central Edmonton. **Figure 5** highlights the current and proposed all-seasons network. Most proposed Level 1 routes identified have simply been upgraded from a Level 2 maintenance standard, while others represent new routes that should be designed to ensure that they can be maintained to the Level 1 standard.

FIGURE 5: Current and Proposed All-Seasons Network



The changes to the all-seasons network can be characterized by the following:

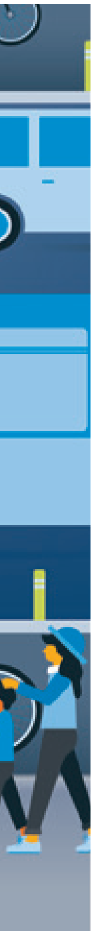
+ Increased density of Level 1 routes in Central Edmonton, where ridership is higher
+ Additional north-south Level 1 routes extending from Central Edmonton to Northwest Edmonton and South Edmonton
+ Addition of east-west Level 1 routes in North and South Edmonton

4.4 Financial Impact

The all-seasons network, as highlighted, includes 95 kilometres of bike routes. Considering the 38 kilometres of currently prioritized (Level 1) routes, this represents an additional 57 kilometres of Level 1 routes. Assuming a unit cost of $8,800 per kilometre to maintain routes to the Level 1 standard, a prioritized network of 95 kilometres is anticipated to cost about $500,000 for snow clearing, in addition to the current cost of clearing the prioritized (Level 1) bike network. The estimate is considered conservative given that the majority of the additional routes are shared pathways, which are currently maintained to the non-prioritized pathway standard (Level 2).

4.5 Other Considerations

The all-seasons network should be updated annually as new infrastructure is added to the network. The all-seasons network should be reviewed from a strategic and network connectivity perspective regularly (e.g., every two to three years) to ensure that it continues to serve Edmontonians in a way that is meaningful to them while aligning with dedicated resources.



SNOW CLEARING CHALLENGES AND EXAMPLES

The implementation and construction of a range of bike facilities has provided many learnings around how to deliver bike infrastructure that meets the needs of Edmontonians in all-seasons. Below are just a few examples of some of the snow clearing challenges that need to be considered in the design and implementation of new bike routes.

The Challenge: Differing levels of maintenance between on-street bike facilities (shared roadway, painted bike lanes, raised bike lanes) and the roadway on which they are located causes snow to creep into the bike route, making it uncomfortable or impassable.

Example: 83 Avenue from 95a Street to 99 Street
This segment of the 83 Avenue bike route is a district connector route which includes an on-street bike facility (a westbound painted bike lane and an eastbound shared road)on a local residential street). For 83 Avenue to serve as an all-seasons route, this section of the route should be cleared to the same standard as the protected bike lane on 83 Avenue west of 99 Street. The on-street bike route creates a challenge from a maintenance perspective resulting in one of two outcomes:

+ The roadway is cleared based on the local roadway standard making this segment of the route impassable for people biking, forcing them onto the sidewalk or to a parallel route (i.e., 82 Avenue); or
+ The roadway is cleared based on the bike priority standard resulting in public confusion and frustration about why a local roadway is cleared to a higher standard comparable to an arterial roadway.

In order to maintain a comfortable bike route in the winter, the adjacent local roadway should be cleared to the level 1 standard. For future on-street bike routes that are to be maintained to the level 1 standard, the operations impact should include the resources required to respond to 311 (and other public) inquiries and to create and deliver a local marketing campaign to communicate how and why the route and roadway will be maintained.

This example highlights how the design of a bike route can affect how it is maintained. All bike projects should include an operations assessment to outline potential maintenance resource requirements, including considerations of handling inquiries and creating supplemental marketing campaigns, to maintain the infrastructure in alignment with the Bike Plan principles of health and comfort and network connectivity.

The Challenge: The design of the bike facility limits the type of equipment or treatment that can be used, causing snow and ice build-up, or an increase in maintenance costs to clear these areas manually.

Example: 76 Avenue from 105 Street to 109 Street
The unidirectional protected bike lanes on 76 Avenue include segments which weave around parking spaces, creating narrow jogs in the route. As a result of the design, some sections of the route must be cleared manually because the equipment cannot be accomodated. This results in additional maintenance resources needed to maintain the bike route to the specified standard. This example underlines how design can affect maintenance practices and may prevent or hinder a specific segment from being maintained to a level that aligns with the Bike Plan Principles of Health & Comfort and Connectivity.

5.0 Monitoring and Evaluation

The overarching goal of the Bike Plan is to increase cycling in Edmonton, with the aspiration that biking is "inviting for people of all ages and abilities, for all reasons, in all seasons." The overarching goal is informed by ConnectEdmonton and The City Plan which include the following indicators, targets, and measures:

+ **ConnectEdmonton Indicator** for the transportation system is transportation mode and identifies the breakdown of Edmontonians' modes of transportation for daily need through the City of Edmonton Community Perception Survey.
+ **The City Plan target** that aims for 50% of trips to be made by transit and active transportation
+ **The City Plan strategic measures** for the transportation system related to biking are:
  » daily trips using transit and active transportation by district
  » bicycle paths/lanes per 100,000 population

The purpose of a monitoring and evaluation program is to determine if changes made in the bike network, supporting infrastructure, or programs are having the intended outcomes. Monitoring and evaluation programs can also gauge the effectiveness of how the plan and its associated programs are being delivered. To do this, two areas must be measured:

+ **Program Outputs —** The institutional products and activities such as policy, programs, infrastructure operation, maintenance, and construction which the City is responsible for delivering or that are delivered by partner agencies

+ **Community Outcomes —** The performance, behaviour, and perceptions of Edmontonians to the changes that are made in the community because of the programs and actions taken by the City or partner agencies.

Metrics aim to measure these program outputs and community outcomes. Some of the metrics were inspired by monitoring frameworks from other cities because of their content and brevity. By focusing on meaningful metrics that are not too onerous to collect, the monitoring and evaluation framework will be easier for the City to implement and consistently receive necessary support for the duration of the Plan.

5.1 Metrics

The program output and community outcome metrics summarized include a proposed data source and frequency of evaluation. The frequency of evaluation is proposed based on the availability of the data, the level of effort required to calculate the metric, and the utility of the data in informing near-term or long-term adjustments. The metrics are also accompanied by a stated utility (i.e., why are we measuring this?). The stated utility typically refers to monitoring overall ridership goals, components of the aspiration and values, the network principles, or the program areas.

Some of the proposed data sources do not currently exist. The data sources that should be developed so appropriate monitoring can occur are:

+ **Asset Management Database –** To be created in line with Bike Plan action 9.6.2 Maintaining Bicycle Facility Infrastructure and Equipment

+ **Community Partner Survey –** To be deployed yearly to track the activities of community partners related to cycling. Community partners should be notified a year in advance of the first survey of the type of metrics they will be asked about to maximize the quality of the collected data.

+ **Transportation Survey –** To be implemented bi-annually in conjunction with the Traffic Safety Culture survey. The survey will provide interim travel information between Household Travel Survey years.

PROGRAM OUTPUT METRICS

Program Output metrics monitor the implementation of the Bike Plan. Some program areas of the Bike Plan may have a limited number of metrics since tracking may be difficult due to data availability or the nature of the metrics (e.g., qualitative vs quantitative). Alternatively, some program areas could have numerous metrics (e.g., Maintenance Program Area) and in those cases a concise list of metrics is suggested. Program output metrics are listed in **Table 7.**

TABLE 7: Program Output Metrics

METRIC	UTILITY	DATA SOURCE	FREQUENCY
length of bike network by facility type (i.e., protected bike lanes, shared pathways, shared streets) per 100,000 population	tracks progress of network construction	network GIS data	yearly
percent of population within 400m of the bike network	tracks expansion of the network into less connected locations	network GIS data, census data	every 3 years
percent of new network length in low-income neighbourhoods	tracks equitable expansion of the network in underserved communities (short term)	network GIS data, census data	yearly
percent increase in bicycle network analysis score	tracks progress in relative accessibility	network GIS data, Land use data	every 3 years
proportion of transit stations, LRT stations and bus stops where bikes are accommodated to the current standard (to be developed)	tracks overall progress in integrating bicycles and transit	network and transit GIS data	yearly
total number of new bike parking spaces	tracks increase in provision of end-of-trip facilities	asset management database	yearly
proportion of bike network signed to the current wayfinding standard	tracks progress in providing up-to-date on road wayfinding	network GIS data, asset management database	yearly
proportion of the bike network illuminated to the current standard	tracks progress in providing properly illuminated facilities	network GIS data, asset management database	yearly
proportion of the bike network with pavement condition index better than specified threshold	tracks quality of the pavement throughout the network	network GIS data, asset management database	yearly
proportion of the bike network maintained for all-seasons riding	tracks extent of winter maintenance Network GIS data	asset management database	yearly
proportion of elementary school children who receive bicycle skills training	tracks progress towards building a strong educational foundation	community partner survey	yearly
proportion of elementary schools with Safe Routes to School programs	tracks progress towards ensuring a safer cycling environment and bicycle education	community partner survey	yearly
number of bicycle-related events supported or instigated by the City or a community partner	tracks culture shift, vibrancy, and health of the cycling community	community partner survey	yearly
average number of bicycle parking spaces provided at major events	tracks culture shift and normalization of cycling	community partner survey	yearly

5.2 Community Outcome Metrics

Community Outcome metrics are focused on changes in behaviour, perceptions, and performance of the people who are using or will use a bicycle to travel around the city. Community Outcome Metrics are listed in **Table 8.**

TABLE 8: Community Outcome Metrics

METRIC	UTILITY	DATA SOURCE	FREQUENCY
percent trips (for any purpose) made by bicycle (breakdown by gender, age, income, neighbourhood)	tracks progress towards The City Plan target and the aspiration of all ages and abilities and all reasons, in addition to value of equity (the Household Travel Survey is the only existing source of data with all trip purposes for each mode with a high level of reliability)	household travel survey	every 10 years
percent of use of bicycle to journey to work (breakdown by gender, age, income)	tracks progress towards The City Plan target and the aspiration of all ages and abilities and all reasons, in addition to value of equity (monitoring this metric requires minimal effort and provides a high level of consistency while measuring long term shifts in the main mode for commuting to work)	Canadian census	every 5 years
percent bicycle use at least 2-3 times per week as mode of transportation (breakdown by gender, age, income, neighbourhood, season, and purpose)	tracks progress towards the City Plan target and the aspiration of all ages and abilities and all reasons, in addition to value of equity (thereliability of this data will likely be lower than the Household Travel Survey, but the higher frequency will provide interim progress data to help adjust implementation in the short term)	transportation survey	every 2 years
count volume, recorded by location and supplemented by crowd-sourced data (e.g., Strava, Google travel data), analyzed by time of day, weekday / weekend, month and season	tracks network usage spatially which can notably inform priority routes for maintenance; tracking by season informs winter retention (all seasons) and time of day can reveal purpose profiles (all reasons)	automated counters (Eco-Counter)	yearly
total number of entering/ exiting cyclists into the central business district (breakdown by observed gender and age (under 18, 18-65, over 65) and use of non-conventional bike or mobility aid in bike lane)	tracks progress towards The City Plan target and the aspiration of all ages and abilities and all reasons, in addition to value of equity; also tracks network usage spatially	cordon counts (manual or video)	every 2 years
number of major injury and fatal collisions involving cyclists (analyze by gender and age)	tracks progress towards making biking a safer transportation option; gender and age analysis can help track equity of outcome issues	collision data and hospitalization data	yearly

TABLE 8 CONTINUED: Community Outcome Metrics

METRIC	UTILITY	DATA SOURCE	FREQUENCY
percent agreement that cycling is accessible, comfortable, and/or easy in Edmonton (breakdown by gender, age, income, neighbourhood)	tracks progress towards ensuring that the network and supporting programs/initiatives provides a comfortable and inviting environment for cycling	transportation survey	every 2 years
percent occupancy of bicycle parking at transit centres and major events (e.g., festivals) where bicycle parking is provided	tracks culture shift and normalization of biking	community partner survey	yearly
percent observations of unlawful riding	tracks progress of compliance with laws and bylaws (direct observations are less subject to bias than infraction numbers or self reported unlawful behavior such as through the Traffic Safety Culture Survey)	cordon counts (manual or video)	every 2 years
gap in self-reported unlawful behaviour by mode and acceptability of unlawful behaviour (see Traffic Safety Culture Survey)	tracks changes in culture around traffic safety and acceptable behaviours	traffic safety culture survey	every 2 years
total number of bike lane obstruction complaints (vehicle, construction or other)	tracks progress in compliance with laws and bylaws and with construction site policies	311 data	yearly
total number of maintenance and snow removal complaints	tracks progress in perceived quality of maintenance	311 data	yearly
proportion of children declaring riding to school	tracks the progress towards making cycling a comfortable and accepted way to move around Edmonton for everyday trips	community partner survey	yearly
number of minutes of physical activity by biking	tracks progress in how biking contributes to people's level of physical activity	transportation survey	every 2 years

5.3 Input Metrics

In addition to the program outputs and community outcomes, a third category of indicators can be measured: inputs. Inputs describe the financial and organizational resources made available to reach the desired outcomes and support the implementation of the Bike Plan. Examples of Inputs include leadership, strategies & policies, resources, research & training, and partnerships. Examples of inputs that can be measured are provided, but not to the same extent as the program outputs and community outcomes since many of these qualitative indicators would benefit from further dialogue and engagement.

Inputs include funding spent on implementing the Bike Plan and can also be used in comparison to funding for other activities or modes. Two metrics are suggested:

+ **Dollar amount of spending to support cycling annually** (includes capital funding, for a bike capital profile and capital funding through other projects), operations costs and program funding)

+ **Funding for cycling as a percent of total transportation spending**

5.4 Setting the Monitoring Foundation

Edmonton currently measures and reports on several of the metrics highlighted in the previous section. While some of the metrics identified are currently not measured and reported, many of these metrics, such as percent trips made by bike, are measured through other monitoring programs and will serve as the foundation for the bike network monitoring program. Over time, it is envisioned that the program will expand through opportunities to modify or add to other monitoring programs and by administering new surveys to measure the metrics highlighted in the previous section.

Table 9 summarizes the metrics which are currently included as part of other monitoring programs that can serve as the foundation for the bike network monitoring program.

TABLE 9: Currently Measured Metrics Related to the Bike Network

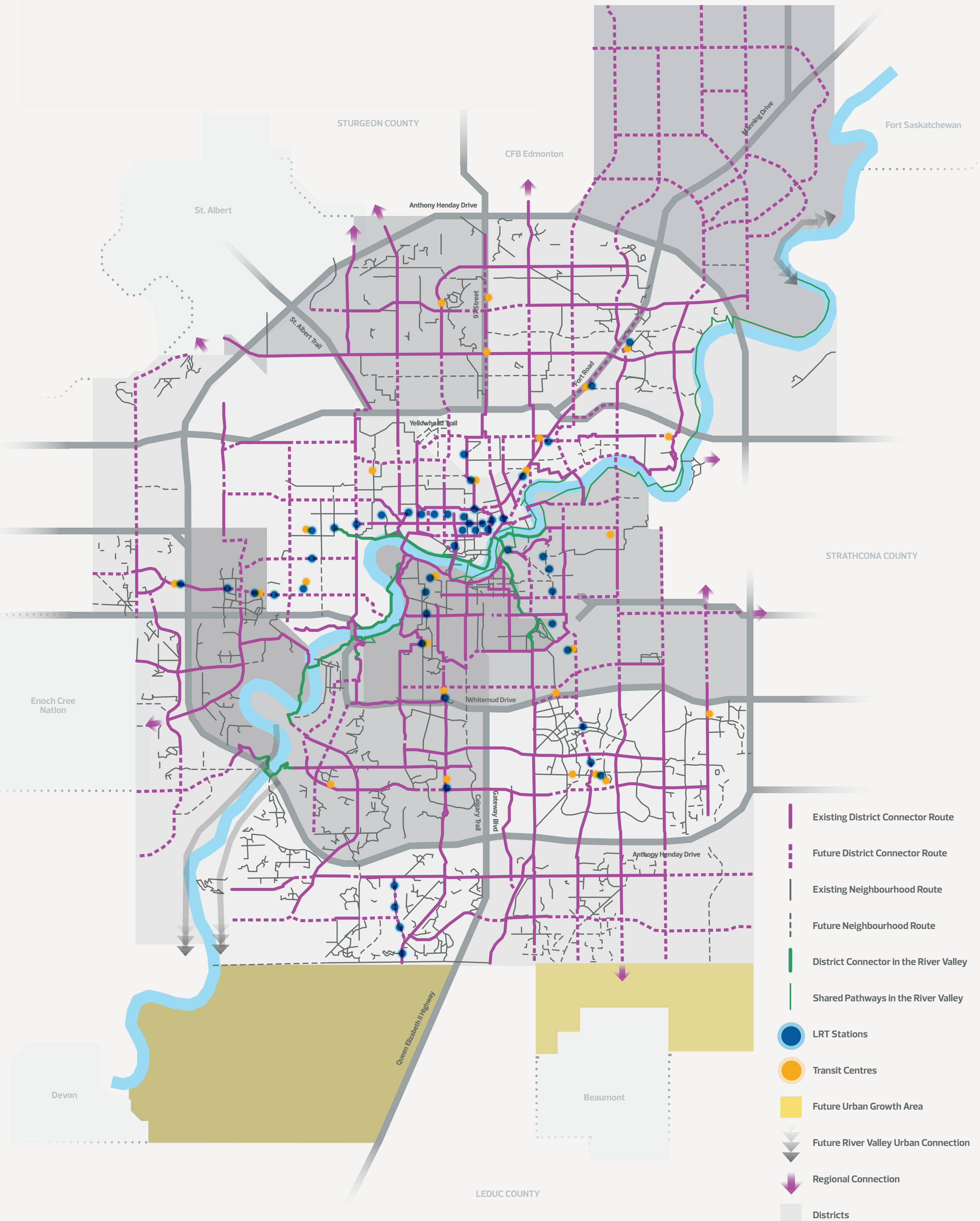
METRIC	SOURCE	YEAR
Length of bike network by facility type (i.e., protected bike lanes, shared pathways, shared streets) per 100,000 population	Network GIS data	2019, 2020, yearly thereafter
Proportion of the bike network maintained for all-seasons riding	Network GIS data	2020, yearly thereafter
Percent trips (for any purpose) made by bicycle (by gender, age, income, neighbourhoods)	Household Travel Survey	2005, 2015, every 10 years thereafter
Percent bicycle use for journey to work (by gender, age and income)	Canadian Census	2006, 2011, 2016, every 5 years thereafter
Count volume recorded by location (by time of day and season)	Eco-Counter data	2018, 2019, 2020, every year thereafter
Total number of entering/exiting cyclists into the central business district (by observed gender and age and bike or mobility aid category)	Central Business Cordon Report	2014, 2016, report when next count re-initiated, every two years thereafter
Number of major injury and fatal collisions involving cyclists (by gender and age)	Collision data	2015, 2016, 2017, 2018, 2019, every year thereafter
Total number of bike lane obstruction complaints (vehicle, construction or other)	311 data	2021 (previous years if data is available), every year thereafter
Total number of maintenance and snow removal complaints	311 data	2021 (previous years if data is available), every year thereafter
Dollar amount of spending to support cycling annually	capital project data	annually
Funding for cycling as a percent of total transportation spending	capital project data	annually

The bike network monitoring program provides an opportunity to highlight the state of the network relative to previous years. and the changes in how people use it to guide how we plan and design bike routes and better highlight the need for bike accommodation throughout the City. The bike network monitoring program should be updated and reported annually to ensure that the most up-to-date data is published and that Administration is referencing the same data for consistencies in communications and reports.

In addition to implementing the bike network monitoring program, being part of an awards program, such as the national program offered by Bicycle Friendly Communities, may provide another opportunity to self-assess the state of Edmonton's bike network. These types of programs can provide a sense of how Edmonton's progress compares to other cities across the province, country and world, and will better highlight areas where improvement is needed. Perhaps even more importantly, they recognize and celebrate Edmonton's achievements around biking, which is also an important part growing biking in Edmonton.

APPENDIX A
The Bike Plan Maps

DISTRICT CONNECTOR NETWORK



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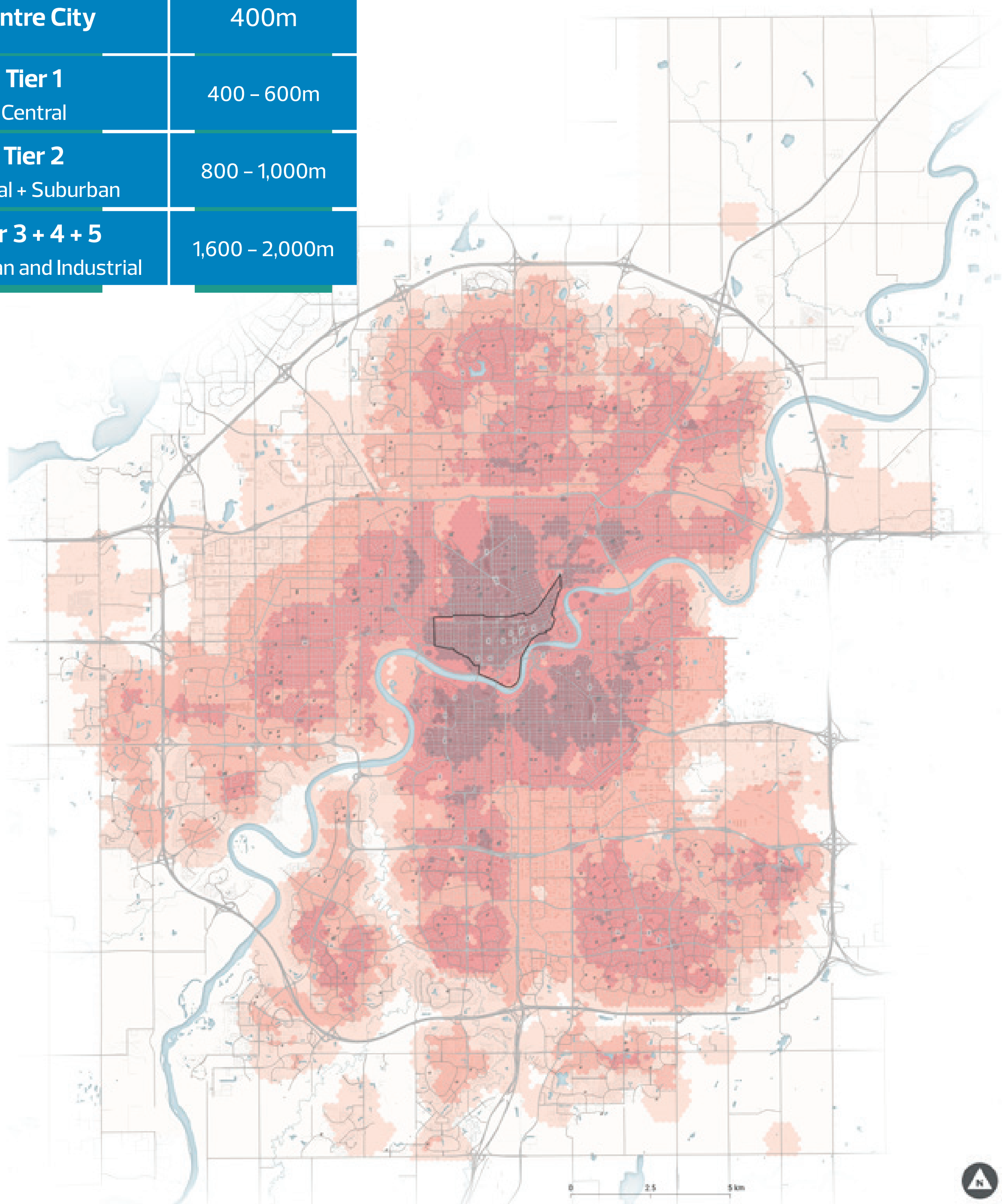
ROUTE SPACING AND BIKE TRIP POTENTIAL

Area	Route Spacing
Centre City	400m
Tier 1 Central	400 – 600m
Tier 2 Central + Suburban	800 – 1,000m
Tier 3 + 4 + 5 Suburban and Industrial	1,600 – 2,000m



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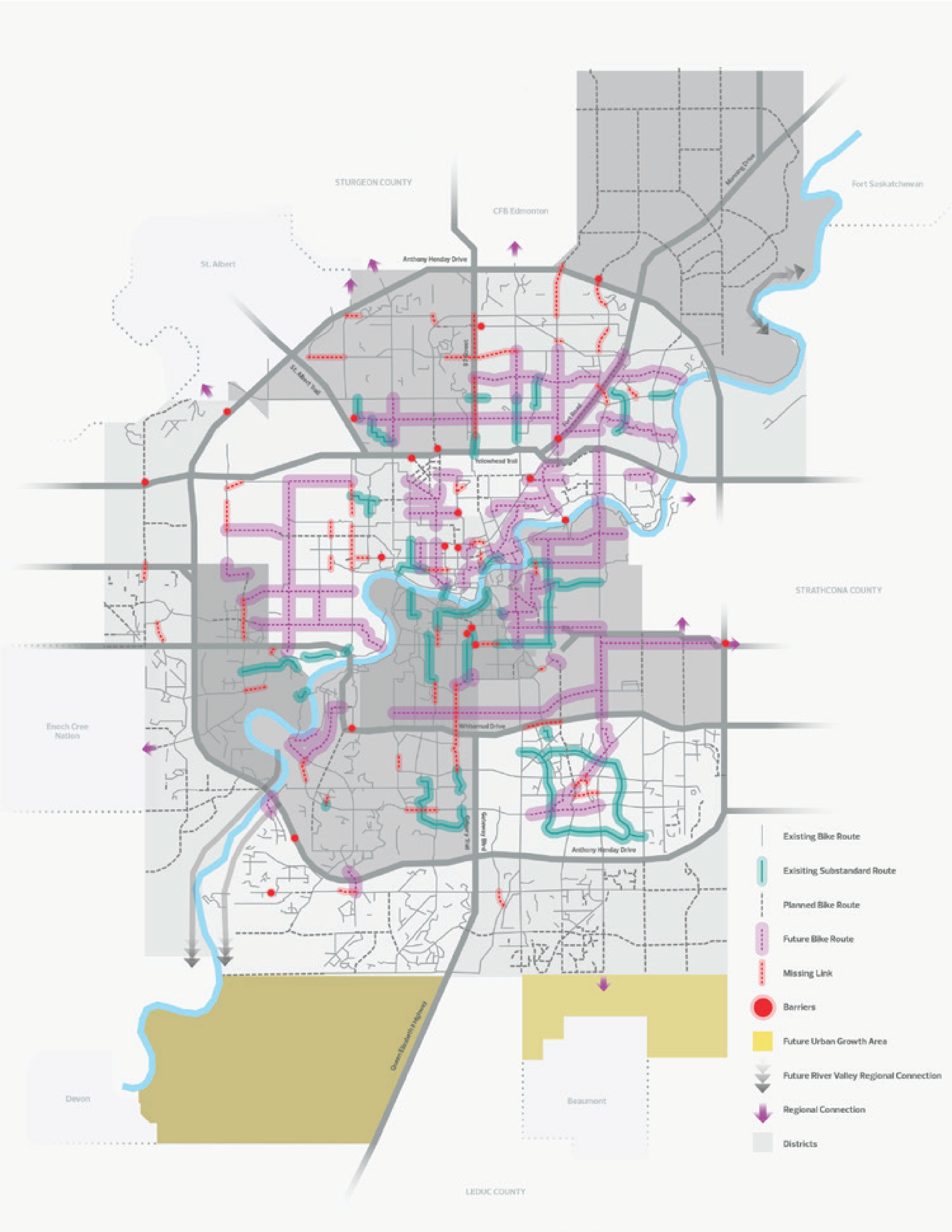
FUTURE BIKE NETWORK IMPLEMENTATION STRATEGY



APPENDIX B
Near-Term Priority Bike Routes Summary

NEAR-TERM PRIORITY ROUTES

CONTEXT	ROUTE	FROM	TO	LENGTH (M)	CONNECTOR TYPE	IMPLEMENTATION TYPE	NOTES
central	99 Street	102A Avenue	101A Avenue	306	District Connector	Missing Link	Downtown
central	MacDonald Drive / 100 Avenue	100 Street	103 Street	564	District Connector	Future Bike Route	Downtown
central	103 Street / 102 Street	103 Avenue	105 Avenue	476	Neighbourhood Connector	Future Bike Route	Downtown
central	105 Avenue	101 Street	97 Street	488	District Connector	Missing Link	Downtown
central	100 Avenue	116 Street	W of 109 Street	803	District Connector	Missing Link	West-Central
central	121 Street	100 Avenue	106 Avenue	1,001	District Connector	Substandard	West-Central
central	101 Avenue path	95 A Street	96 Street	89	District Connector	Substandard	
central	High Level Bridge	97 Avenue	Saskatchewan Drive	375	District Connector	Substandard	
central	Saskatchewan Drive	109 Street	Gateway Blvd	1,850	District Connector	Substandard	
urban	102 Avenue	142 Street	135 Street	421	District Connector	Missing Link	West-Central
urban	106 Street	Princess Elizabeth Avenue	S of 118 Avenue	252	District Connector	Missing Link	West-Central
urban	113 Street	Kingsway Avenue	109 Avenue	1,067	District Connector	Future Bike Route	West-Central
urban	114 Avenue	120 Street	113 Street	1,461	District Connector	Future Bike Route	West-Central
urban	111 Avenue	120 Street	Kingsway Avenue	1,795	Neighbourhood Connector	Future Bike Route	West-Central
urban	114 / 115 Avenue	Groat Road	142 Street	1,093	Neighbourhood Connector	Substandard	West-Central
urban	118 Avenue	78 Street	64 Street	1,393	District Connector	Future Bike Route	East-Central
urban	110 Avenue	90 Street	92 Street	200	Neighbourhood Connector	Future Bike Route	East-Central
urban	112 Avenue	E of 76 Street	90 Street	1,595	Neighbourhood Connector	Future Bike Route	East-Central
urban	78 Street	119 Avenue	117 Avenue	346	District Connector	Planned	East-Central
urban	90 Street	112 Avenue	110 Avenue	161	Neighbourhood Connector	Future Bike Route	East-Central

NEAR-TERM PRIORITY ROUTES CONTINUED

CONTEXT	ROUTE	FROM	TO	LENGTH (M)	CONNECTOR TYPE	IMPLEMENTATION TYPE	NOTES
urban	82 Avenue	93 Street	83 Street	1,195	District Connector	Future Bike Route	South-Cental
urban	84 Street	101 Avenue	98 Avenue	415	District Connector	Missing Link	South-Cental
urban	91 Street	76 Avenue	88 Avenue	1,243	District Connector	Future Bike Route	South-Cental
urban	92 Street	88 Avenue	Connors Road	724	District Connector	Future Bike Route	South-Cental
urban	Connors Road	95 Avenue	92 Avenue	555	District Connector	Future Bike Route	South-Cental
urban	88 Avenue	85 Street	83 Street	223	Neighbourhood Connector	Planned	South-Central
urban	88 Avenue	85 Street	95 Street	923	Neighbourhood Connector	Future Bike Route	South-Cental
urban	Connors Road	92 Avenue	90 Avenue	354	Neighbourhood Connector	Future Bike Route	South-Cental
urban	101 Avenue	50 Street	79 Street	2,036	District Connector	Future Bike Route	
urban	97 Street	128 Avenue	124 Avenue	726	District Connector	Substandard	
urban	Crossing Canadian Pacific Railway	Argyll Road	75 Street	318	District Connector	Future Bike Route	
suburban	121 Avenue	66 Street (122 Avenue)	Wally Footes Trail	701	District Connector	Future Bike Route	East-Central
suburban	119 Avenue	38 Street	118 Avenue via Abbotsfield Road	985	District Connector	Future Bike Route	
suburban	127 Street	137 Avenue	127 Avenue	1,607	District Connector	Future Bike Route	
suburban	153 Avenue	Griesbach Road	82 Street	2,750	District Connector	Missing Link	
suburban	66 Street	127 Avenue	125 Avenue	450	District Connector	Future Bike Route	
suburban	97 Street	144 Avenue	128 Avenue	2,325	District Connector	Missing Link	
suburban	Fort Road / Manning Drive	127 Avenue	153 Avenue	2,105	District Connector	Future Bike Route	
suburban	139 Avenue / 40 Street	Clareview Transit Centre East	Hermitage Road	725	Neighbourhood Connector	Substandard	

NEAR-TERM PRIORITY BARRIERS

CONTEXT	BARRIERS	FROM	TO
central	Grant MacEwan campus	N of 104 Avenue	110 Street
central	Grant MacEwan campus	N of 104 Avenue	106 Street
urban	railyard	Approx 76 Avenue	E of Gateway Blvd
urban	challenging intersection (LRT crossing, congested vehicle traffic, skewed intersection)	106 Street	111 Avenue
urban	path disrupted because of LRT overpass at 118 Avenue	118 Avenue	E of 78 Street
suburban	challenging intersection (skewed intersection, >4 legs)	127 Avenue	Fort Road

APPENDIX C
Current Maintenance Practices

CURRENT MAINTENANCE LEVELS

The updated Snow and Ice Control Policy (C409J), approved in October 2018, directed to maintain prioritized bike lanes to bare pavement within 24 hours from the end of snowfall, with the goal of improving safety and accessibility for people riding throughout winter.

These prioritized bike routes include 19.7 kilometres of protected bike lanes and 18.3 kilometres of shared pathways, for a total inventory of 38 kilometres of prioritized routes. The City's bike network also includes non-prioritized bike lanes, including contra-flow bike lanes, painted bike lanes, shared roadways and shared pathways. Many on-street bike lanes, that are not part of the the prioritized bike routes, are serviced at the same level, and at the same time, as the rest of the roadway, while bike lanes on non-prioritized shared pathways and sidewalks are serviced to the same level as other pedestrian infrastructure. **Table C1** summarizes the City's maintenance standards by season.

TABLE C1: City of Edmonton Maintenance Standards

SEASON	PRIORITIZED BIKE LANES	NON-PRIORITIZED SHARED PATHWAYS	NON-PRIORITIZED ON-STREET BIKE LANES
Spring	includes sweeping	includes sweeping	swept when street is swept
Summer	N/A	N/A	N/A
Fall	N/A	N/A	N/A
Winter	maintain prioritized sidewalks, trails and bike routes to bare pavement within 24 hours from end of snowfall	plow snow from shared pathways and sidewalks adjacent to city-owned land within 48 hours of a snowfall where there is an accumulation of 2 cm or more	plow snow from designated bicycle lanes with the roadway plowing to the same service level designated for that roadway

PRIORITIZED BIKE LANES FOR SNOW AND ICE CONTROL

The network of prioritized bike lanes generally focuses on central and west-central Edmonton. The current network of prioritized bike lanes is illustrated in **Figure C1.**

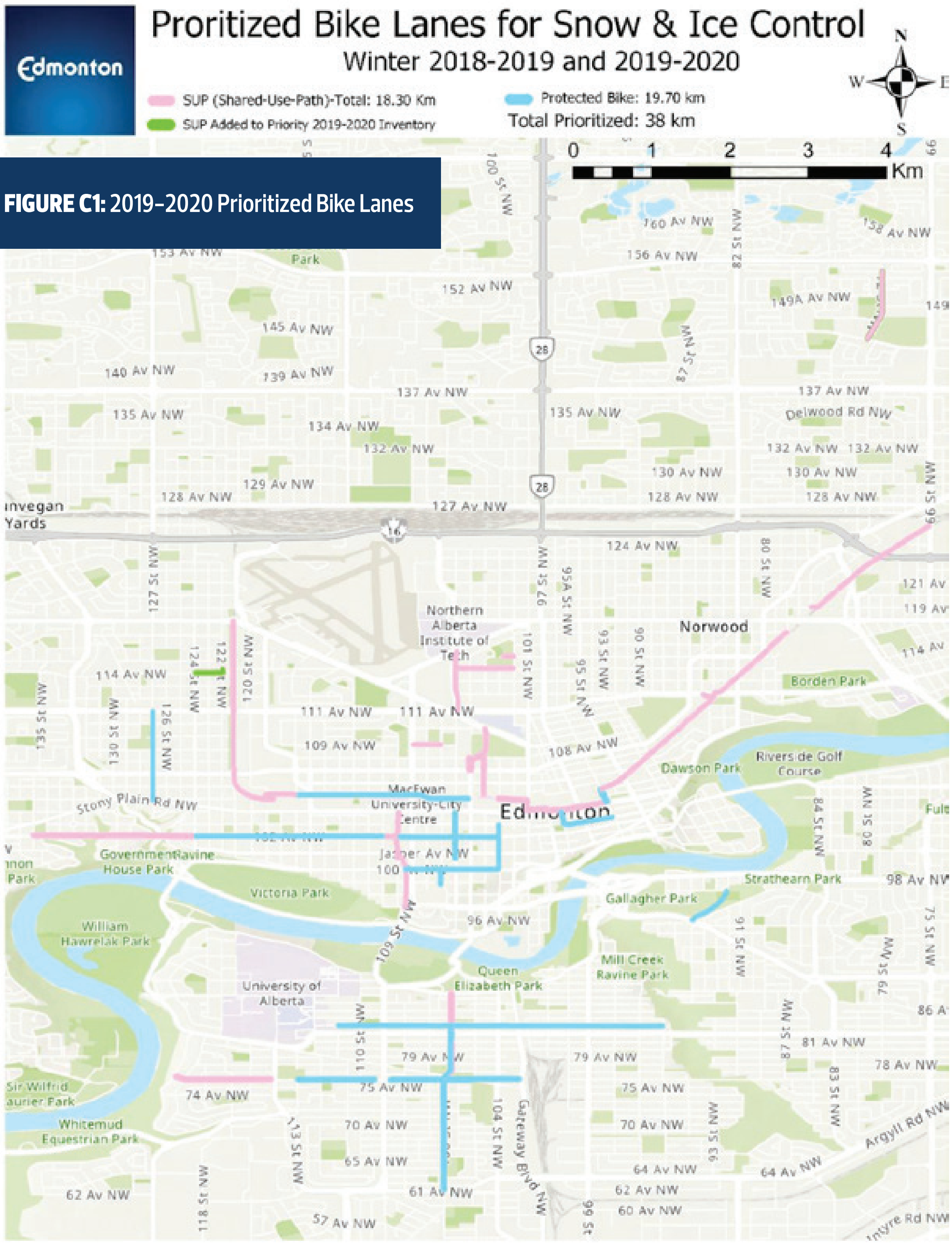


FIGURE C1: 2019–2020 Prioritized Bike Lanes

FINANCIAL IMPLICATIONS

Table C2 summarizes the breakdown of the total costs associated with clearing snow and ice from the 38 kilometres of prioritized bike lanes during the winter of 2018–2019 and 2019–2020.

TABLE C2: Winter Maintenance Costs for 2018–19 and 2019–20

SEASON	LABOUR COSTS	EQUIPMENT COSTS	MATERIALS & OTHER COSTS	TOTAL COSTS
2018–2019	$338,358.85	$111,968.35	$12,732.31	$463,059.51
2019–2020	$207,850.94	$106,851.17	$20,315.17	$335,017.28

Source: CR_8194 Cost of Clearing Bike Lanes

While there weren't any substantial changes to the prioritized bike lanes network over this period, there was a 28 per cent reduction in the total costs in the 2019–2020 season. Although most of this reduction can be attributed to the decrease in labour costs, it should be noted that these costs are also influenced by the weather and can fluctuate year to year. Based on the 2019–2020 costs, the unit cost to clear a bike lane is estimated to be in the order of about $8,800 per kilometre; however, the unit cost can vary depending on the type and design of the facility.

The Snow and Ice Control budget for 2018–2019 was $63.7 million and for 2019–2020 was $60.0 million. The total cost of snow clearing the 38-kilometre network of prioritized bike lanes was $463,059.51 (0.7 per cent) for the 2018–2019 winter season and $335,017.28 (0.5 per cent) for the 2019–2020 winter season. Those costs represent 0.7 per cent and 0.5 per cent of the total snow clearing budget in 2018–2019 and 2019–2020, respectively.

The Bike Plan

Implementation Guide | 2021 — 2026

February 2021

SHARE YOUR VOICE
SHAPE OUR CITY

The Economic Benefits of Bike Lanes

Bike lanes bring numerous benefits to cities. This section highlights those economical benefits of bike lanes by summarizing research and case studies from other municipalities across Canada, North America and the world. Economic benefits are generally grouped into five areas:

- Health benefits
- The shift to car-lite
- People who bike are shoppers, too
- Job creation
- Property values and bike lanes

Physical Activity and Health

Investments in bicycle lanes come with good societal and economic value, largely in part because they promote physical activity, serving as one of the more cost-effective approaches to preventative healthcare (Gu et al., 2017). For example, in Copenhagen, it is estimated that every kilometer traveled via bicycle results in a net gain of 1.20 DKK (0.25 CAD). Driving, by contrast, is associated with a loss of 0.69 DKK (0.14 CAD) per kilometer (Gosling & Choi, 205). These savings result from lower public sector investment (e.g., bike infrastructure costs less than vehicle infrastructure) and reduced health care costs from a more active population.

Considering savings in health care alone, the economic benefits of bike lanes outweigh the costs, typically in the order of 5:1 (Cavill et al. 2009). By providing bicyclists with a continuous network of bikeways and the highest degree of travel continuity possible, studies show that people bicycle more and obesity rates are lower in countries that have better bicycle infrastructure (City of New York, 2010).

The Shift to Car-Lite

Cars are a relatively expensive way to move around in big cities. Nationally, spending on transportation is the second highest household expense after housing. The Alberta Motor Association estimates the annual cost for operating a mid-size car, including the cost of the vehicle, fuel, maintenance, and insurance, can be $9,500 per year. Biking provides a low-cost transportation option with an estimated annual operating cost of around $350. Reduced spending on transportation can allow residents to direct these cost-savings elsewhere.

Many cities are progressing towards better enabling car-lite life by making neighbourhoods people-first, rather than car-first. Measures employed range from providing a more comprehensive active modes network to the introduction of car-free zones to allow the movement of people by transit, bikes and walking more easily.

In Edmonton, 11 per cent of Edmonton households don't have a car and over half (59%) of Edmonton households have at least one adult bicycle, with an average ownership rate of 1.21 adult bicycles per household (City of Edmonton, 2018). Vehicle sharing is also trending up in Edmonton, further enabling people to pursue a car-lite lifestyle (City of Edmonton, 2018).

Boosting Retail Sales

People who bike and walk to stores tend to spend less per visit than those who arrive by car, but people biking and walking tend to visit more often, resulting in more spending over the course of a longer period (i.e., per month) (Clifton et al., 2012). Research in the United Kingdom suggests that this support for local retailers is often unnoticed as retailers tend to overestimate how many people arrive by car and also tend to overestimate how far shoppers travel to get to their store (Sustrans, 2006).

Retailers adjacent or near newly installed bike corrals report increased numbers of customers and improved visibility of the business from the street (Meisel, 2012), and often tend to seek further improvements to the public realm space adjacent to their store, such as sidewalk seating and/or tables.

Job Creation

Research suggests constructing pedestrian and bicycle infrastructure projects tend to require more people per dollar spent than road projects (Cambridge Systematics & Toole Design, 2018). In addition, pedestrian and bicycle infrastructure projects tend to have a higher share of salary expenditures than capital costs like asphalt and heavy equipment (Cambridge Systematics & Toole Design, 2018). Besides construction, jobs may also be created in the bike manufacturing, retail, and hospitality sectors.

Increasing Property Values

A review of past research from across the U.S. about bike lanes and property values concluded that "the majority of studies indicate that the presence of a bike path/trail either increases property values and ease of sale slightly or has no effect" (Dunne, 2019). Increases in property values are not seen as a benefit by everybody as bike lanes may, unintentionally, be a tool of gentrification that contribute to housing affordability issues (Dunne, 2019).

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Urban Planning and Economy
CR_7889

The Bike Plan Implementation Guide

Urban Planning Committee / February 15, 2022

1. Resources and Timelines
2. Project and Program Prioritization
3. Bike Route Planning Process
4. Maintaining an All-Seasons Network
5. Monitoring and Evaluation

Edmonton

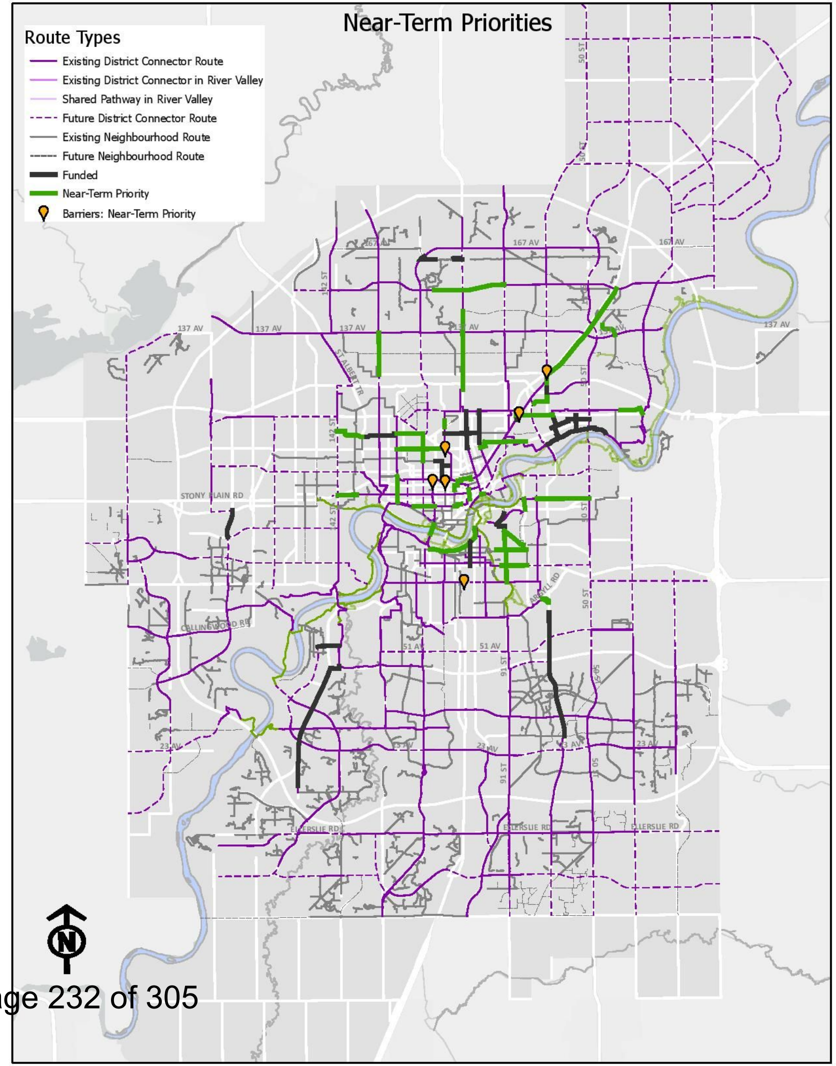
The City Plan Implementation Approach

	Planning, Policy & Regulation	Process & Service Delivery	Data & Measurement	People, Partnerships & Change Management
Examples	• District Planning • City Planning Framework • Zoning Bylaw Renewal	• Prioritized budgeting • Business planning • Operational service delivery	• Measures and targets • Transparent reporting	• Organizational change management • External relationships and partnership

Edmonton

Bike Network Implementation

Redeveloping Areas	408 km
Developing and Future Growth Areas	278 km
TOTAL	**678 kms**



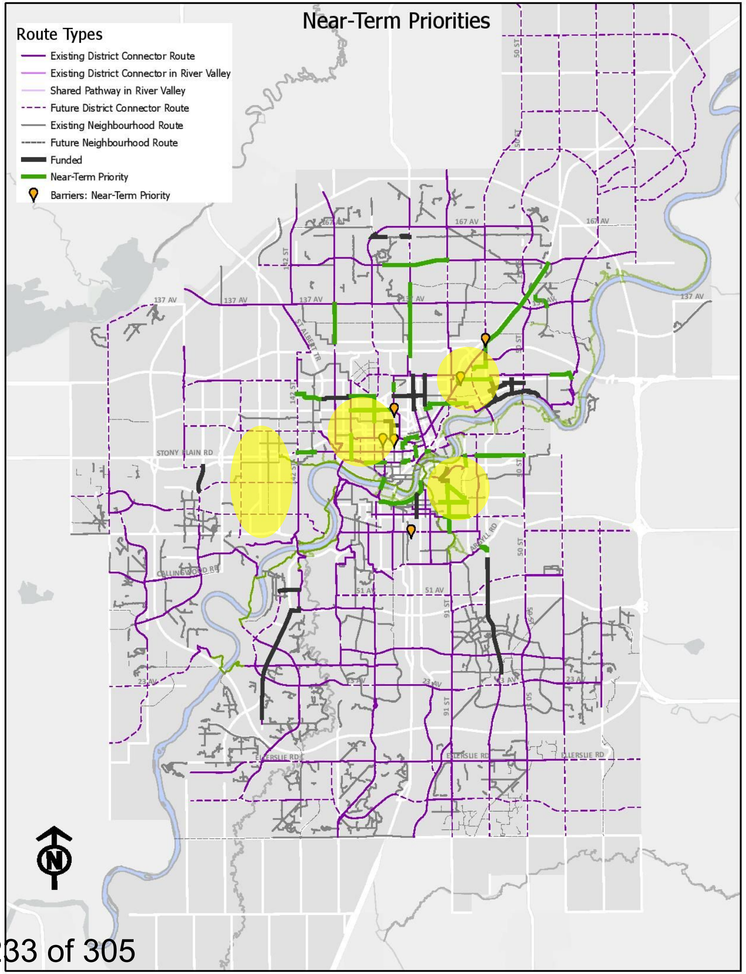
Bike Network Priorities

Near-Term Priorities:

- Increasing network density in central Edmonton
- Extending high quality network out from the central areas
- Stronger connections between central and north Edmonton

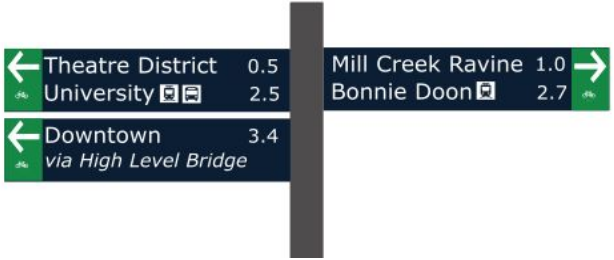
Area Network Plans

- Areas where it makes sense to do integrated planning across multiple neighbourhoods



Edmonton

Program Areas



Edmonton

Next Steps

- Develop recommendations for 2023-2026 capital budget cycle (both network and program areas)
- Ongoing planning and design in select locations
- Continue to watch for opportunities for alignment with other projects and partnerships

Thank You.

Urban Planning Committee / February 15, 2022

COUNCIL REPORT

MOBILITY NETWORK ASSESSMENT

RECOMMENDATION

That the February 15, 2022, Urban Planning and Economy report UPE00491, be received for information.

Report Purpose

Information only.

Urban Planning Committee is being informed of Administration's technical analysis to prioritize mobility infrastructure investments in alignment with The City Plan.

Executive Summary

- Administration has developed a prioritization framework for mobility infrastructure investments that support the Big City Moves identified in The City Plan.
- The process identified eight corridors and/or intersections with high alignment to the City's strategic goals.
- Additional investment programs were also considered that could support smaller operational improvements at various locations city-wide.
- High priority corridors and/or intersections will be packaged into projects with a defined scope for potential funding, which will help inform recommendations for the 2023-2026 Capital Budget Cycle.
- Through the Capital Budget process, City Council will have the opportunity to allocate funding towards recommended priorities.

REPORT

The City Plan envisions a vibrant and prosperous city of two million people with half of future population growth occurring in established areas. The foundation of our future city includes a network of nodes and corridors that provide the necessary urban structure to direct future investment and manage ongoing change. Together, the network of nodes and corridors support greater community equity, opportunity and connectedness. This vision is supported by an integrated and diverse mobility system that provides residents with convenient travel options and allows people to complete their daily needs within a 15-minute travel time.

As part of implementing the City Plan, a Mobility Network Assessment was developed, establishing a technically driven process to identify transportation network investments that align with the City's strategic goals. The process considers potential capital investments that would result in operational improvements for either general traffic, transit, or active modes along arterial roadways, freeways and expressways. The process also considers budget allocations that could fund multiple small local improvements throughout Edmonton. The results of this technical process will contribute to developing the upcoming 10-year Capital Plan, which will contribute to recommendations related to priority transportation infrastructure investments in upcoming capital budget cycles.

The Urban Planning and Economy report CR_7477, Transportation Network Indicators, presented at the March 23, 2021, Urban Planning Committee meeting provided an overview of the Mobility Network Assessment process to prioritize mobility network investments. This report summarizes the prioritization process, alignment with The City Plan and introduces the priority locations identified through the assessment. The report highlighted that the highest priorities will not include locations affected primarily by vehicular congestion or perceived operational issues, and many road widening project locations will not rank highly.

Prioritization Process

The Mobility Network Assessment assessed potential infrastructure investments that would address existing gaps and operational issues in the mobility networks. The assessment prioritized investments that provide the greatest support to the strategic evolution of the mobility system.

The City Plan was used as a key input in the development of the prioritization framework. Alignment with nodes, corridors, principal roadways, active modes and mass transit all inform the prioritization criteria. The criteria also incorporates direction from The Safe Mobility Strategy, The Sidewalk Strategy, The Bike Plan, The Transit Priority Measures Study, and Mass Transit Planning for a population of 1.25 million people. Other inputs into the process include data on funded capital projects and upcoming renewal plans. Details on the prioritization process are included in Attachment 1.

A holistic approach was used to consider how all types of transportation investments align with the City's strategic direction including locations that have previously been identified as the City's responsibility for road widening. Rather than prioritizing transit, active modes, vehicular operations, and goods movement separately, these networks were considered as an interconnected mobility system and the resulting priorities provide opportunities to improve mobility for multiple travel modes. An additional qualitative review was completed with a focus on equity and ensuring that investment priorities consider the needs of all Edmontonians.

The prioritization framework and criteria is adaptable and can be adjusted to reflect changes in circumstances, data availability or strategic direction. Administration will continue to review the prioritization framework and adjust as needed.

Mobility Network Assessment

Greenhouse Gas Emissions Review

In consideration of Edmonton's Community Energy Transition Strategy, Administration also completed a qualitative review of how mobility infrastructure investments may influence greenhouse gas emissions.

The types of investments most likely to support reduced transportation sector greenhouse gas emissions are those that support lower emissions travel like transit and active transportation or reduce long distance travel demand through the development of compact land use patterns. Without these types of investments, Edmonton will not be able to achieve its greenhouse gas emission targets as outlined in the updated Community Energy Transition Strategy.

Greenhouse gas emissions were considered through the development of The City Plan and are embedded within the existing strategic direction. Through alignment with The City Plan, these factors are reflected within the prioritization criteria, which considers support for transit, active transportation, and the land use patterns envisioned by The City Plan. As a result, the locations showing high strategic alignment also support opportunities for investments that support reduced greenhouse gas emissions.

Prioritization Results

The prioritization process identified eight locations that show the greatest strategic alignment to The City Plan. These locations demonstrated alignment with existing transit service, mass transit plans, roadway function, and historical safety considerations. Locations that are ranked highly align with locations of missing active modes connectivity, complement work planned or delivered through other projects, and align with The City Plan nodes and corridors.

The top locations are:

- **97 Street** (137 Avenue to 153 Avenue) provides an opportunity for improvements that support transit, active modes, and goods movement.
- **23 Avenue** (Calgary Trail to 111 Street) provides an opportunity for improvements that support transit and goods movement.
- **111 Avenue/142 Street** Intersection provides an opportunity to improve transit operations and multi-modal access to the Westmount Transit Centre.
- **104/103A Avenue** (97 Street to 102 Street) provides an opportunity to align with upcoming renewal work and support multi-modal access within the city centre node.
- **111 Avenue/101 Street** Intersection provides an opportunity to align with upcoming renewal and support multi-modal access to the Kingsway-NAIT node and the Royal Alexandra Hospital.
- **111 Avenue/Kingsway** Intersection provides an opportunity to align with upcoming renewal and support multi-modal access to the Kingsway-NAIT node and the Royal Alexandra Hospital.
- **Whyte Avenue/Gateway Boulevard** Intersection provides the opportunity to improve multi-modal access to the Whyte Avenue primary corridor.

- **101 Street** (103 Avenue to MacDonald Drive) provides an opportunity to improve multi-modal access within the city centre node.

Additional details and insight regarding the focus of possible improvements for these locations are provided in Attachment 2. Further assessment, planning and design would be required to determine the specific improvements at each location.

Composite Programs

In addition to specific locations, the prioritization process also considers composite programs. Composite programs are funding allocations that support localized improvements at multiple locations city-wide. Composite programs can be used to complete smaller improvements at locations that did not rank as top priorities on their own, but still provide opportunity to support the evolution of the mobility system. These programs can also support improvements on local and collector roadways and in open spaces that were not considered as part of the location-specific prioritization.

The Mobility Network Assessment identifies these five composite programs for consideration in the upcoming capital budget planning process:

- Missing and/or enhanced sidewalk connections
- Missing and/or enhanced active modes/cycling connections
- Safety improvements
- Transit priority measures
- Intersection improvements

Targeted localized improvements like those supported by the composite programs provide an opportunity to improve multi-modal access to local destinations, which supports The City Plan vision of a 15 minute community.

The composite program focusing on intersection improvements can be used to implement relatively fast and low-cost interventions for targeted locations with operational concerns that may not have ranked as highly through the prioritization process including locations identified for road widening.

Impact of Investments

The Mobility Network Assessment prioritizes infrastructure investment, from a technical perspective, that helps the city progress towards the strategic goals and targets established through The City Plan. However, infrastructure investment represents only one of the four levers of change identified in The City Plan. A combination of infrastructure investment alongside the other levers such as policy, partnerships and advocacy, and incentives, pricing and subsidies will be required to effect substantial change in the transportation indicators.

Next Steps

The results of the mobility network assessment will inform:

- The priority-based Capital Budget process which considers The City Plan's Big City Moves in order to inform the 10 year Capital plan and 2023-2026 Capital Budget cycle.

Mobility Network Assessment

- Opportunities for further refinement with confirmed asset renewal plans and strategic direction resulting from growth management criteria.
- Development of composite programs, as identified in this report, for consideration in the budget process.

Through the Capital Budget process, City Council will have the opportunity to allocate funding towards the recommended priorities, or other priorities identified by Council.

COMMUNITY INSIGHT

The Mobility Network Assessment relied on the direction provided in The City Plan and other strategic documents that included robust public engagement with Edmontonians. Additional research and/or conversations with Edmontonians and other stakeholders would be included as part of the project development and delivery model process for mobility projects that proceed to planning and design.

GBA+

Seniors, the young, newcomers, people with disabilities, and low-income populations, among others, experience physical, social, and/or economic barriers to driving. Mobility barriers and safety concerns can be experienced by these populations when investment is focused on infrastructure that favours one mode of transportation, like motor vehicles. In alignment with direction in The City Plan, the mobility network assessment includes transit, safety, and active transportation as important criteria to help identify locations for investment that can benefit a wide range of users including those that do not have access to a personal vehicle. Most trips Edmontonians take every day are multimodal. Trips typically begin and end with walking, and thus a diverse mobility system benefits everyone even if an individual favours one particular mode of transportation.

The mobility needs of marginalized populations such as seniors and families with children may not be addressed by projects that focus on commuting corridors and long-distance travel. Large projects focusing on arterial roadways may not address localized needs for access to healthcare services, education, and other supports. The Mobility Network Assessment identifies the importance of prioritizing composite programs which support more localized improvements supporting a greater diversity of users in accessing local destinations.

A GBA+ process will be integrated into the project process for all mobility projects that proceed to planning and design. Applying GBA+ to mobility planning will help ensure that projects do not create inequalities or contribute to the marginalization of diverse individuals.

ATTACHMENTS

1. Mobility Network Assessment Prioritization Process
2. Mobility Network Assessment Priority Locations

Mobility Network Assessment Prioritization Process

Strategic prioritization of infrastructure investment can help ensure that funding is allocated effectively. The Mobility Network Assessment prioritization framework seeks to identify locations where mobility investments best align with strategic direction. The prioritization process includes 3 steps.

1. **Identify Locations for Potential Investment**
   An operational review of the mobility network identified that there is a long list of locations for potential investment. These locations include:
   - Roadway segments and intersections with congestion and/or operational concerns
   - Opportunities to improve transit speed and reliability, including new mass transit lines
   - Existing gaps in the pedestrian and cycling network
   - Locations with identified safety concerns

2. **Evaluate Locations Based on Prioritization Criteria**
   Locations for potential investment receive scores for alignment with strategic prioritization criteria. Locations that demonstrate an opportunity to meet multiple objectives receive scores for multiple criteria and therefore receive higher overall scores. Details on the prioritization criteria are provided below.

3. **Apply Additional Lenses of Review**
   While many elements of alignment can be evaluated through the scoring process, other elements cannot be easily quantified or scored. Because available data and modelling capability is limited, both equity impacts and greenhouse gas impacts were included in the process as additional lenses on the final results. This review includes an assessment of the locations through these lenses and making any necessary adjustments to the prioritized lists.

Prioritization Criteria

A multi-departmental team, with consultant support, worked with the data available and strategic documents to develop prioritization criteria. Key strategic direction and data informing the prioritization criteria include:

- The City Plan
- The Bike Plan
- The Sidewalk Strategy
- Mass Transit Planning
- Transit Priority Measures Study
- The Safe Mobility Strategy
- 5 Year Life Cycle Management Plan
- Funded Project Lists

The following table includes the resulting prioritization criteria, including sub-criteria and how the criteria aligns with the Big City Moves identified in The City Plan.

Table 1. Prioritization Criteria

1. Transit Support	**Description**	How the investment aligns with and supports transit routes and mass transit plans.
	Sub-Criteria	• Transit Priority Measures (TPM) Location (locations identified for potential transit priority measures) • Bus Network Redesign Routing • Mass Transit Semi-Exclusive Corridor • Mass Transit Rapid Corridor • Transit Centre/LRT Station Connectivity
	Strategic Alignment	• Greener as we Grow • Community of Communities
2. Active Modes Support	**Description**	How the investment supports improvements for people walking, rolling, and cycling.

	Sub-Criteria	• Missing links identified through the Bike Plan • Links identified on the missing sidewalk request list • Connections to mobility hubs identified through The City Plan and Mass Transit Planning for 1.25 million • Active connectivity to Transit Centres and LRT stations
	Strategic Alignment	• Greener as we Grow • Community of Communities
3. Roadway Operations	**Description**	How the investment affects vehicle traffic and goods movement.
	Sub-Criteria	• Primary Corridor • Principal Roadway • Secondary Corridor • Freeway/Expressway • Truck Route • Access to Major Employment Areas • Regional and Provincial Connectivity • Park and Ride Connectivity
	Strategic Alignment	• Catalyze and Converge
4. Synergies	**Description**	How the investment aligns with planned renewal work or other funded capital projects.

	Sub-Criteria	• Preliminary information on
		    ○ Minor renewal needs
		    ○ Major renewal needs
		• Future LRT
		• Other funded capital projects

	Strategic Alignment	• Rebuildable City • Catalyze and Converge
5. Safety Considerations	**Description**	How the investment aligns with the high injury network identified using the crash and equity analysis developed as part of the Safe Mobility Strategy.

	Sub-Criteria	• Motor vehicle serious injuries • Motor vehicle fatalities • Vulnerable user serious injuries • Vulnerable road user fatalities
	Strategic Alignment	• Inclusive and Compassionate
6. Development Support	**Description**	How the investment supports potential for high user growth and development of the city's nodes.
	Sub-Criteria	• Major Nodes (identified in The City Plan) • Minor Nodes (Identified in The City Plan) • Destinations serving low income residents (from the household travel survey data)
	Strategic Alignment	• Rebuildable City • Community of Communities

Mobility Network Assessment Priority Locations

The application of the prioritization framework yielded a ranked list of locations which best align with the City's strategic direction and offer varied opportunities to improve mobility for multiple transportation modes. In examining the list of locations, the following groupings emerged:

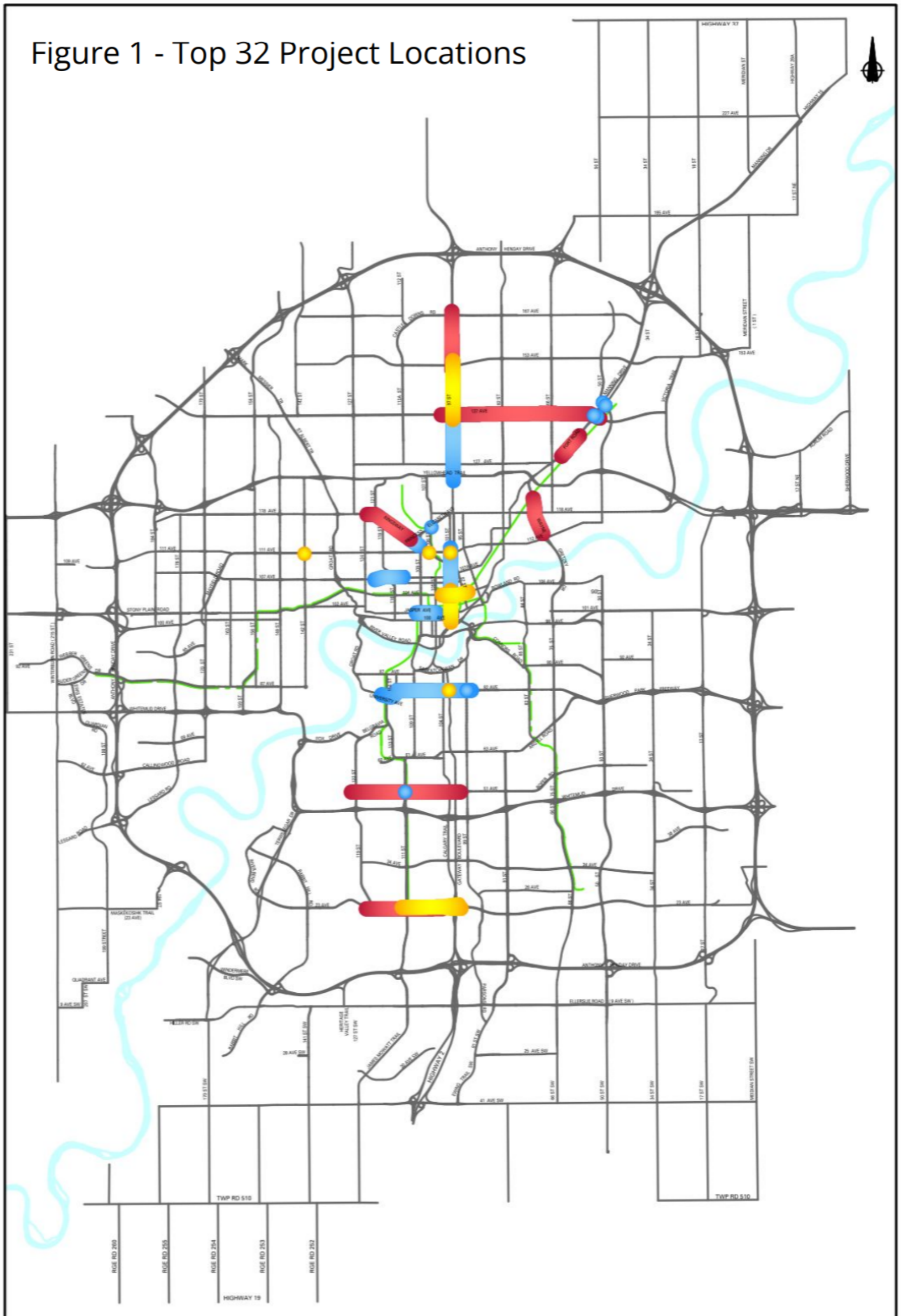
- First Group - Top 8 locations listed in Table 1 and shown in Figure 1
- Second Group - Top 32 locations listed in Table 2, also shown in Figure 1
- Third Group - Top 100 locations listed in Table 3 and shown in Figure 2

Locations are listed in the order of ranking determined through the prioritization process.

Composite programs were also considered as part of the evaluation process, all of which showed high alignment with the City's strategic direction. A summary of the composite profiles is included in Table 4.

Attachment 2

Figure 1 - Top 32 Project Locations



LEGEND:
- ARTERIAL, EXPRESSWAY, OR FREEWAY
- EXISTING LRT
- UNDER CONSTRUCTION LRT
- TOP 8 PROJECT LOCATION
- TOP 32 PROJECT LOCATION
- TOP 32 PURE ACTIVE MODES PROJECT LOCATION

TOP 32 PROJECT LOCATIONS

Attachment 2

Table 1 - First Group - Top 8 Project Locations

Description	Strategic Alignment
97 Street - **137 Avenue to 153 Avenue** **Northgate to Northtown District Node** Investment in this area could improve the operations of the existing transit network while also supporting the development of the mass transit network and completing missing active modes connections while addressing operations along a regional truck route and principal roadway.	**Transit Function** - In addition to being a major existing bus corridor connecting the Eaux Claire and Northgate transit centres, 97 Street is identified as a future bus semi-exclusive mass transit corridor and a potential Transit Priority Measures (TPM) corridor. **Active Modes Function** - Portions of the corridor have missing active modes infrastructure. **Road Function** - 97 Street is identified as a secondary corridor, and principal roadway within the City Plan. It also serves as a truck route, provides regional connectivity, access to major employment areas, and park and ride facilities **Safety Function** - This corridor has experienced vulnerable user serious injury and fatality collisions. **Synergies** - There are no planned other capital investments in the project area. **User Impact** - This corridor services a district node as identified in the CIty Plan.
23 Avenue - **Calgary Trail to 111 Street** **Century Park District Node** Investment in this area could improve the operations of the existing transit network and access to Century Park LRT station while also supporting the development of the mass transit network.	**Transit Function** - The 23 Avenue corridor has been identified as a future semi-exclusive mass transit corridor and provides transit access to the Century Park Transit Centre and LRT Station. **Active Modes** - The corridor provides access to the mobility hub at Century Park. **Road Function** - 23 Avenue is a secondary corridor, truck route, and provides access to a future major employment node as well as the transit centre and LRT station. **Safety Function** - The corridor and intersection have experienced serious injury collisions involving both vulnerable users and motor vehicles. **Synergies** - The 23 Avenue / 111 Street intersection will be impacted by the upcoming extension of the Capital Line LRT, with any improvements needing to be designed to minimize throwaway during future LRT construction and operation. **User Impact** - The project services a district node as identified in the City Plan.
111 Avenue / 142 Street Intersection **Westmount District Node** Investment in this area could	**Transit Function** - Regular transit routing is planned along both corridors, along with a proposed future mass transit corridor along 111 Avenue, and access to the Westmount Transit Centre to the east. **Active Modes Function** - The intersection provides indirect access to the Westmount mobility hub. **Road Function** - Both intersecting roadways provide access to employment

improve the operations of the existing transit network and access to the Westmount Transit Centre while potentially addressing existing safety concerns.	areas, as well as serving as truck routes. **Safety Function** - The intersection has experienced serious injury and fatality collisions involving vulnerable road users, as well as serious injury collisions involving motor vehicles. **Synergies** - The project does not have any current synergies. It should be noted that rehabilitation of 111 Avenue was recently completed in the area. **User Impact** - The project provides access to a district node as identified in the City Plan.
104 / 103A Avenue - **97 Street to 102 Street** **Centre City Node** Investment in this area has the opportunity to align with upcoming renewal work and support multi-modal access within the centre city node while potentially addressing existing safety concerns.	**Transit Function** - The roadway accommodates regular bus service. **Active Modes Function** - The roadway connects to the downtown mobility hub. **Road Function** - The roadway is a primary corridor and provides access to the central business district employment area. **Safety Function** - The roadway has seen serious injury and fatal motor vehicle collisions as well as serious injury collisions involving vulnerable users. **Synergies** - Currently, rehabilitation of the corridor is planned within the next 5 years, and Administration is in the early stages of planning for streetscaping in this location providing opportunity for implementation of changes beyond condition-based renewal. **User Impact** - The project services a major node as identified in the City plan.
111 Avenue / 101 Street Intersection **NAIT - Kingsway Node** Investment in this area has the opportunity to improve existing transit operations while also supporting development of the mass transit network and multi-modal access to the Royal Alexandra Hospital and Kingsway-NAIT major node.	**Transit Function** - Both roadways serve regular transit, but 101 Street is also identified as a future mass transit rapid corridor. **Active Modes Function** - The project provides indirect access to the Kingsway/Royal Alex mobility hub. **Road Function** - The intersecting roadways include primary corridors, provide access to a major employment area, and 111 Avenue serves as a truck route. **Safety Function** - The intersection has experienced serious injury and fatality collisions involving vulnerable users, as well as serious injury collisions involving motor vehicles. **Synergies** - The project aligns with upcoming renewal of 111 Avenue. **User Impact** - The intersection provides access to a major node as identified in the City Plan.
Whyte Avenue / Gateway Boulevard Intersection	**Transit Function** - Both intersecting roadways are identified as future mass transit corridors. Whyte Avenue serves regular transit routes, and the intersection has been identified for implementation of potential transit

Whyte Avenue & Gateway Boulevard/Calgary Trail Primary Corridors Investment in this area has the opportunity to support the development of the mass transit network and improve operations of the existing transit network, supporting multi-modal access to an important primary corridor.	priority measures. **Active Modes Function** - The intersection provides access to a major mobility hub along Whyte Avenue. **Road Function** - The intersecting roadways are primary corridors and provide access to a major employment area. **Safety Function** - The intersection has experienced serious injury and fatality collisions involving vulnerable users. **Synergies** - The project has synergies with planned reconstruction of Gateway Boulevard (80 Avenue to 82 Avenue/Whyte Avenue. **User Impact** - The project serves an employment destination for lower income residents.
111 Avenue / Kingsway Avenue Intersection **NAIT - Kingsway Node** Investment in this area has the opportunity to address existing congestion for all modes while improving existing transit and access to the Kingsway/Royal Alex LRT station and node.	**Transit Function** - The intersection serves existing bus service, future mass transit rapid services, and has been identified as a potential location for transit priority measures. **Active Modes Function** - The project provides indirect access to the Kingsway/Royal Alex mobility hub. **Road Function** - The intersecting roadways include primary corridors and provide access to a major employment area. **Safety Function** - The intersection has experienced serious injury and fatality collisions involving vulnerable users. **Synergies** - The project aligns with upcoming renewal of 111 Avenue. **User Impact** - The intersection provides access to a major node as identified in the City Plan.
101 Street - **103 Avenue to MacDonald Drive** **Centre City Node** Investment in this area has the opportunity to improve multi-modal access within the centre city node while also supporting existing transit operations and the development of the mass transit network.	**Transit Function** - 101 Street serves regular transit, and is also identified as a future mass transit rapid corridor. Furthermore, potential transit priority measures have been considered at some intersections. **Active Modes Function** - The corridor is within the central business district mobility hub. **Road Function** - 101 Street is a primary corridor and provinces access to the central business district employment area. **Safety Function** - The corridor has experienced serious injury and fatality collisions involving vulnerable users. **Synergies** - The project does not have any current synergies. **User Impact** - The project services a major node as identified in the City plan.

Table 2 - Second Group - Top 32 Project Locations

Description
Fort Road from approximately 127 Avenue to 132 Avenue Active Modes Infrastructure
Manning Drive / 50 Street Intersection
101 Street from approximately 104 Avenue to 107 Avenue
Kingsway Avenue from approximately 111 Street to 122 Street Active Modes Infrastructure
97 Street from approximately 137 Avenue to 144 Avenue Active Modes Infrastructure
97 Street from approximately Yellowhead Trail to 137 Avenue
97 Street from approximately 128 Avenue to 137 Avenue Active Modes Infrastructure
Whyte Avenue from approximately 114 Street to 99 Street
23 Avenue from approximately 105 Street to 119 Street Active Modes Infrastructure
99 Street / Whyte Avenue Intersection
Kingsway Avenue from approximately Princess Elizabeth to 110 Street
101 Street from approximately 107 Avenue to 111 Avenue
137 Avenue from approximately Manning Drive to 102 Street Active Modes Infrastructure
Wayne Gretzky Drive Northbound from approximately 116 Avenue to 121 Avenue Active Modes Infrastructure
Jasper Avenue from approximately 106 Street to 109 Street
51 Avenue from approximately Gateway Boulevard to 122 Street Active Modes Infrastructure
111 Street / 51 Avenue Intersection
97 Street from approximately 153 Avenue to 167 Avenue Active Modes Infrastructure
Fort Road / 137 Avenue Intersection
107 Avenue from approximately 115 Street to 120 Street
Princess Elizabeth Avenue / 106 Street Intersection

Attachment 2

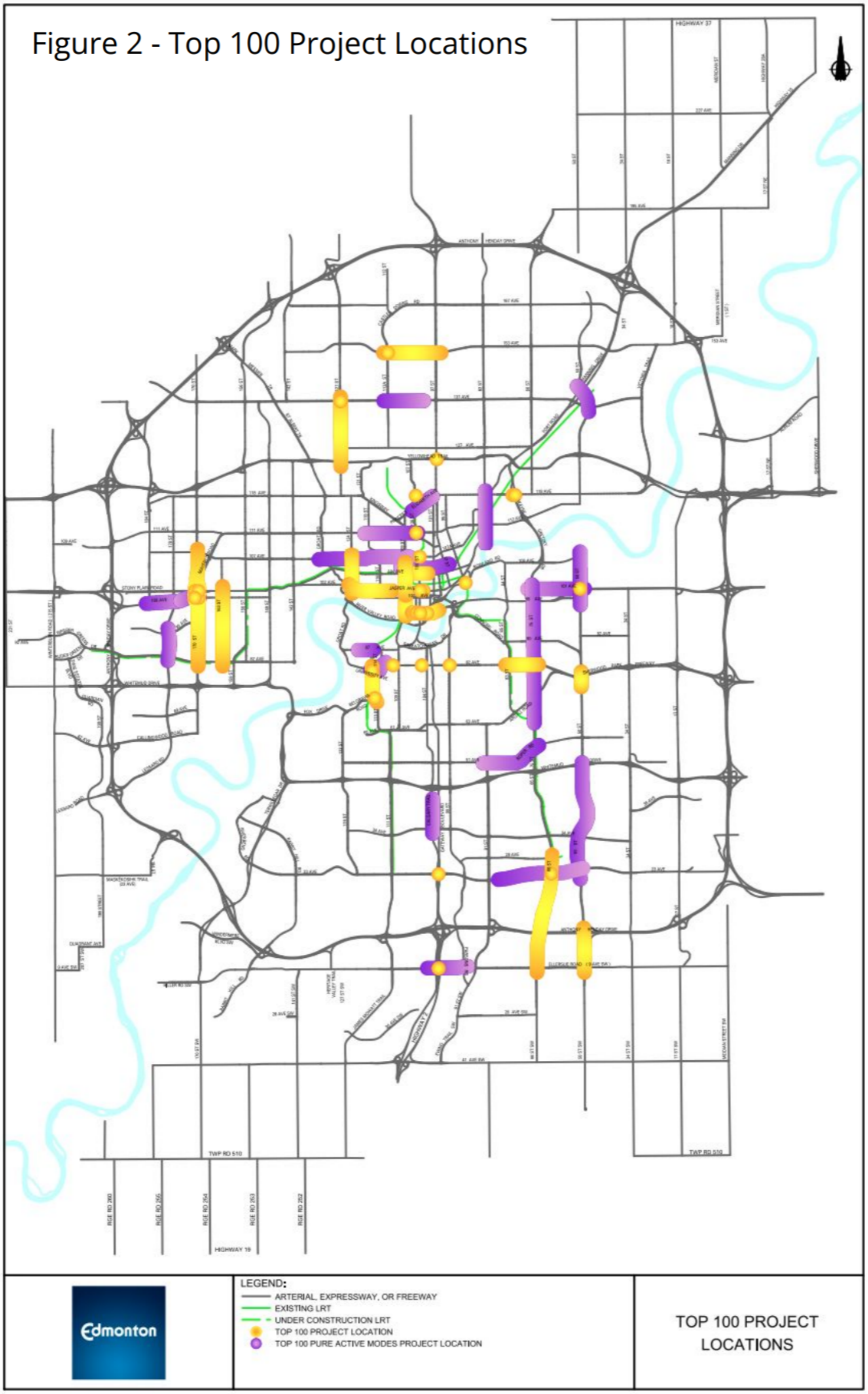


Table 3 - Third Group - Top 100 Projects
A third grouping contains the remaining locations that ranked within the top 100

Description
109 Street from approximately 102 Avenue to 105 Avenue
109 Street from approximately 102 Avenue to Jasper Avenue
50 Street from approximately 137 Avenue to Manning Drive Active Modes Infrastructure
23 Avenue from approximately 50 Street to 85 Street Active Modes Infrastructure
104 Avenue from approximately 106 Street to 104 Street
66 Street from approximately 23 Avenue to 28 Avenue
66 Street / 23 Avenue Intersection
114 Street / University Avenue Intersection
50 Street from approximately 22 Avenue to Whitemud Drive Active Modes Infrastructure
82 Street from approximately 118 Avenue to Jasper Avenue
114 Street from approximately University Avenue to Belgravia
107 Avenue from approximately 109 Street to Groat Road Active Modes Infrastructure
153 Avenue / Castle Downs Road Intersection
97 Avenue / 106 Street Intersection
109 Street from approximately 97 Avenue to 99 Avenue
101 Avenue from approximately 50 Street to 75 Street Active Modes Infrastructure
Whyte Avenue / 105 Street Intersection
Whyte Avenue / 110 Street Intersection
101 Avenue / 50 Street Intersection
82 Avenue / University Avenue from approximately 112 Street to 114 Street Active Modes Infrastructure
82 Street from approximately 113 Avenue to Jasper Avenue Active Modes Infrastructure
Jasper Avenue from approximately 114 Street to 116 Street
Jasper Avenue from approximately 116 Street to 124 Street
105 Avenue from approximately 97 Street to 109 Street Active Modes Infrastructure

118 Avenue / 106 Street Intersection
50 Street from approximately Ellerslie Road to Anthony Henday Drive
170 Street from approximately 107 Avenue to 95 Avenue
Stony Plain Road / 100 Avenue / 170 Street Intersection
105 Street / Jasper Avenue Intersection
104 Street / Jasper Avenue Intersection
111 Avenue / 106 Street Intersection
Ellerslie Road from approximately Parsons Road to 106 Street Active Modes Infrastructure
23 Avenue / Gateway Blvd Intersection
100 Avenue from approximately 178 Street to 184 Street Active Modes Infrastructure
Belgravia Road / 114 Street Intersection
170 Street from approximately 87 Avenue to 95 Avenue
97 Avenue from approximately 106 Street to 101 Street
137 Avenue from approximately 104A Street to 113A Street Active Modes Infrastructure
50 Street from approximately 76 Avenue to Sherwood Park Freeway
124 Street from approximately 107 Avenue to Jasper Avenue
111 Avenue from approximately 108 Street to 109 Street
Princess Elizabeth Avenue from approximately 103 Street to 106 Street Active Modes Infrastructure
118 Avenue / Wayne Gretzky Drive Intersection
111 Avenue from approximately 120 Street to Kingsway Avenue Active Modes Infrastructure
170 Street from approximately 87 Avenue to 95 Avenue
127 Street from approximately 127 Avenue to 137 Avenue Active Modes Infrastructure
97 Avenue / 105 Street Intersection
Ellerslie Road / Highway 2 Intersection
75 Street from approximately Wagner Road to 101 Avenue Active Modes Infrastructure
105 Street / 107 Avenue Intersection

Attachment 2

178 Street from approximately 87 Avenue to 95 Avenue Active Modes Infrastructure
137 Avenue / 127 Street Intersection
163 Street from approximately 87 Avenue to 100 Avenue Active Modes Infrastructure
127 Street from approximately Yellowhead Trail to 137 Avenue
97 Street / Yellowhead Trail Intersection
50 Street from approximately 98 Avenue to 106 Avenue Active Modes Infrastructure
87 Avenue from approximately 115 Street to 116 Street Active Modes Infrastructure
51 Avenue / Roper Road from approximately 75 Street to 91 Street Active Modes Infrastructure
101 Avenue / 95 Street Intersection
100 Avenue from approximately 170 Street to 175 Street Active Modes Infrastructure
Calgary Trail from approximately 31 Avenue to G.A. McDonald Active Modes Infrastructure
66 Street from approximately Ellerslie Road SW to 23 Avenue
Whyte Avenue from approximately 83 Street to 75 Street
97 Avenue / Bellamy Hill Road/104 Street Intersection
97 Avenue / Rossdale Road Intersection
153 Avenue from approximately Castle Downs Road to 97 Street

Table 4 - Composite Programs

Description	Strategic Alignment
Missing and/or enhanced Sidewalks Composite Program A funding allocation focusing on missing pedestrian or substandard connections in road right-of-way and open space identified through the sidewalk strategy and missing sidewalk request list.	High alignment with the Active Modes function, with enhanced importance due to the ability to improve local community connections beyond large arterial projects.
Missing and/or enhanced Bike Infrastructure Composite Program A funding allocation focused on developing missing or substandard active modes/cycling connections identified through The Bike Plan.	High alignment with the Active Modes function, with enhanced importance due to the ability to improve local community connections beyond large arterial projects.
Priority Safety Improvements Composite Program A funding allocation for targeted safety improvements such safe crossing improvements at key locations.	High alignment with the Safety function, with enhanced importance due to the ability to improve local community connections beyond large arterial projects.
Transit Priority Measures Composite Program A funding allocation for measures to support transit speed and reliability.	High alignment with the Transit function, with enhanced importance due to the ability to improve transit connections in locations that may not qualify for larger investments.
Intersection Operational Improvements Composite Program A funding allocation for relatively quick and low-cost interventions for targeted locations with operational concerns that may not have ranked as highly through the prioritization process.	High alignment with the Road function, with enhanced importance due to the ability to improve operations in locations that may not qualify for larger investments.

Urban Planning and Economy
UPE00491

Mobility Network Assessment

Urban Planning Committee / February 15, 2022

The City Plan Implementation Approach

Planning, Policy & Regulation

Process & Service Delivery

Data & Measurement

People, Partnerships & Change Management

Examples

Planning, Policy & Regulation
- District Planning
- City Planning Framework
- Zoning Bylaw Renewal

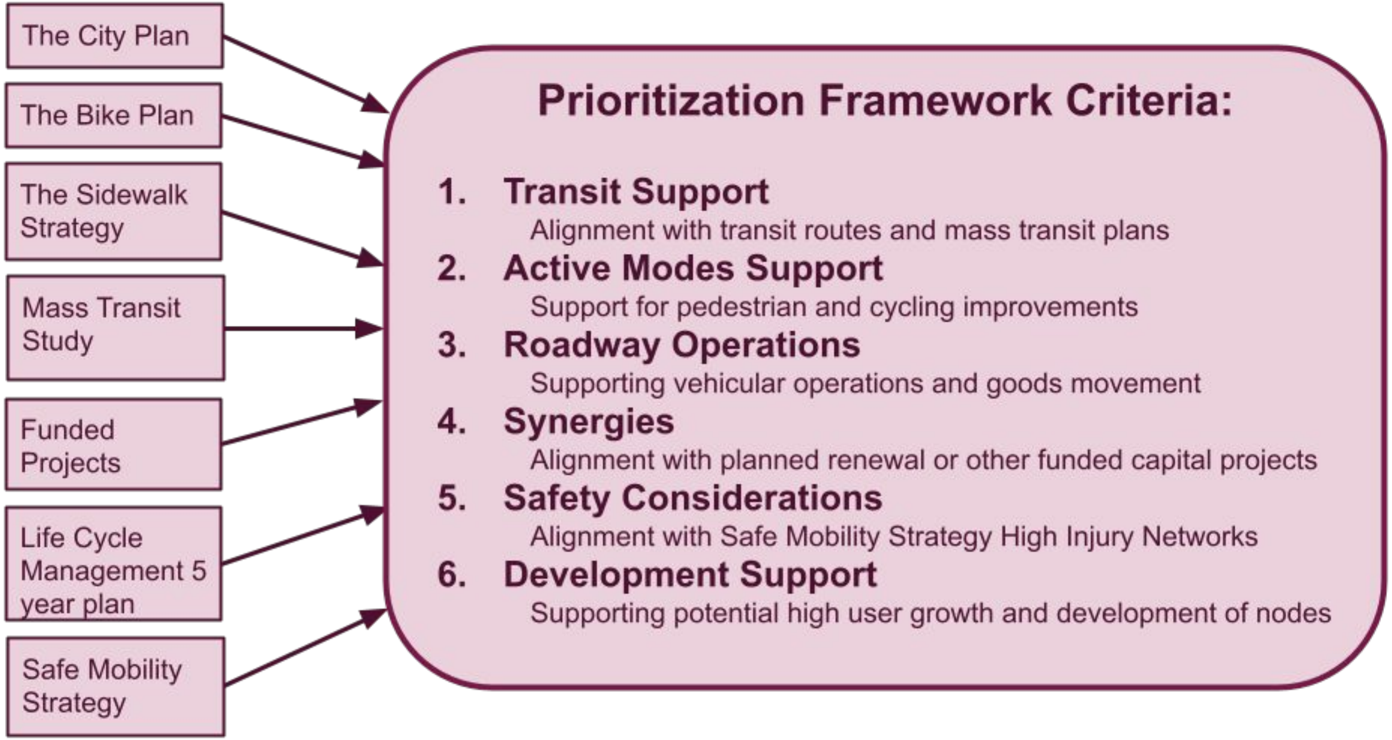
Process & Service Delivery
- **Prioritized budgeting**
- **Business planning**
- **Operational service delivery**

Data & Measurement
- Measures and targets
- Transparent reporting

People, Partnerships & Change Management
- Organizational change management
- External relationships and partnership

Edmonton

Prioritization Framework



Additional Considerations

- → Energy Transition and Reduction of Greenhouse Gas Emissions
- → Equitable Mobility - GBA+ Review

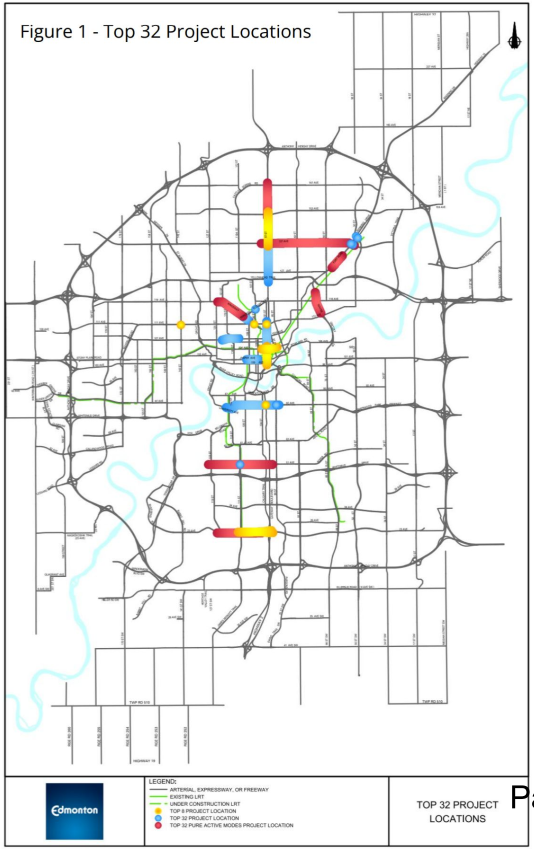
Edmonton

Identification of Candidate Projects

- Locations with operational issues
- Opportunities to improve and support transit speed and reliability
- Infrastructure gaps for people walking or cycling
- Locations with identified safety concerns

Edmonton

Prioritization Results



Top Eight Locations

- **97 Street** (137 Avenue to 153 Avenue)
- **23 Avenue** (Calgary Trail to 111 Street)
- **111 Avenue/142 Street Intersection**
- **104/103A Avenue** (97 Street to 102 Street)
- **111 Avenue/101 Street Intersection**
- **111 Avenue/Kingsway Intersection**
- **Whyte Avenue/Gateway Boulevard Intersection**
- **101 Street** (103 Avenue to MacDonald Drive)

Composite Programs

- → Missing sidewalk connections
- → Missing active modes/cycling connections
- → Safety improvements
- → Transit priority measures
- → Intersection improvements

Next Steps

- ➔ Results will inform development of 10 Year Capital Plan and recommendations for 2023-2026 capital budget
- ➔ Opportunities for further refinement with confirmed asset renewal plans
- ➔ Strategic direction resulting from growth management criteria

Edmonton

Thank You

Edmonton

COUNCIL REPORT

ETS Fleet Storage and Maintenance Facility Project

RECOMMENDATION

That Urban Planning Committee recommend to City Council:

That the strategy outlined in the February 15, 2022, Integrated Infrastructure Services report, IIS00416, be approved.

Report Purpose

Council decision required

Council is being asked to approve the strategy and next steps outlined in this report that supports the long term need to guide the renewal and development of existing and future Edmonton Transit Service fleet storage and maintenance facilities as a priority for alignment with The City Plan.

Executive Summary

- The Edmonton Transit Service Fleet Storage, Operations and Maintenance Facility Strategy ("the Strategy") is designed to guide the renewal and development of existing and future Edmonton Transit Service fleet storage and maintenance facilities to address the growth, capacity and electrification needs of the fleet through to 2040.
- Transitioning to a zero-emission transit fleet is a core objective of this work and currently calls for up to 440 electric buses to replace diesel buses by 2030.
- The Strategy recommends the construction of two new operations and maintenance garages in the southeast and northwest quadrants of the city, enabling a fully electrified bus fleet. The Strategy also recommends a progressive series of upgrades, renewals and expansion projects within existing facilities to accommodate growth, capacity and electrification.
- The success of this Strategy will ideally see facility development stay ahead of fleet growth, capacity and electrification requirements. New and upgraded facilities are needed to enable transit service growth related to bus service.
- The Strategy will help address corporate outcomes and future impact on our community, including support in delivering services to Edmontonians now and in the future.

ETS Fleet Storage and Maintenance Facility Project

- Approval of this strategy will launch the process toward a fully integrated approach that addresses the needs of the network of fleet storage, operations and maintenance facilities across the city. This will ensure a holistic approach that aligns the service, infrastructure, and deployment of assets to be located where and when they are needed most.

REPORT

Edmonton Transit Service (ETS) fleet storage, operations and maintenance facilities are operating at full capacity. In order to grow, respond to future increased service demands and achieve greenhouse gas emissions targets by 2030 and beyond, significant investment into the design and construction of new and expanded facilities will need to be considered.

The Strategy outlined in this report is foundational to contributing to the delivery of The City Plan and the four strategic goals of ConnectEdmonton. It is critical to support the growth of the Bus Network and implementation of the Mass Transit Network envisioned in The City Plan. The ETS fleet of buses will need to grow and transition from diesel to electric buses over the next 20 years to meet these objectives.

This integrated strategy considers all aspects and infrastructure needed for the storage, operations and maintenance of buses allowing ETS to be responsive to riders' needs. The Strategy includes being more efficient with City resources and identifying what is needed now and in the future. With the foundation of the transit network established, the Strategy supports future city and ridership growth.

The Strategy also supports building an environmentally sustainable transit service. It addresses growth requirements that align with the Energy Transition Strategy and City Operations Greenhouse Gas Management Plan by building the foundation to support a fully electric fleet in the future.

The current fleet occupies the total available storage within each garage and cannot grow or be electrified without expanding the storage and maintenance capacity. Electric bus maintenance and charging stations require different infrastructure than diesel buses, including significant electrical substation and distribution system upgrades. Retrofits cannot be undertaken in an existing facility without a complete shutdown, which is not possible when all garages are required to be fully operational.

Recommended Approach - Scenario 3

Administration explored three scenarios (Attachment 1) as options to address and guide the renewal and development of existing and future ETS fleet storage, operations and maintenance facilities. The recommended scenario is designed to meet the City's objectives for growth and electrification, resulting from the hybrid scenario. The recommended approach and strategy builds on the existing storage and maintenance facilities, adds capacity and diversifies fuel sources. In addition to enhancing existing facilities, the strategy recommends constructing two new garages over the next 20 years which will alleviate the expected growth pressures on the transit network. The Strategy has the flexibility to integrate and adapt to evolutions in technology and the future decisions related to the Edmonton Metropolitan Regional Transit Commission.

ETS Fleet Storage and Maintenance Facility Project

Administration's first priorities are the development and delivery of a new southeast garage, in addition to the expansion of the Davies and Ellerslie facilities to accommodate additional maintenance requirements as the fleet grows. To meet the target for a new southeast garage in the 2027-2030 budget cycle, the land acquisition, design and delivery would commence in the 2023-2026 budget cycle.

The second phase is the expansion of existing facilities between 2025 and 2028 and will target the Richard Paterson Garage (5710 86 St NW), Thomas Ferrier Garage (8620 58 Ave NW) and Centennial Garage (15520 Ellerslie Rd SW). Adjusting capacity levels at these facilities will support the increased service demand due to fleet growth. As the fleet of electric buses expands, an expansion of the electric bus infrastructure is required at Kathleen Andrews Transit Garage (12403 Fort Rd NW) within the same timeframe.

Ideally, planning and design for a new northwest garage would begin as early as 2024, starting with functional programming and land acquisition activities. The northwest garage is expected to be complete in the 2031-2034 budget cycle, followed by progressive installation of electric bus infrastructure through 2040 or as the procurement timeline for electric buses dictates.

Opportunities for Growth Before 2027

Understanding that the bus fleet will require growth before 2027, Administration has been reviewing opportunities to accommodate additional buses and increase fleet electrification ahead of the completion of the new southeast garage. The following changes from the recommended approach could be considered:

- Establishing a satellite storage facility by acquiring an existing facility or building a new facility. The facility would be limited to storage and dispatch operations of diesel buses. As well as creating capacity, the satellite facility would ensure the work on existing facilities is completed safely and efficiently by temporarily housing operations on a rotating basis as facilities are expanded to accommodate the long-term growth.
- Accelerating the upgrades to the electric bus charging infrastructure of Centennial Garage and Kathleen Andrews Transit Garages to support additional electric buses.
- This revised approach would allow the decision on the investment into the Strategy to align with the capital budget deliberations for 2023-2026 by allowing for the new southeast garage to be delayed by one year while allowing for growth in the bus fleet.

The Strategy's success requires facility development to stay ahead of fleet growth, creating capacity and electrification requirements, flexibility, opportunity and efficiency across the facility and bus network. Additional infrastructure is needed to ensure that the maintenance of the bus fleet is well supported through the growth of the fleet. This growth will require new and expanded garages to support the growing needs of the bus fleet and Edmonton.

Budget/Financial Implications

Council approved the capital profile 20-20-2022 New Transit Bus Garage with $6 million in funding in the 2019-2022 Capital Budget cycle through tax-supported debt. The profile provides funding to complete the strategy phase and begin the planning phase for the initial priorities.

ETS Fleet Storage and Maintenance Facility Project

The order of magnitude estimate for implementing the Strategy for fleet storage and maintenance facilities to address the growth, capacity and electrification needs is approximately $1.4 billion, with investments up to 2040. This estimate is an order of magnitude as the project has completed the strategy phase and Checkpoint 1 of the Project Development and Delivery Model (PDDM), per Capital Project Governance Policy C591.

Given the order of magnitude of the investment required for the proposed expansion, the City continues to advocate to both the federal and provincial governments for funding support toward the construction of the proposed new transit garage and expansion of two existing garages as important infrastructure priorities.

Next Steps/Priorities

- $4.1 million in funding remains available in Capital Profile 20-20-2022 to advance the project to the facilities planning phase. The following planning activities are planned for 2022:
    - Complete functional programming for the new southeast garage, Davies, Ellerslie expansions and the resulting Paterson operational impacts to PDDM Checkpoint 2;
    - Advance concept and preliminary design for Davies and Ellerslie expansions towards PDDM Checkpoint 3; and
    - Advance planning for establishing the satellite facility and the acceleration of the upgrades to the electric bus charging infrastructure of Centennial Garage and Kathleen Andrews Transit Garages.
- Additional funding may be required in the short-term to support the establishment of a satellite storage facility by acquiring land if necessary. Planning will be informing the needs in 2022.
- A critical component to the implementation of the Strategy is the acquisition of land to advance to concept and preliminary design for the new southeast garage. The current budget is insufficient to support the land acquisition estimated at $45 million.
- If this strategy is supported by Council, Administration will return with a budget request through future capital budget processes. Depending on how quickly Council would like to advance the strategy the budget requirement for initial costs, such as the land acquisition costs for the new southeast garage, could be included for consideration in the Spring 2021 Supplemental Capital Budget Adjustment. Approving funding in advance of formal 2023-2026 capital budget deliberations in the fall of 2022, will reduce available funding for other priorities over the 2023-2026 budget cycle. However, Administration views electrification of the City's bus fleet and investment in supporting transit infrastructure as one of the City's top priorities.
- Project timelines will be reviewed and updated as these next steps progress.

COMMUNITY INSIGHT

This strategy supports the implementation of the energy transition strategy and The City Plan. This work is needed to support the City's services to Edmontonians; the facilities identified are required as municipal service support to ensure that transit serves Edmontonians now and in the future. Maintenance, operations and storage facilities are required to operate and maintain transit service as the fleet and the city continues to grow. Public engagement, if required, will be evaluated on a facility by facility basis.

GBA+

The development of the ETS Fleet Storage, Operations and Maintenance Facility Strategy has identified some key areas and opportunities to address equity for all age groups, abilities and diverse demographics:

- **Accessibility:** ensure accessibility requirements for people with disabilities in the new and existing facilities and their surrounding areas are in place; accessibility is considered at each stage of the project design.
- **Safety:** Incorporate the needs of diverse demographics to improve safety within existing and new facilities.
- **Useability**: Consider how facility renewals (i.e. existing buildings) and new facilities improve the useability for those working in and for others who visit these facilities for business or other purposes.

The planning and design process will be guided by the principles of universal design, which speak to “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.”

As the Strategy transitions into the Develop phase, GBA+ Analysis will be applied to ensure the projects are inclusive, decisions are evidence-based, work is effective and the process contributes to equality of outcomes.

ATTACHMENTS

1. ETS Fleet Storage and Maintenance Facility Project - Executive Summary
2. Ideal Scenario Implementation Timeline

Attachment 1

ETS Fleet Storage and Maintenance Facility Project - Executive Summary

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Introduction

Edmonton Transit Service fleet storage and maintenance facilities are operating at full capacity. Both conventional and paratransit fleets cannot grow and respond to increased service demands in the future without significant investment in the design and construction of new and expanded facilities. Additionally, achieving greenhouse gas emissions targets by 2030 and beyond through fleet electrification cannot be realized within existing facilities. A long-term strategy has been developed to address these challenges.

The Edmonton Transit Service Fleet Storage and Maintenance Facility Strategy ("the Strategy") is designed to guide the renewal and development of existing and future Edmonton Transit Service fleet storage and maintenance facilities, addressing growth, capacity and electrification needs of the fleet through 2040.

The Strategy recommends the construction of two new operations and maintenance garages to integrate a fully electrified bus fleet located in the southeast and northwest quadrants of the city. The strategy also recommends a series of progressive upgrades, renewals and expansion to existing facilities to accommodate growth, capacity and electrification.

The land for the South East Garage is required to achieve the target of 2027; planning and design would commence and continue through the 2023-2026 budget cycle to support advancing the delivery activities.

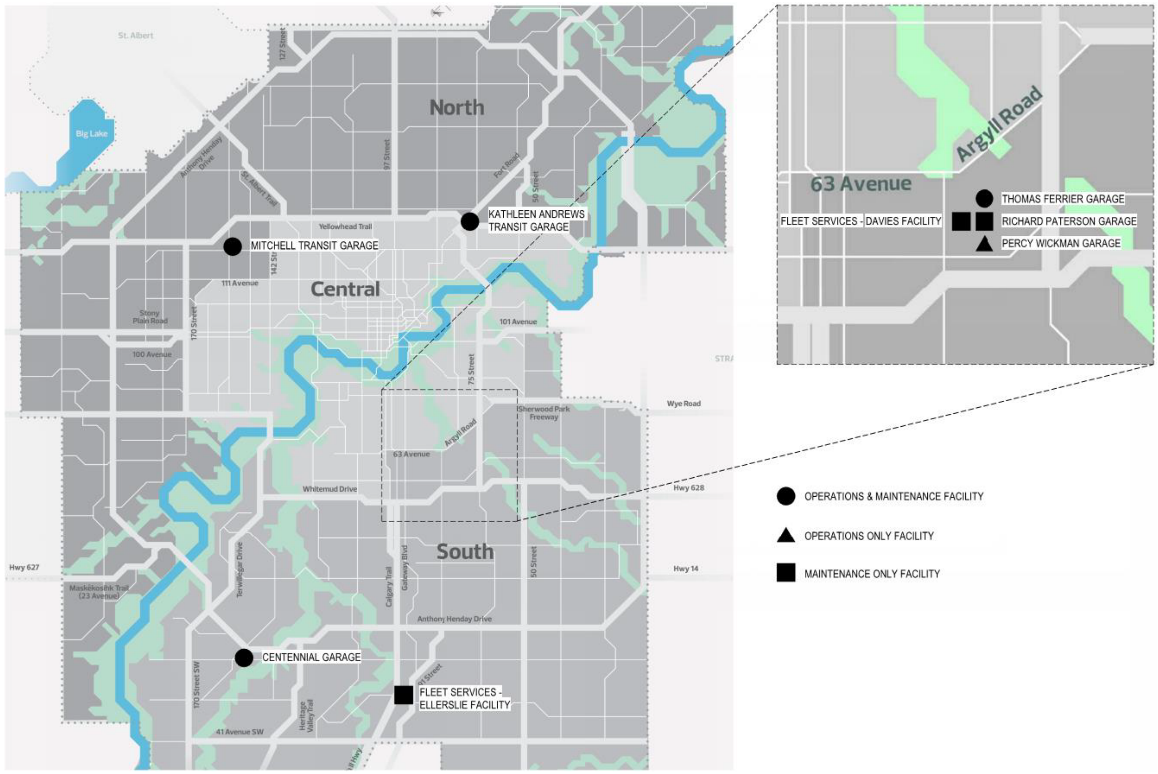
Project Methodology

The project followed the following process in the development of the Strategy:

- Assessed and documented the current state;
- Defined future requirements;
- Considered Electric Bus infrastructure requirements;
- Developed and evaluated scenarios and layout options to accommodate projected fleet growth and fleet mix through 2040; and
- Developed recommendations and next steps.

Current State

Existing Facilities Overview



Facility Details

Edmonton currently has four fleet storage and maintenance facilities that house the conventional transit mixed fleet of 962 buses (as of June 2020).

- Mitchell Transit Garage
- Kathleen Andrews Transit Garage
- Thomas Ferrier Garage
- Centennial Garage

Additional facilities support the operations of ETS:

- The Richard Paterson Garage provides heavy maintenance for the conventional transit fleet.
- Ellerslie Facility is home to the body shop. This space is part of the larger facility, which includes spaces dedicated to municipal fleet services.
- Percy Wickman Garage is home to the city’s paratransit (DATS) operation. The fleet of 93 DATS buses is stored here.
- Davies Facility is where municipal fleet services provide DATS Fleet maintenance services.

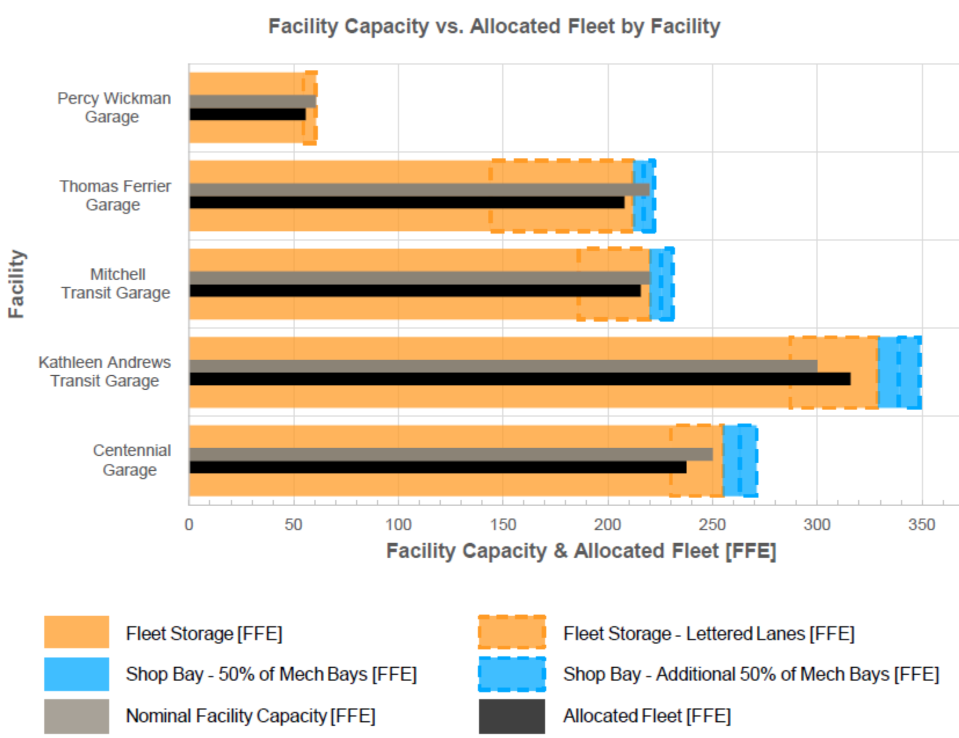
Current Revenue Fleet

The charts that follow describe how the fleet is allocated across facilities (as of June 2020).

	Conventional Transit				Paratransit
Bus Type	**Centennial Garage**	**Kathleen Andrews Transit Garage**	**Mitchell Transit Garage**	**Thomas Ferrier Garage**	**Percy Wickman Garage**
60' Diesel	21	34	-	-	-
40' Diesel	196	235	197	190	-
40' E-Bus	10	30[1]	-	-	-
30' Diesel	-	-	25	24	-
25' DATS Gasoline	-	-	-	-	93[2]
Total Fleet by Facility	**227**	**299**	**222**	**214**	**93**
Total Fleet by Service Type	**962**				**93**
Total Fleet [Count]	**1,055**				

[1] On order as of June 2020.
[2] Four DATS Ford E450 are damaged, out of service, and excluded from this value. Some service is contracted to third parties, including upwards of seventy-five contracted vehicles, ten vehicles for hire, five Leduc County paratransit buses, and five to six St. Albert Transit paratransit buses.

The figure that follows compares facility capacity to the allocated fleet.



The orange bar represents the total fleet storage space within each garage. The blue bar represents the total area within the maintenance areas. The grey bar represents the nominal capacity or the number representing the maximum storage capacity for each garage. The black is the actual fleet currently allocated to each garage.

The figure shows that the allocated fleet is near the top of each garage's total available storage area. In some cases, the assigned fleet is close to dipping into the shop areas, which is not ideal. The current fleet occupies the total available storage within each garage, and the fleet cannot grow without expanding the storage and maintenance facilities to accommodate the growth.

Future Requirements

Fleet Growth Projections

The ETS Fleet has not grown since 2013 aside from the recent addition of the Heritage Valley shuttle. A new garage in 2027 would be the first opportunity to expand the fleet in the last 13 years.

The Bus Network Redesign resets the foundation of the network and supports efficiency efforts utilizing the resources available. Preparing for growth to support our future city is the next step. This can be accomplished by ensuring that fleet storage and maintenance facilities are positioned to respond to an expanding fleet.

To meet The City Plan's objectives of the associated Mass Transit Network, the Bus Network Redesign and Greenhouse Gas Reduction targets, the ETS fleet needs to grow and transition from diesel to electric buses over the next 20 years (and beyond). Early projections to achieve the Mass Transit Network for a population of 1.25 million could require approximately 130 growth buses to support The City Plan's goals.

Strategic Alignment

The Strategy aligns with several transformational initiatives and is foundational to delivering on The City Plan and the four strategic goals of ConnectEdmonton. It is critical to support the new Bus Network's goals and the Mass Transit Network envisioned in The City Pan.

The Strategy supports building a green transit service and addressing growth requirements for our future city. The Strategy aligns with the Energy Transition Strategy and the current Greenhouse Gas Management Plan by providing a pathway to integrate an electric fleet in the future. Transitioning to a zero-emission transit fleet is a core objective of this work and currently calls for up to 440 electric buses (E-bus) to replace diesel buses by 2030.

Strategy Overview

Key Drivers

The current fleet occupies the total available storage within each garage. It cannot grow or add the required electrified fleet without significantly impacting operations and maintenance services in existing garages. Electric bus maintenance and charging stations require different infrastructure, including significant substation and distribution system upgrades that cannot be retrofitted into the existing occupied facilities when all current garages are required to be fully operational to maintain services across the transit network.

Sufficient facility storage capacity must be available before any fleet expansion or transition can occur.

Other key drivers of the Strategy are:

A. **Growth.** New facilities are required to add buses to the fleet and transition from diesel (and gasoline) to electric. Other facilities must be expanded and upgraded to increase capacity to accommodate the growth and fleet changes.

B. **Efficiency.** As the fleet grows and changes, parts storage and distribution is a necessary support to the growing fleet. This growth includes exploring a 'north-south parts storage and distribution hub' concept, the current use and repurposing the existing parts hub space within Richard Paterson Garage, and tire storage and distribution across all facilities.

C. **Training Spaces** for drivers, transit fleet maintenance and the public via the Mobility Choices Training program are also needed.

D. **Fleet Allocation** must be met to accommodate 30' and 60' diesel bus operations and maintenance at multiple locations.

E. Additional drivers or issues include:

    a. Finding a permanent home for the Heritage Fleet;

    b. Allocating space to accommodate displaced outdoor storage compounds (i.e. Richard Paterson Garage - Edmonton Police Service and Heavy Maintenance Staging); and

    c. Demolition of the Thomas Ferrier Garage tents, which are at the end of their lifecycle.

Scenarios

Two scenarios were explored that respond to the key drivers described previously to guide the renewal and development of existing and future ETS fleet storage and maintenance facilities.

Scenario 1 presented a decentralized model as follows:

- Two new operation and maintenance garages with room to store a larger number of articulated buses, maximizing the number of 60’ shop bays to create flexibility to absorb future fleet mix changes (particularly, an increase in articulated buses).
- Ellerslie Facility is expanded to increase body shop capacity.
- The Richard Paterson Garage is to be expanded to increase heavy maintenance capacity, including the addition of sixty-foot shop bays.
- Davies Facility is retained ‘as is’ and continues servicing the DATS fleet, with incremental maintenance. DATS storage needs to be allocated to the new operation and maintenance garages.
- Changes to Thomas Ferrier Garage are required to accommodate changes at other sites and facilities. This work considers a facility expansion to accommodate the “Mobility Choices Training Program” and site reconfiguration to support bus driver training and relocation of the Heritage Fleet to a new operations and maintenance garage.
- Upgrade Centennial Garage’s E-Bus charging capacity to support up to 40 E-Buses.
- Upgrade Kathleen Andrews Transit Garage E-Bus charging capacity to support up to 43 E-Buses.

Scenario 2 is presented as a centralized model and varies from Scenario 1 as follows:

- DATS operations and maintenance are consolidated at a single facility as follows:
    - Expand Richard Paterson Garage as a consolidated DATS operations and maintenance facility, replacing existing Percy Wickman Garage and Davies Facility spaces.
    - Conventional transit bodyshop and heavy maintenance are consolidated at Ellerslie Facility.
    - Expand Ellerslie Facility for additional body shop capacity and accommodate the Richard Paterson Garage heavy maintenance operation.

- Build two new operations and maintenance garages; upgrade Thomas Ferrier Garage, Centennial and Kathleen Andrews upgrades as described in Scenario 1.

Recommended Scenario

The preferred path forward was identified through a cross-organizational stakeholder evaluation of two scenarios, conducted and documented using a process called Multiple Account Evaluation which systematically evaluated the relative advantages and disadvantages of the options or scenarios presented.

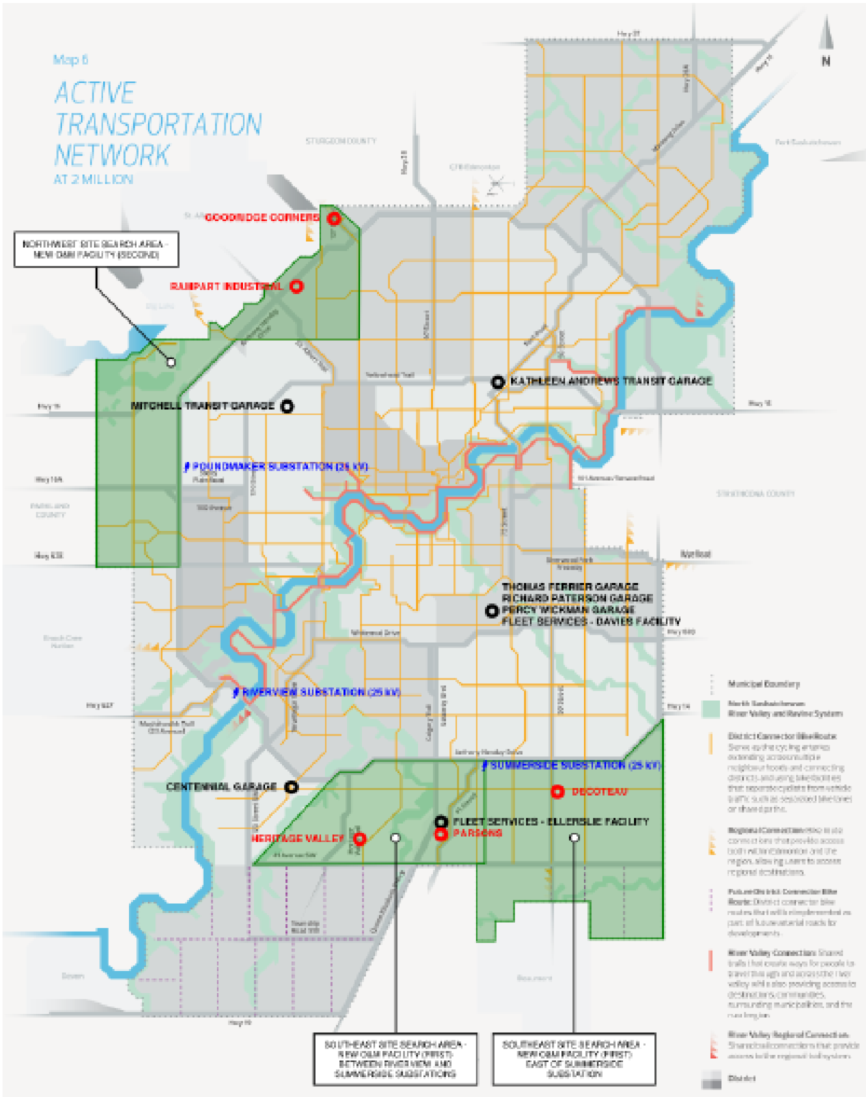
The evaluation process resulted in the adoption of a third scenario - Scenario 3 (Hybrid) - which captures the benefits of decentralization and mitigates some of the issues driving a centralized model. The following section provides a detailed description of the hybrid scenario, including individual descriptions of the work required at each location.

Strategy (Recommended Scenario 3)

The strategy, resulting from the hybrid scenario, recommends constructing two new operation and maintenance garages to integrate a fully electrified bus fleet located in the southeast and northwest quadrants of the city. This strategy will include a progressive series of upgrades, renewals and expansion projects within select existing facilities to accommodate growth, capacity and electrification.

This strategy's success requires facility development to stay ahead of fleet growth, capacity, and electrification requirements, creating flexibility, opportunity, and efficiency across the facility and bus network.

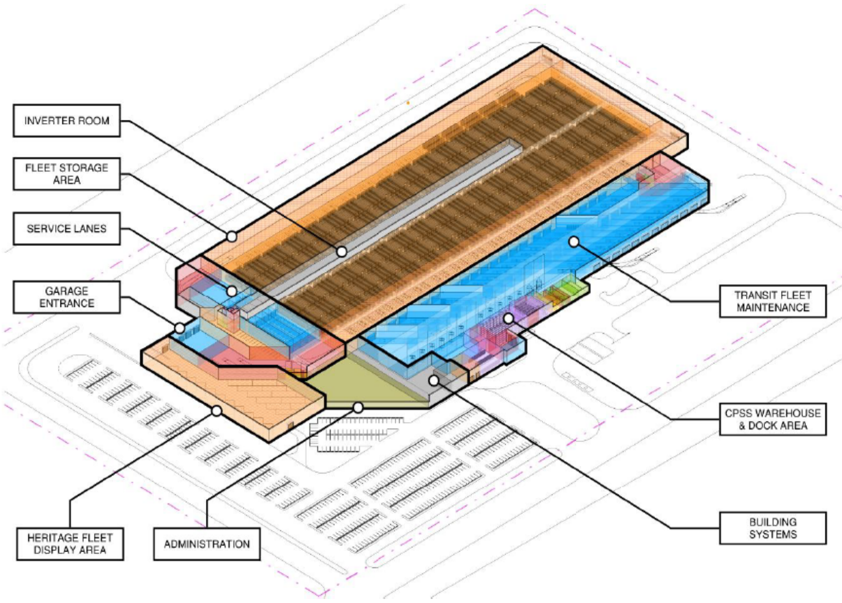
The areas highlighted in green on the map below indicate proposed locations for the new operation and maintenance garages to align with existing facilities and network connections.



Strategy Projects

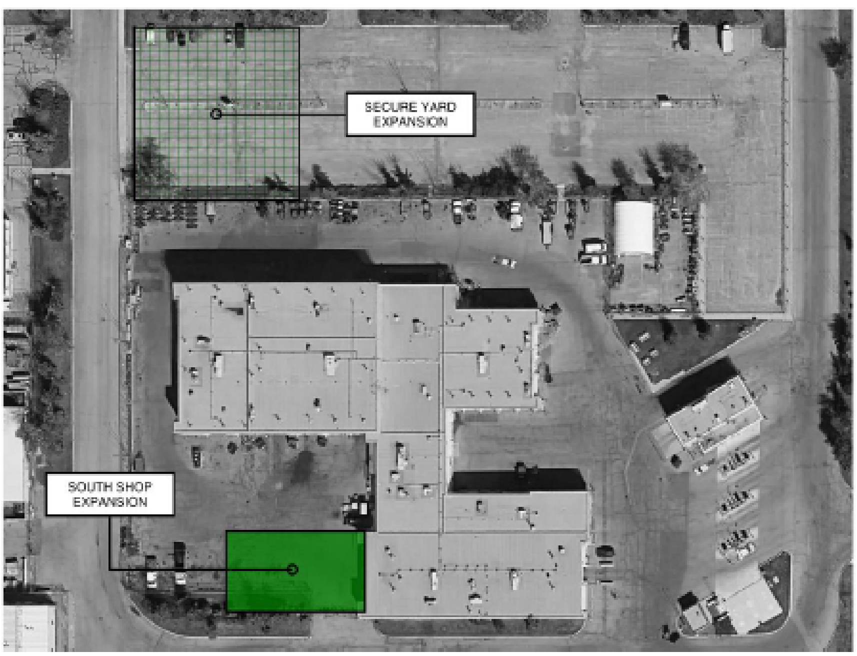
2021-2026 • New Southeast Garage • New Build

New emissions neutral operations & maintenance facility accommodating the equivalent of 430 forty-foot bus equivalents (FFEs); Fleet transitions to electric over time; Includes space for Heritage fleet; located in Southeast Edmonton.



2021-2024 • Davies Facility • Expansion

Existing facility; South shop expansion including six DATS Service bays and expansion of secure yard into the existing parking area.



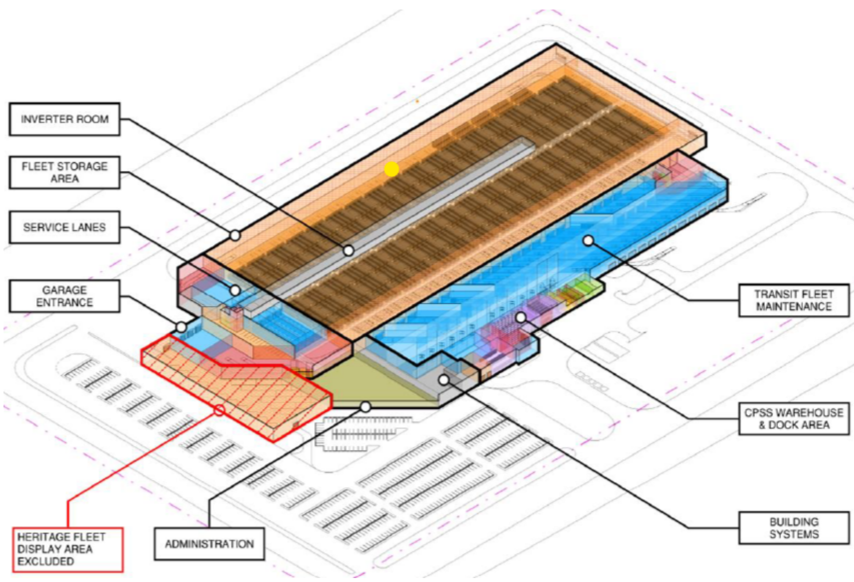
2021-2024 • Ellerslie Facility • Expansion

Existing facility; Body shop expansion includes four articulated bus body bays, three articulated bus paint/prep booths, one wash bay, and parking expansion.

Attachment 1

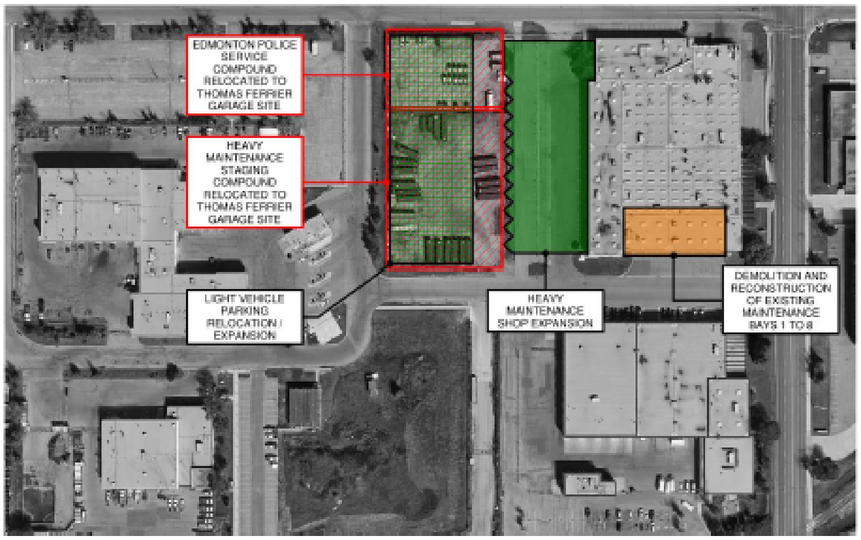
2024-2032 • New Northwest Garage • New Build

New emissions neutral operations & maintenance facility accommodating the equivalent of 430 forty-foot bus equivalents (FFEs) (i.e. Electric buses) located in Northwest Edmonton.



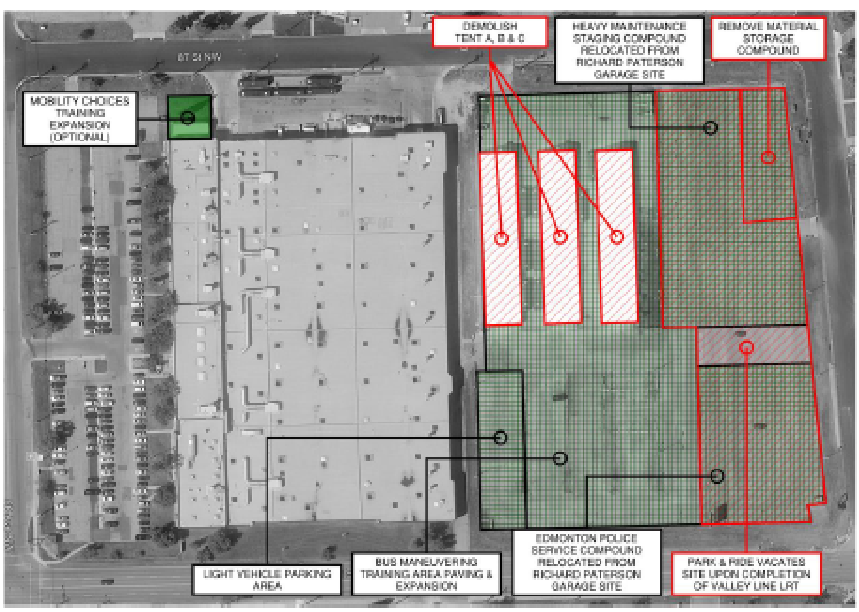
2025-2028 • Richard Paterson Garage • Expansion / Site works

This existing facility will include heavy maintenance shop expansion to eight mechanical bays, one chassis dyno bay, and one wash bay. The work consists of selective demolition and reconstruction of bays one to eight with increased clear height, increased bay length, and in-ground hoists. Existing compounds (i.e. EPS and Maintenance Staging) will be relocated to the Thomas Ferrier Garage site and replaced with an expanded light vehicle parking area.



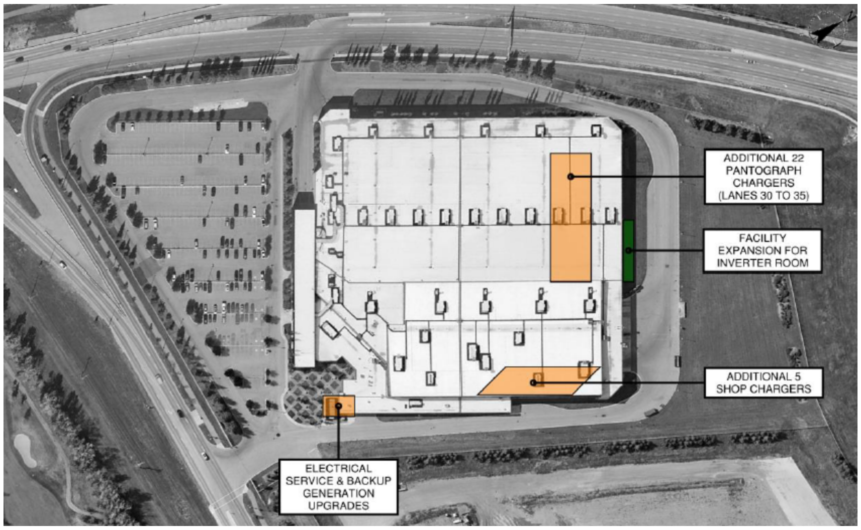
2025-2028 • Thomas Ferrier Garage • Demolition / Site Works / Expansion

Demolish tents; New site for EPS and maintenance staging compounds; Driver Training area paved and expanded; Mobility Choices Training Program expansion (optional - may be located at the first NEW Garage).



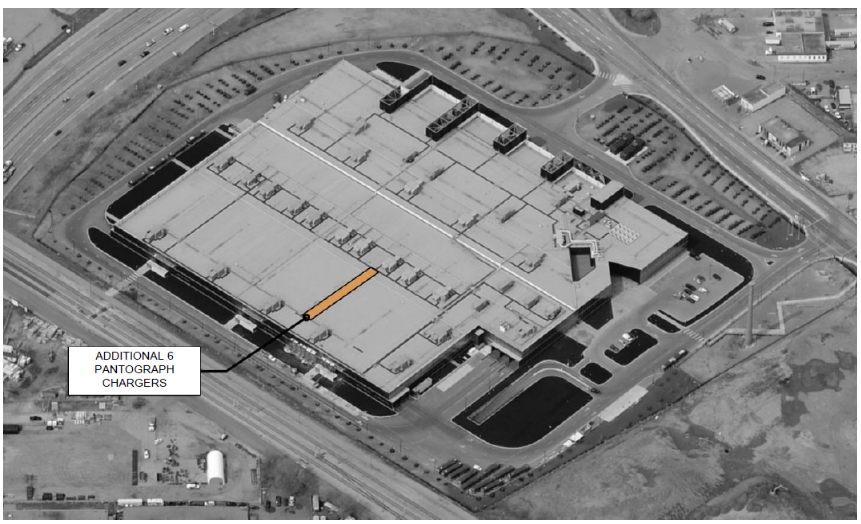
2026-2027 • Centennial Garage • Expansion / E-Bus Infrastructure

Existing facility; Expansion of the inverter room; Increased electric bus charging infrastructure from four to 26 pantograph chargers and increase from one to six shop chargers to support a maximum of 40 E-Buses.



2026-2027 • Kathleen Andrews Transit Garage • E-Bus Infrastructure

Existing facility; Increase from 22 to 28 chargers to support a maximum of 43 E-Buses.



Implementation Timeline

Attachment 2 provides a high-level overview of the project timelines (i.e. program, design and construction) and shows when and how a facility's capacity is impacted, triggering fleet growth and electrification opportunities. This timeline assumes that funding is available for continuous project development and delivery.

Given current facility capacities, fleet growth is flat until the end of 2026. Based on the timeline, fleet growth can begin in 2027 with conventional and DATS growth buses allocated to the New Southeast Operations and Maintenance Garage. The overall fleet is redistributed and balanced between all garages.

Upon occupancy of the New Northwest Operations and Maintenance garage at the end of 2032, the fleet can again be redistributed and balanced between six operations and maintenance garages, with additional conventional and DATS fleet growth distributed equally to the new facilities.

This timeline supports meeting the Mass Transit Network projections for a population of 1.25 million and supporting The City Plan and the City Operations GHG Management Plan goals.

Preliminary Cost Estimates

The order of magnitude costs of the Strategy implementation is summarized below by facility and capital budget cycle. Per the PDDM, this is the Strategy and only to PPDM Checkpoint 1; the costs described below are defined as Class 5 and have an expected degree of accuracy of -30% to +50%.

Estimated Project Costs

	Order of Magnitude Costs ($'000)					
	2019-2022	**2023-2026**	**2027-2030**	**2031-2034**	**Future Years**	**TOTAL**
New Southeast O&M	57,000	410,000	165,000	-	-	632,000
Davies Facility	300	6,000	-	-	-	6,300
Ellerslie Facility	700	21,000	-	-	-	21,700
New Northwest O&M	-	57,000	230,000	250,000	95,000	632,000
Richard Paterson Garage	-	1,000	34,000	-	-	35,000
Thomas Ferrier Garage	-	500	5,000	-	-	5,500
Centennial Garage	-	500	21,000	-	-	21,500

Kathleen Andrews	-	3,000	3,000	-	-	6,000
TOTAL	58,000	499,000	458,000	250,000	95,000	1,360,000

*Calculations do not include contingency and escalation costs.

The estimates include costs for the facility infrastructure and the electric bus infrastructure, such as the increased capacity of the electrical systems and charging stations. There remain some costs that are *unknowns*. These are excluded from the above and will be defined as more information becomes available in later phases of each project. Exclusions include:

- EPCOR Distribution/Transmission costs
- Cost of contaminated soil removal and hazardous material (e.g. asbestos, lead, PCB, etc.) removal
- Fleet or additional equipment

The Strategy does not include the cost of buses, or the operating impacts of capital. These costs are developed as part of the planning and design for each individual facility.

Additional Considerations

It is critical to interpret the strategy's information and analysis at a point in time and could require adjustments, refinements, or potentially significant changes during implementation. These include, but are not limited to:

- Timeline adjustments and construction phasing plan to align capital expenditures with growth projections.
- Further development of the initial concepts presented in the report will be refined during the functional programming, schematic design, design development and construction documentation process, per the Project Development and Delivery Model (PDDM), per Capital Project Governance Policy C591.
- Ongoing refinement of the cost estimate at key project milestones to tighten the accuracy range as design definition increases and serve as a tool to drive cost versus value decisions made during the design process (i.e. value engineering).
- Refinement of the type, scale and design of infrastructure as more experience is gained with operation and maintenance of the initial E-Bus fleet, particularly the maintenance requirements (i.e. time-utilization of the maintenance bays) and charging requirements (optimization of the charging infrastructure from a capital cost and operational cost perspective).

The strategy is recommended to be revisited as part of annual planning activities for all branches involved in this study.

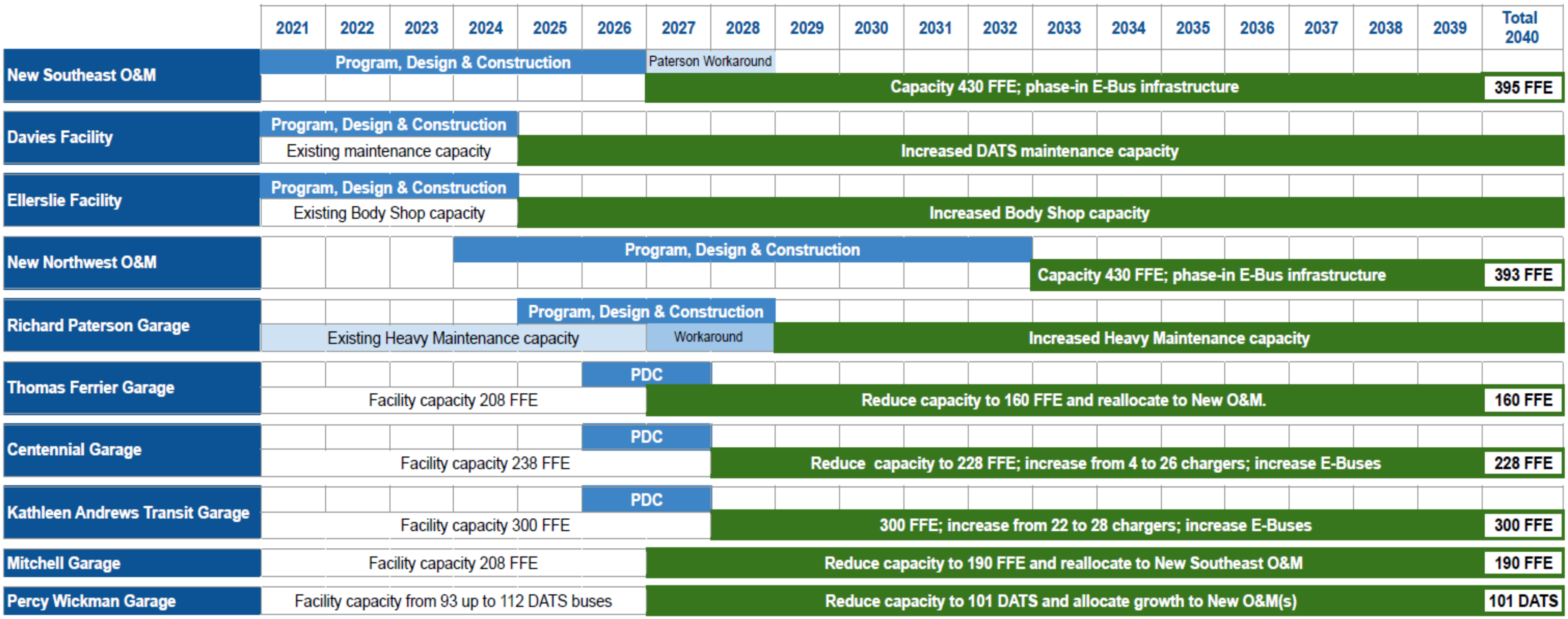
- Ongoing monitoring of fleet projections and corresponding realignment of the Strategy on an annual basis is recommended.
- Monitor the current and long term potential impacts of the COVID-19 pandemic related to infrastructure needs, facility planning, and capital planning.

Electric Buses

The Strategy assumes all future E-Bus fleet growth will be based on the current Proterra model. This means that all programming will be based using the dimensions, charging equipment, and operational basis of the Proterra model. (note: Proterra is the manufacturer of the Electric Bus the City has chosen to purchase buses from). This assumption should be closely monitored and adapted as the Strategy is implemented.

The introduction of other fleet types such as Hydrogen fuel-cell electric buses or electric articulated buses is possible. However, infrastructure planning must be monitored and adjusted to respond to changes to fleet growth, capacity and electrification targets.

Ideal Scenario Implementation Timeline



By 2032 and the opening of the New Northwest Operations and Maintenance Garage, the overall capacity of the facilities exceeds the number of buses in the fleet, creating flexibility to move buses between facilities and allow for future growth as well.

Integrated Infrastructure Services

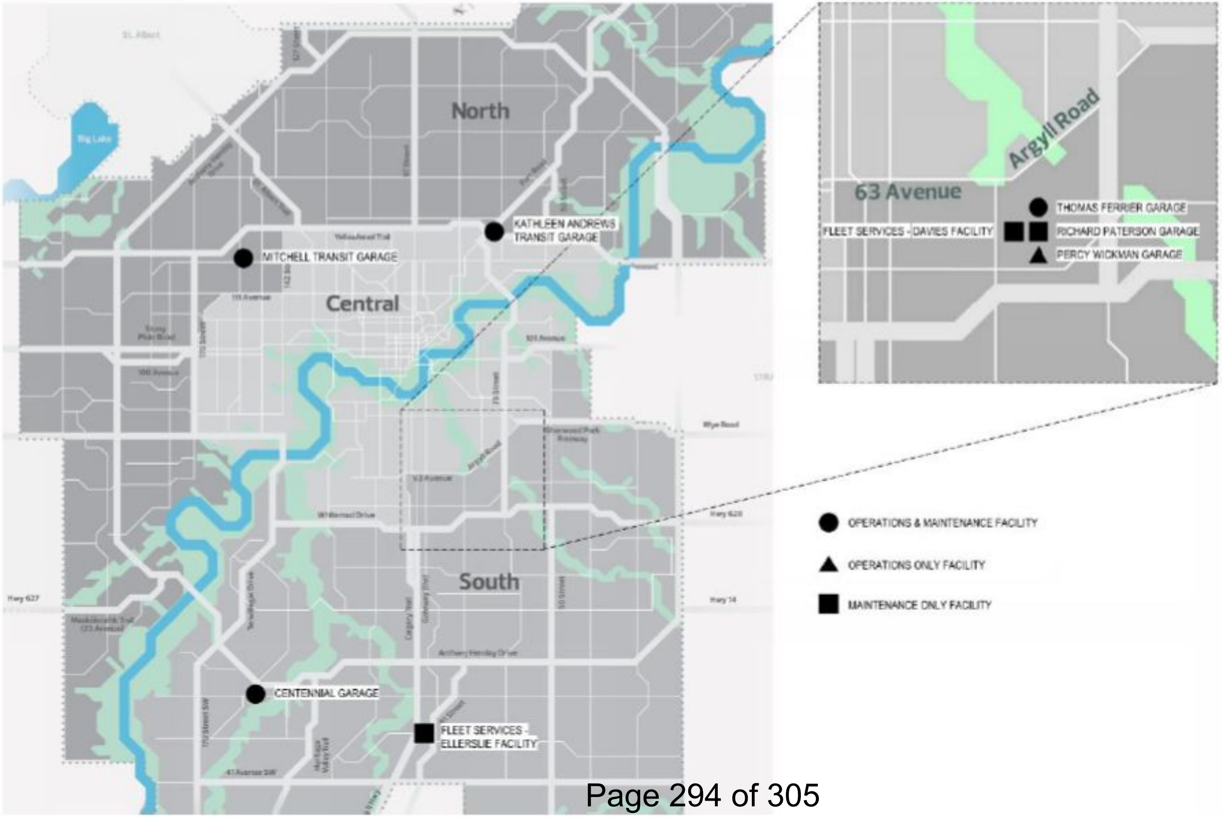
Infrastructure Planning and Design

ETS Fleet Storage, Operations and Maintenance Facility Project

Urban Planning Committee
February 15, 2022

IIS00416

Current State



Edmonton

Background

- ETS fleet storage, operations and maintenance facilities are operating at full capacity, unable to support fleet growth and achieve the City's greenhouse gas emission reduction targets.
- New facilities and renovations to existing facilities are required to support future growth and electrification of the bus fleet.
- The long-term strategy has been developed to guide fleet growth, electrification, facility renewal and development of facilities through 2040.

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Bus Garage Operations

- Transit service delivery:
  - Dispatch
  - Service deployment
  - Operator support
  - Fleet maintenance
- 24/7 operation
  - First bus of the day leaves at 3:41am
  - Last bus of the day arrives back at 4:57am

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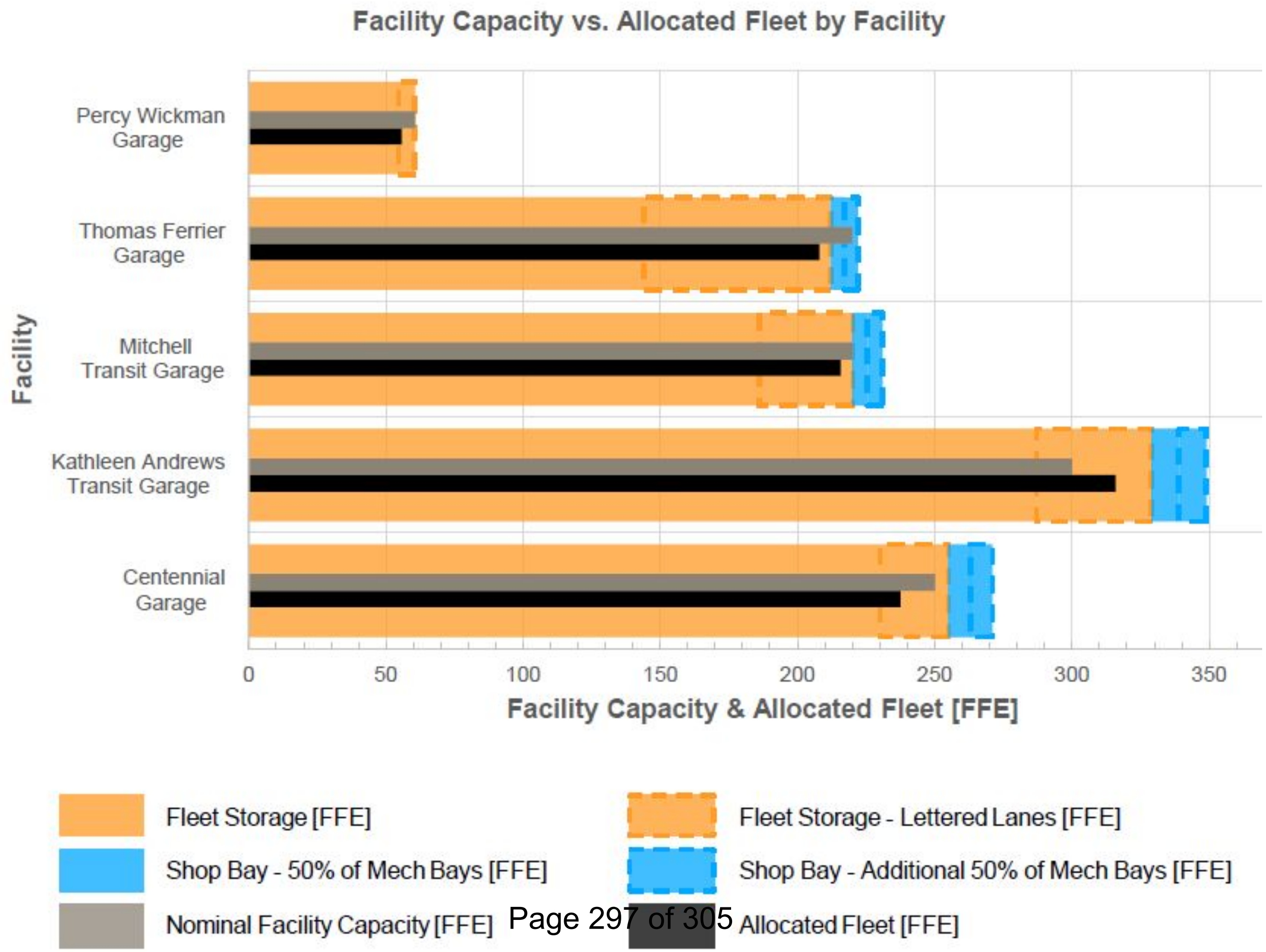
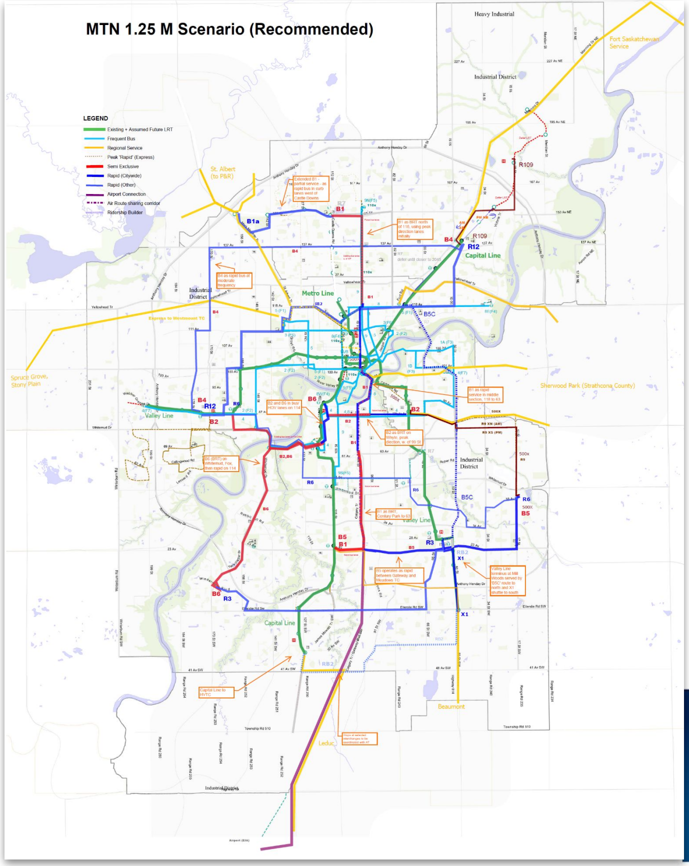

Facility Capacity vs. Allocated Fleet by Facility
Facility
Percy Wickman Garage
Thomas Ferrier Garage
Mitchell Transit Garage
Kathleen Andrews Transit Garage
Centennial Garage
0
50
100
150
200
250
300
350
Facility Capacity & Allocated Fleet [FFE]
Fleet Storage [FFE]
Fleet Storage - Lettered Lanes [FFE]
Shop Bay - 50% of Mech Bays [FFE]
Shop Bay - Additional 50% of Mech Bays [FFE]
Nominal Facility Capacity [FFE]
Allocated Fleet [FFE]

Strategic Alignment: City Plan

- Mass Transit Network for interim horizon of 1.25 M population (~2030).
- Recommended network includes LRT growth and several BRT/rapid bus corridors.
- Projected fleet growth aligned with Mass Transit Network requirements



Strategic Alignment: Electrification

Edmonton's Community Energy Transition Strategy calls for the transition of the bus fleet to electric or zero emissions fuel

- ETS currently operates 40 electric buses
- By 2034, the Strategy would provide infrastructure for 450 electric buses
- Initiative underway exploring hydrogen electric buses and could help address infrastructure challenges for zero-emission fuel

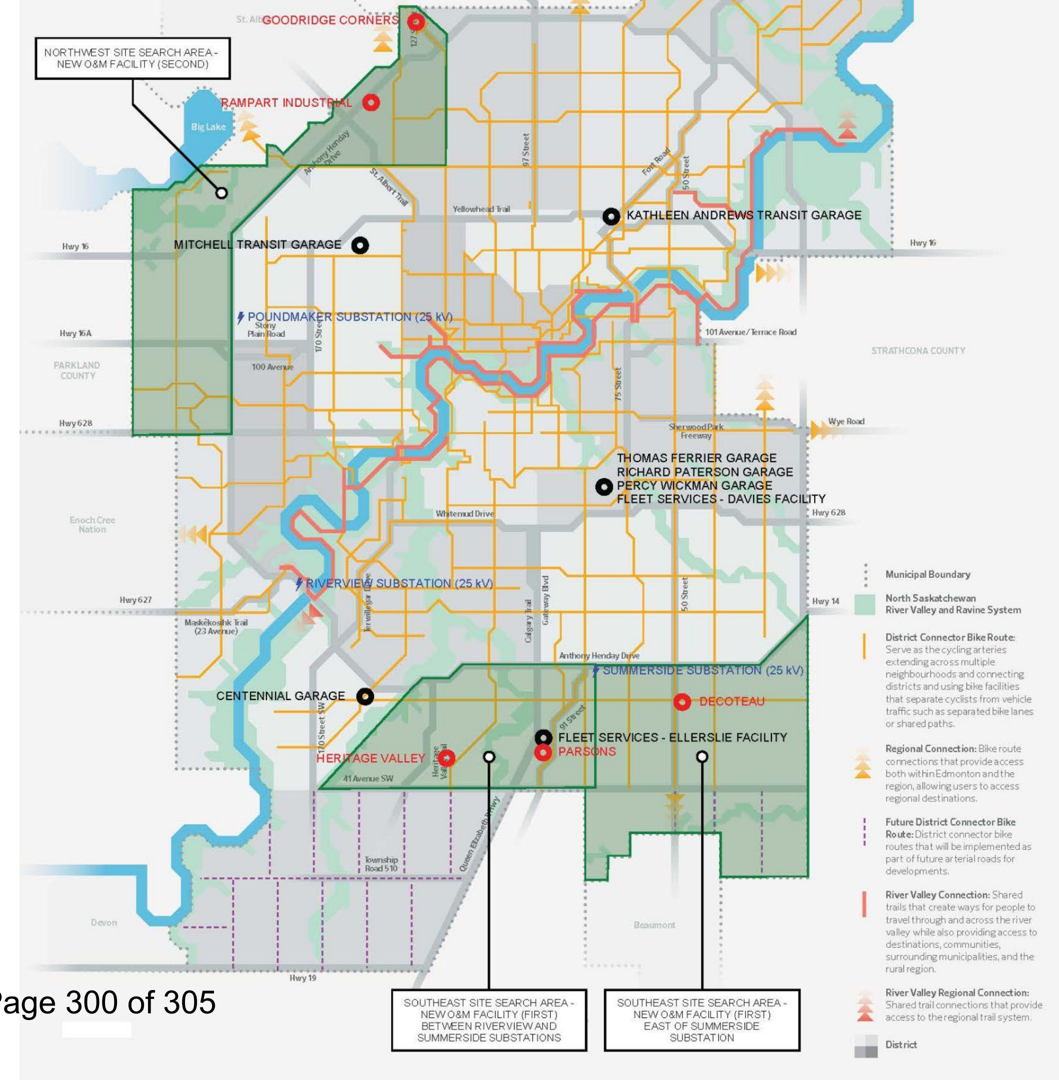
Strategy Overview

New Garage in south east quadrant

Progressive renewal and expansion of existing facilities

- Davies
- Ellerslie
- Paterson
- Ferrier
- Centennial
- Kathleen Andrews

New Garage in north west quadrant



Opportunities for Growth Before 2027

- Establishing a satellite storage facility
  - Creates capacity for expansion of the fleet ahead of a new full service garage
  - Creates capacity in existing facility for safe and efficient expansion and upgrades
- Accelerating the upgrades to the electric bus charging infrastructure of Centennial Garage and Kathleen Andrews Transit Garages to support additional electric buses

Next Steps - Strategy Development

Work in Progress

- Complete Functional Programming for New Southeast Garage (PDDM Checkpoint 2)
- Advance concept and preliminary design for Davies and Ellerslie facility expansions (PDDM Checkpoint 3)
- Advance planning for a satellite facility and the acceleration of the upgrades to the electric bus charging infrastructure of Centennial Garage and Kathleen Andrews Transit Garages

Future Requests

- Land acquisition is on critical path to advance design & construction for the New Southeast Garage (estimate of $45M)

Potential Grant Funding Options

- **Federal Zero Emissions Transit Fund**
  - $2.75B over next 5 years to support bus fleet electrification and supporting infrastructure, including charging infrastructure and facility upgrades. Program's primary focus appears to be ZEB procurement
- **Federal Permanent Transit Fund**
  - Permanent measure of $3B annually beginning in 2026/27 to support public transit initiatives. Program currently in development; allocation method unknown.
- **Canada Community Building Fund (formerly federal Gas Tax Fund)**
  - Permanent measure currently at $2.2B annually, allocated to municipalities on a per capita bases; funding grows incrementally with inflation (2% indexing) and population growth.
- **Local Government Fiscal Framework (MSI replacement)**
  - Will replace MSI in 2024 when program ends; provincially legislated annual funding based on a revenue sharing formula. Program parameters expected to mirror MSI.

Recommendation

That Urban Planning Committee recommend to City Council:

That the strategy outlined in the February 15, 2022, Integrated Infrastructure Services report, IIS00416, be approved.

Edmonton

Thank you.

Questions?

Integrated Infrastructure Services
Infrastructure Planning and Design