NEW WESTMINSTER BUS SPEED AND RELIABILITY STUDY

Final Report

CITY OF NEW WESTMINSTER

March 2024

Table of Contents

1. INTRODUCTION 1

1.1 Planning and Policy Alignment 1

1.2 Transit Services in the Study Area 5

1.3 Document Purpose and Organization 7

2. DATA SOURCES 8

2.1 Bus Speed and Reliability Data 8

2.2 GIS & Land Use Data 8

2.3 Sociodemographic Data 8

3. ASSESSMENT METRIC DEFINITIONS 9

3.1 Speed and Travel Time 9

3.2 Ridership 10

3.3 Equity, Diversity, and Inclusion 10

4. BUS SPEED AND RELIABILITY EXISTING CONDITIONS 12

4.1 Corridor Definition Methodology 12

4.2 Corridor Bus Speed and Reliability Results 13

5. BUS SPEED AND RELIABILITY PROJECT ALTERNATIVES 26

5.1 Methodology 26

5.2 22nd Street Station Area 27

5.3 6th Street Corridor 31

5.4 Downtown Area 35

5.5 6th Avenue Corridor 38

5.6 8th Street Corridor 40

5.7 Ewen Avenue & Queensborough Connector 44

6. IMPLEMENTATION STRATEGY 47

6.1 Cost Estimation Methodology 47

6.2 Phase 1 – Short Term (Year 1) 48

6.3 Phase 2 – Medium Term (Years 2 & 3) 49

6.4 Phase 3 – Long Term (Years 4 & 5) 49

1. Introduction

The City of New Westminster, the oldest city in the Lower Mainland, is home to nearly 79,000 residents and spans 15.6 square kilometres[1]. It is located on the unceded and un-surrendered land of the Halkomelem speaking people and is surrounded by the Lower Fraser River, the City of Burnaby, the City of Coquitlam, and the City of Richmond. Without room to grow horizontally, infill and vertical growth is required, resulting in increased density and a diversity of land uses in a compact area. Due to its central location just north of the Fraser River, New Westminster serves as a regional transportation hub and major throughfare for regional and local trips. Local and regional movements are facilitated by five SkyTrain Expo Line stations, a bus route network and two bridges connecting New Westminster to Surrey via the Patullo Bridge (Highway 1A), and to Richmond and Delta via the Queensborough Bridge (Highway 91A).

New Westminster is experiencing significant development that will impact travel patterns and demand over the coming years. The downtown core and riverfront areas are densifying, the Sapperton area (through the Sapperton Green Transit-Oriented Mixed-Use Community plan (SGTMC)) and the Brunette Avenue and East Columbia Street area (part of the Brewery District Mixed Use and Health Care (BDMU)) are both intensifying and diversifying, and the 22nd Street SkyTrain Station will be reimagined through the 22nd Street Station Area Bold Vision.

To accommodate the planned increase in population, density and diversity, the City of New Westminster together with TransLink is actively improving the transit network so that it is a convenient and attractive mode chosen by an ever-increasing percentage of the population. This study identifies locations (intersections, blocks, or multi-block segments) of significant recurring transit delay and variability and presents solutions, or bus speed and reliability (BSR) projects to improve travel times in a prioritized 5-year implementation strategy.

1.1 Planning and Policy Alignment

Improving transit operating efficiency and customer service aligns with and supports relevant provincial, regional and local planning and policy initiatives. They include the Province's and the City's climate action plans, *CleanBC Roadmap to 2030*, the *Community Energy and Emissions Plan (CEEP) 2050*, respectively; TransLink's regional transportation strategy, *Transport 2050*; and several local planning initiatives identified below.

CLIMATE ACTION

Improving transit speed and reliability supports the Province's commitment to reduce greenhouse gas emissions by 16% below 2007 levels by 2025, 40% by 2030, 60% by 2040 and 80% by 2050. It also aligns with the City's area of greatest opportunity to achieve their goal of 60% of trips made by sustainable modes of transportation by 2030 (and 80% by 2050), as identified in the CEEP. Identified actions in the CEEP related to transit include supportive land use development in alignment with the OCP like transit-oriented development; complete communities with transit supportive densities; transit priority measures, expanding frequent transit service, and developing the 8th Street RapidBus.

[1] https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&SearchText=New%20Westminster&DGUIDlist=2021A00055915029&GENDERlist=1,2,3&STATISTIClist=1&HEADERlist=0

TRANSPORT 2050 (TRANSLINK)

Transport 2050 establishes a bold vision for mobility in Metro Vancouver — a future where getting around is easy and everyone has access to affordable, convenient, and reliable low and no-carbon transportation options. Supported by the goals (convenient, reliable, affordable, safe and comfortable and carbon-free), identified improvements are designed to realize the regional mobility vision:

In 2050, everyone can easily connect to the people, places, and opportunities that they need to thrive — because we all have real choices, that we can count on, that we can afford, and that we can safely enjoy for generations to come. Our transportation system supports an inclusive, future-ready region that has meaningfully advanced reconciliation.

The Regional Transportation Strategy emphasizes the interconnected nature and reciprocal relationship between land use and transit—which the City's plans also reflect. The specific City of New Westminster improvements identified in T2050 include a new RapidBus route along 8th Street which forms part of the major transit network, and capacity relief measures along Stewardson Way/Front Street and across the Patullo Bridge.

LOCAL PLANNING INITIATIVES

City planning initiatives that are the most relevant to the overall context of this plan and its outcomes include the *Official Community Plan* (OCP), *Master Transportation Plan (MTP),* the *All Ages and Abilities Active Transportation Network Plan* (ATNP), the *Downtown Transportation Plan* (DTP), the *Uptown Streetscape Vision* and the *22nd Street Station Area Bold Vision.* The key features of each plan are summarized below.

Official Community Plan

The OCP (2017) is the over-arching plan to which all other plans and projects are created to realize the OCP vision, policies and goals. The OCP vision statement is:

New Westminster is a healthy, inclusive and thriving community where people feel connected with each other. This sustainable city showcases a spectacular natural environment, public spaces and unique neighbourhoods that are well-integrated and accessible. Superior urban design integrates its distinctive character, heritage assets and cultural identity. Growth and development provide a variety of services and employment opportunities that contribute to a high quality of life for all.

The vision is supported by twelve goals, one of which is about transportation and accessibility. The plan envisions a transportation system that is accessible to people of all ages and abilities, and supports a sustainable, compact and prosperous community. It contains high-level policies and guidance to which the MTP and other plans (some of which are summarized below) support and define the path to achieving the vision in greater detail.

Master Transportation Plan

The 2015 MTP directly supports the Official Community Plan and the community's projected growth and development. The vision is:

New Westminster's multi-modal transportation system will support the development of a compact, sustainable and resilient community, maintaining the City's role as an important historic centre and economic hub within the region, while ensuring that New Westminster's diverse neighbourhoods are healthy, active, livable and vibrant.

To achieve this vision, multi-modal transportation infrastructure and programming investments over the next 25 years are aligned with six overarching goals: mobility and access; health and safety; social diversity; sense of place and social cohesion; land use and transportation integration; and sustainable transportation system. The plan establishes a transit mode share target of 32% by 2041 (a 14% increase from 2011). This target is to be achieved by increasing the attractiveness and convenience of public transit by:

- Enhancing transit service frequency
- Implementing transit priority treatments
- Developing transit-oriented communities
- Providing excellent customer facilities and information
- Improving safety and accessibility of transit
- Promoting region-wide transit improvements

Even though the MTP was published seven years prior to TransLink's T2050, the priorities remain relatively consistent. Additional service is recommended for two north-south corridors that make-up part of the Frequent Transit Network (6th and 8th Street), in addition to improving service on two east-west corridors, 6th and 8th Avenue.

All Ages and Abilities Active Transportation Network Plan

Published in 2022, the City of New Westminster's *All Ages and Abilities Active Transportation Network Plan* (ATNP) more clearly defines how the City will achieve MTP's long-term bicycle network vision. The ATNP promotes mode shift by creating safe and accessible bicycle and pedestrian environments. ***Figure 1.1*** illustrates the City's proposed active transportation network.

FIGURE 10: PROPOSED ACTIVE TRANSPORTATION NETWORK

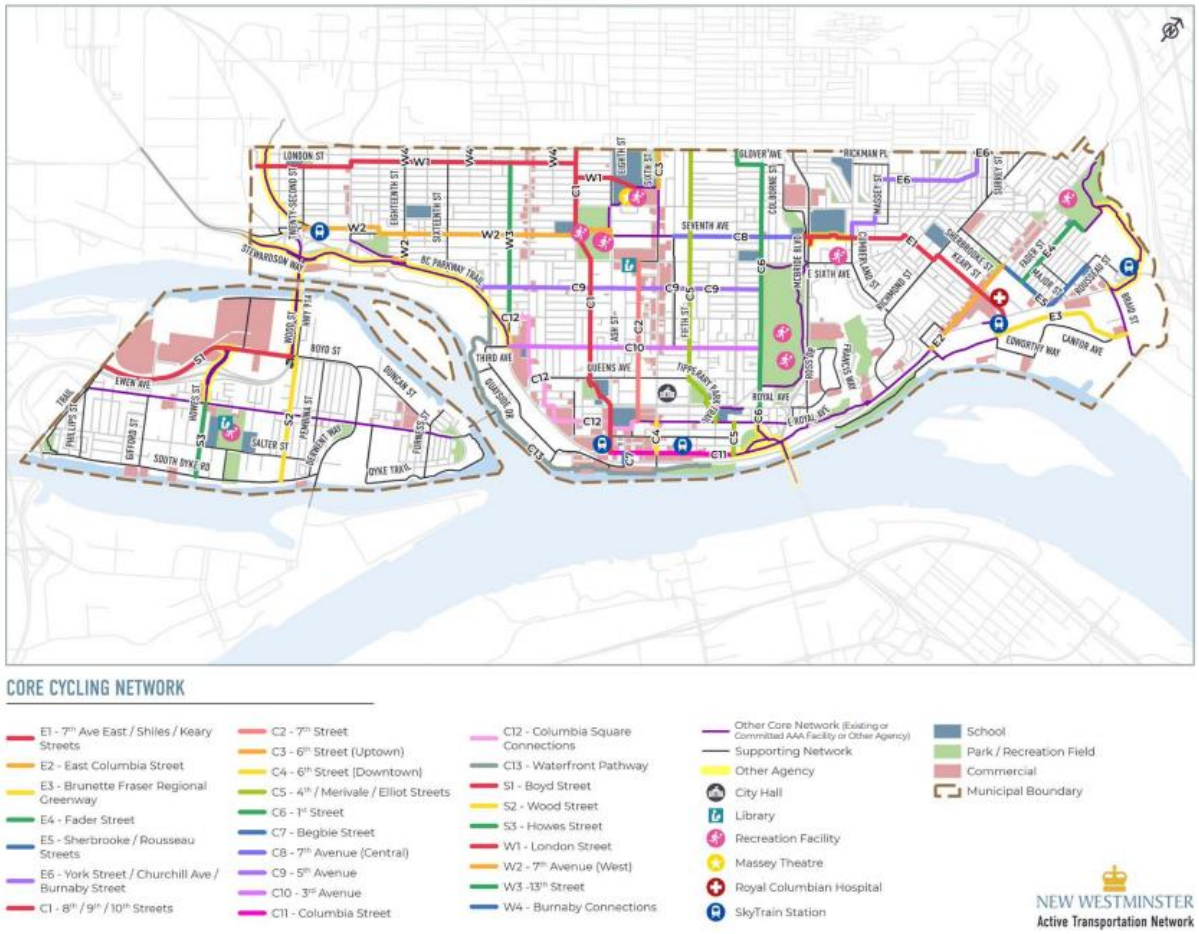


FIGURE 1.1: CITY OF NEW WESTMINSTER PROPOSED ACTIVE TRANSPORTATION NETWORK

Active transportation improvements most relevant to the recommended transit priority treatments contained herein include:

- **7th Avenue (Westbound):** Installation of a constrained width bidirectional protected mobility lane on north side of 7th Avenue between BC Parkway and 20th Street.
- **8th Street**: Installation of unidirectional protected mobility lanes on 8th Street between Royal Avenue and Columbia Street.
- **6th Street (Uptown)**: Substantial completion of unidirectional protected mobility lanes south of 10th Avenue, as part of the New Westminster Secondary School Cycling Connector.
- **6th Street (Downtown)**: Provision of bidirectional mobility lanes on the west of 6th Street to provide a connection from the Agnes Greenway to the Waterfront Pier Park.

Downtown Transportation Plan

The City of New Westminster DTP, published in 2020, outlines the transportation vision for an important economic and residential hub of the Metro Vancouver region. The Downtown neighbourhood accommodates high transportation volumes of both people and goods—via active travel, transit (SkyTrain and bus), motor vehicle, truck, and heavy rail. To complement the City and the region's climate action goals, the DTP provides a

framework to transition to sustainable modes of transportation. The plan's goals center around the following themes:

- Creating a safe, livable, and walkable community.
- Making cycling comfortable and inviting for people of all ages and abilities.
- Ensuring reliable and convenient transit.
- Increasing the use of sustainable modes of transport for all trips within the area.
- Establishing a transportation network that reallocates road space to create a people-centered public realm.
- Addressing barriers to transportation accessibility.
- Celebrating the historical natural and built form of Downtown.

Several corridors are identified as future Complete Streets in the DTP, including Carnarvon Street and 8th Street. These corridors—both well served by transit (bus routes and SkyTrain stations)—will be redesigned to prioritize sustainable modes, in addition to vehicular traffic, by widening sidewalks, providing boulevards and street trees, changing curbside uses, and implementing transit priority measures. Proposed transit priority measures in this study incorporate and complement the DTP's Complete Streets.

Uptown Streetscape Vision

The Uptown Streetscape Vision, approved by Council in November 2020, establishes an overarching vision for the Uptown area, focused around 6th Street and 6th Avenue, to inform future development and infrastructure investment. Streetscapes include all visual elements—sidewalks, trees, adjoining buildings, open spaces, the road, etc.—that when combined, create a person's experience of the space. It includes design concepts and guidelines to transform 6th Avenue and 6th Street into 'Great Streets' or streets that are destinations unto themselves. The Great Street concept is composed of seven principles:

1. Prioritize pedestrian connectivity, safety, and accessibility.
2. Include great places, destinations, and vibrant commercial activity.
3. Prioritize active transportation, transit, and future mobility options.
4. Provide comfortable and pleasant experiences.
5. Embody a unique and unified character that speaks to its place in the city.
6. Enhance the urban tree canopy and integrate green infrastructure.
7. Be a fully inclusive and welcoming space for all.

22nd Street Station Area Bold Vision

The City of New Westminster OCP envisions higher densities in the area surrounding the 22nd Street SkyTrain Station. However, the goals for this area have expanded as a result of the subsequent declaration of a climate emergency by City Council in 2019. Council realizes that in order to achieve climate action targets, density increases alone are not enough. A climate friendly neighborhood, one where the daily lives of people make a real difference for climate action is envisioned. Future transit improvements will be reviewed in light of the plan's outcomes, slated to be complete in 2024.

1.2 Transit Services in the Study Area

The New Westminster SkyTrain Expo Line is interconnected with a bus network composed of local routes, operating primarily within the city, and regional routes which connect the City of New Westminster with neighboring cities like Richmond, Burnaby, Vancouver, and Surrey. A snapshot of the bus routes in the City of

New Westminster is shown in ***Figure 1.2***, and includes the route number, route name, peak frequency (in buses per hour), and local or regional connectivity.

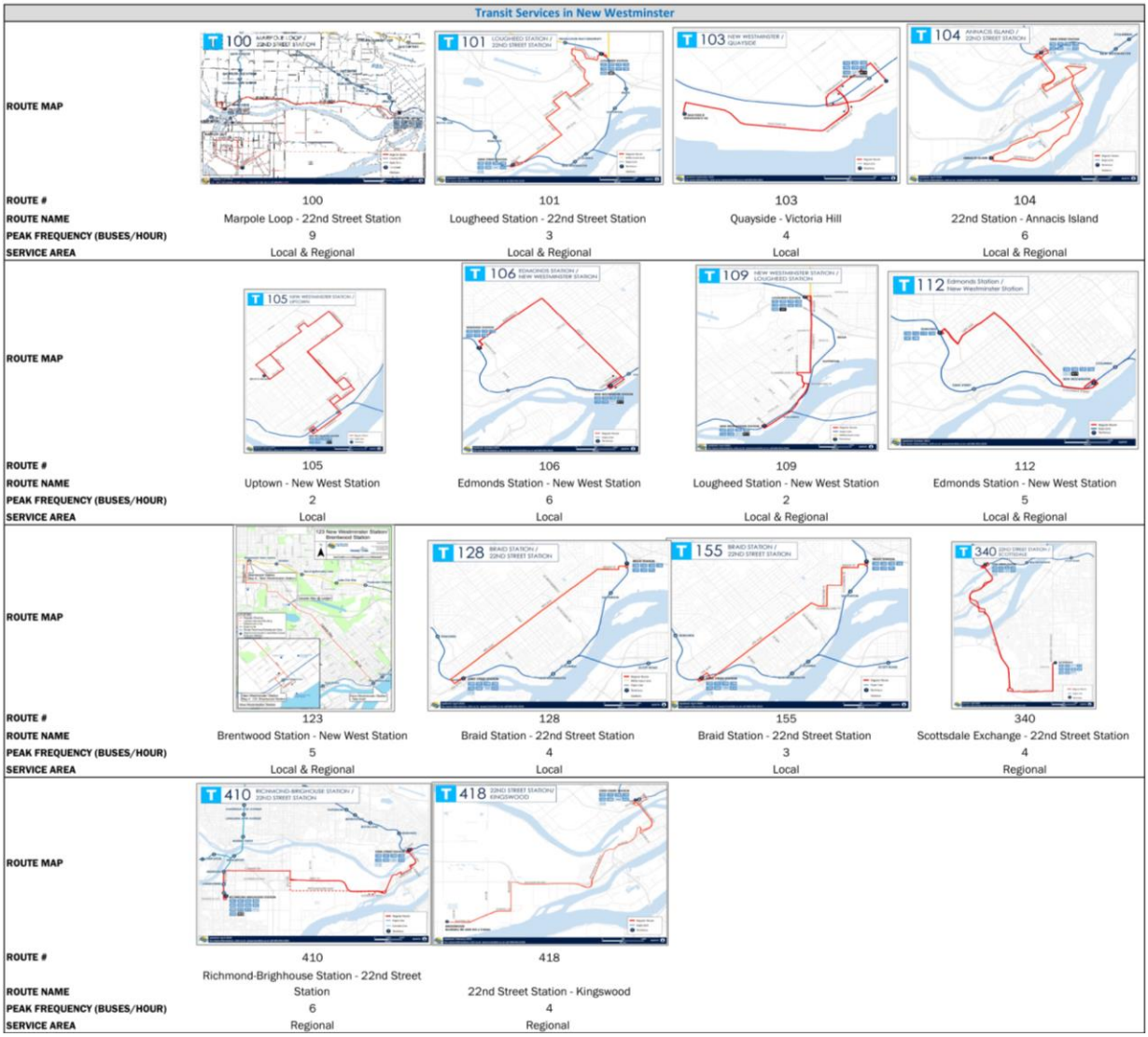


FIGURE 1.2: TRANSIT SERVICES IN THE STUDY AREA

Together these routes create the city's transit network, shown together in ***Figure 1.3***.



FIGURE 1.3: MAP OF TRANSIT ROUTES AND KEY DESTINATIONS IN NEW WESTMINSTER

1.3 Document Purpose and Organization

The purpose of this report is to identify locations of significant recurring transit delay and service unreliability, and to develop infrastructure and operational measures, presenting the most preferred in a five-year implementation strategy.

This document is structured as follows:

- **Section 2 Data Sources** defines the types of data sources used to perform the comparative analysis.
- **Section 3 Assessment Metric Definitions** provides definitions of key assessment metrics used in the analysis.
- **Section 4 BSR Existing Conditions** shows corridor-level results of the delay and variability analysis and provides a corridor profile of the existing transit and walkshed characteristics of the area.
- **Section 5 Bus Speed and Reliability Project Alternatives** describes the rationale for selecting the transit delay hotspots to be prioritized for treatment and describes the proposed delay reduction treatments.
- **Section 6 Implementation Strategy** outlines the implementation of the proposed treatments at three different timescales – short-term, medium-term, and long-term treatment implementation.

2. Data Sources

The data sources for this study are categorized into three groups: bus speed and reliability data, GIS and land use data, and sociodemographic data. The following section describes these data requirements in detail.

2.1 Bus Speed and Reliability Data

AUTOMATIC VEHICLE LOCATION (AVL)

Bus speed and reliability data is collected by TransLink through the provision of automatic vehicle location (AVL) devices on buses. The GPS devices provide time stamps by location along the route by direction and time of day. From this information, travel time, speed and dwell time are calculated.

AUTOMATIC PASSENGER COUNTERS

Automatic Passenger Counters (APC) are sensors placed at the doorways of the buses to count the number of persons boarding and alighting at each stop. From this data, passenger volumes or loads are derived to estimate the number of passengers on the bus in-between stops and further to estimate total ridership. Typically, only some buses are equipped with APCs; therefore, volumes provided by TransLink are scaled/factored into an estimated total. One limitation of the APC data is that it does not provide information about the passengers nor additional trip level information like origin-destination data.

TRANSIT OPERATIONS DATA

Recovery time is extra minutes not shown in the schedule in-between the end of a trip and the start of the next trip. It allows the bus to begin the next trip on-time despite the previous trip taking longer than what is stated in the schedule. Bus routes have varying amounts of recovery time built into the schedule.

As traffic volumes and congestion increase, travel times increase, requiring recovery time to be reallocated to the schedule, reducing recovery time. Eventually, an additional bus is required to deliver the same service when there is insufficient recovery time due to increased, or longer travel times. Therefore, Coast Mountain Bus Company (CMBC) provided the number of minutes that would need to be saved for New Westminster routes with the least amount of recovery time.

2.2 GIS & Land Use Data

The City of New Westminster provided bus stop locations, route paths and land use designations.

2.3 Sociodemographic Data

The 2021 Statistics Canada Census divides New Westminster into 91 Dissemination Areas (DA). Dissemination areas are the smallest standard geographic area with an average population of 400-700 people. Each DA provides sociodemographic information about the people living within its boundaries including but not limited to population, age cohorts, households and household compositions, visible minorities, one-parent families, density, language, and income.

A 400-metre walkshed is applied to all bus stops along the study corridor, and the dissemination areas of which part or all of the defined boundary is within the 400m walkshed are aggregated. This generates a demographic profile of the nearby population to evaluate impacts of proposed improvements to bus service.

3. Assessment Metric Definitions

This section outlines and defines the metrics used to assess transit performance in the City of New Westminster. These metrics are split into three categories: speed and travel time, ridership and passenger load, and census data, and are described below.

3.1 Speed and Travel Time

Five metrics are used to assess speed and travel time. They include passenger-hours of delay (PHD), bus-hours of delay (BHD), average speed, average variability, and recovery time. The first two metrics are used by TransLink to assess delay across the entire Metro Vancouver region — TransLink's measurements are applied here to enable regional comparison.

Travel time and speed are calculated from the departure time of one bus stop to the arrival time at the next bus stop. The time spent at each bus stop, or the time in which passengers board and alight, is not included. Therefore, conclusions about travel time, speed, delay, and reliability can all be attributed to road conditions, signal timing, infrastructure design, and other factors like weather and construction.

PASSENGER-HOURS OF DELAY

To quantify impacts to customers and service quality, PHD is measured by the number of persons on the bus experiencing delay, resulting in longer trip times. Average weekday person-hours of delay is measured by *(average run time – 20th percentile run time) * number of passengers (average load of each segment).* Calculations for different purposes and distances include:

- **Corridors:** All segments along the identified corridor or station area are added together, representing the delay experienced by passengers along the entire corridor.
- **Hot Spot Ranking:** Each segment PHD is then divided by the segment length, normalizing results by distance. This enables a fair comparison of all New Westminster route segments in order to be able to prioritize the segments according to PHD.
- **Transit BSR Alternatives:** In Section 5, the PHD calculation reflects the same methodology as that which was applied to the corridors. All segments that wholly or partially travel along the project area are added together to reflect the magnitude of passenger delay that is being addressed through the proposed alternative.

BUS-HOURS OF DELAY

Impacts to transit operations and travel time is measured similarly to PHD. Average BHD of delay is measured by *(average run time – 20th percentile run time) * number of buses.* Also similar to PHD, the results are normalized by distance only for the hot spot ranking.

AVERAGE SPEED

Average speed is another indicator of performance relative to other corridors with similar composition and posted speed limits, and relative to prior years on the same corridor. Speed is the distance traveled divided by the time it takes to travel that distance. The average speed per hour for each segment is totaled and then averaged across all weekdays to get the average speed per weekday.

AVERAGE VARIABILITY

Bus travel time variability has both an impact to operations and customer service. Operationally, a corridor with a high degree of travel time variability is difficult to schedule. It requires scheduling by time of day to account for the different travel times, or if the scheduled travel time is static, a high degree of actual travel time variability requires the scheduled time to be designed around the longer run times. This results in inefficiencies (excess recovery time) when actual run times are shorter.

RECOVERY TIME

No calculations are performed for this metric. Instead, CMBC provided the amount of scheduled recovery time, that if no longer required because travel times have been reduced through BSR treatments, would enable one bus to be removed from service whilst delivering the exact same schedule. routes with the least amount of time are prioritized in an effort to free-up a bus so that it can be deployed elsewhere.

3.2 Ridership

Ridership is reported for the average weekday by route and is supported by more focused metrics like passenger load, boardings and alightings (described below).

RIDERSHIP

Ridership is reported as the total number of persons riding the bus along the project corridor on an average weekday. This definition includes all routes that travel along a segment of the corridor. Route-level ridership is used because it describes the greatest potential impact on customer experience. Bus operations and performance of one route segment within the City of New Westminster impacts operations of the entire route and potentially all customers on-board in other regional communities served.

PASSENGER LOAD

Passenger load is the number of persons on the bus between stops for an average weekday.

BOARDINGS

Boardings are the number of persons that board the bus within the defined segment for an average weekday.

ALIGHTINGS

Alightings are the number of persons that get off the bus within the defined segment for an average weekday.

3.3 Equity, Diversity, and Inclusion

The intent of the equity, diversity and inclusion (EDI) metrics is to ensure that historically disadvantaged populations and populations with the potential to have a greater need for transit are not underrepresented, and instead to intentionally improve transit service in areas where a greater percentage of equity-seeking groups live. Including these metrics also helps to ensure that any potential negative impacts do not have a disparate impact on said populations.

The selection of the nine metrics below reflects persons who have been historically discriminated against based on age (young and seniors) and race/culture (indigenous identity, visible minority, populations without knowledge

of either official languages), and reflect populations with a potential to have a greater need for transit (low-income households, one-parent families). Total population and population density are also included here to gauge the degree of potential riders along the corridor.

- **Total Population.** This metrics aids in understanding the total potential ridership of each corridor.
- **Population Density.** Population density measures the population per square kilometre of the identified corridors. Higher densities are one indication of the corridor's residential housing composition. Corridors of greater density have more potential to support higher levels of transit.
- **Indigenous Population.** This metric includes all persons who identify as Indigenous. This metric in particular should be used with caution as estimates associated with this variable is more affected than most by the incomplete enumeration of certain reserves and settlements in the Census. Estimates are also derived from 25% sample data.
- **Visible Minority.** Total visible minority (line 1688 in the Census) are persons who identify as non-Caucasian in race or non-white in colour and who do not report as Aboriginal. This metric provides an indication of the relative diversity of a corridor.
- **Population Without Knowledge of Either Official Language.** This metric identifies the number of persons without knowledge of either of the official languages (French nor English). This metric provides an indication of the relative diversity of a corridor and the potential greater need for transit.
- **Low-Income Households.** Low-income is defined here as those households at or below the low-income cut-offs, after tax (LICO-AT). These households are likely to spend a larger share of their after-tax income than the average on basic necessities of clothing, shelter, and food. This metric provides an indication of potential greater need for transit.
- **One-Parent Families.** The number of one-parent families, regardless of the gender of the parent. This metric provides an indication of potential greater need for transit.
- **Young Children Population.** This metric includes the number of persons ages 0 – 4. This metric provides an indication of the relative diversity of the corridor.
- **Senior Citizen Population.** This metric includes the number of persons aged 65 years and over. This metric provides an indication of the relative diversity of a corridor and the potential greater need for transit.

The corridors are ranked (1-12) for each EDI metric; lower numbers represent higher populations, or a greater number of persons that identify as a visible minority within the walkshed of the corridor, for example. Given that the corridors had relatively similar rankings across all of the EDI metrics, the rankings are averaged by corridor to provide one number that generally reflects the diversity of the corridor (see ***Table 3.1).***

TABLE 3.1 - EDI RANKINGS BY CORRIDOR

Equity, Diversity & Inclusion Rankings												
Corridor	6th Street	8th Street	6th Avenue	8th Avenue	E Columbia Street	Ewen Avenue	12th Street	2nd Street	Downtown	Braid Station	22nd Street Station	Route 155
Total Population	2	5	3	4	8	10	6	9	1	12	11	7
Population-Weighted Density (per sq km)	1	2	5	7	8	11	4	6	3	10	12	9
Indigenous Identity	2	4.5	1	4.5	8	12	6	9	3	11	10	7
Visible Minority	2	5	3	4	10	7	6	11	1	12	8	9
Population without knowledge of either official language	2	1	3	4	11	7	6	10	5	12	8	9
Low-Income Households	1	3	4	6	9	11	5	7	2	12	10	8
One-Parent Families	4	5	2	3	8	11	6	9	1	12	10	7
Young Children (0-4) Population	3	4.5	2	4.5	8	9	6	10	1	12	11	7
65+ Population	4	5	1	2	8	11	6	9	3	12	10	7
Average EDI metrics	2.8	4.5	2.5	3.8	8.8	10.0	5.8	9.0	1.8	12.0	9.5	7.8

4. Bus Speed and Reliability Existing Conditions

Existing conditions presents the bus speed and reliability performance of each corridor, prefaced by the methodology used to define each corridor.

4.1 Corridor Definition Methodology

The metrics are first applied citywide by corridor, and then areas with high delay and/or travel time variability are analyzed individually. The process began by dividing the city's transit network into logical segments and focus areas.

Transit routes do not perfectly align to linear corridors in New Westminster, creating a need for a corridor definition methodology. First, corridors are identified by routes which neatly align to one or two roads. Next, these linear corridors are removed from the city's transit system map, leaving a mixture of SkyTrain station areas and curvilinear route segments (i.e., Route 155). SkyTrain stations are served by multiple routes; therefore, analyzing access/egress activity of the surrounding area is more informative than looking at each road to/from the station individually. Of the four SkyTrain stations, only Sapperton Station is excluded as it is not directly served by bus routes. The closest bus stops to Sapperton Station are on E. Columbia Street (just north of Brunette Avenue) which is included as a corridor. The three remaining SkyTrain station areas are included as unique focus areas, all of which are identified by the station name except the New Westminster SkyTrain Station, which is included in the downtown focus area.

Person-hours of delay and variability for the City of New Westminster are displayed graphically in ***Figure 4.1***.

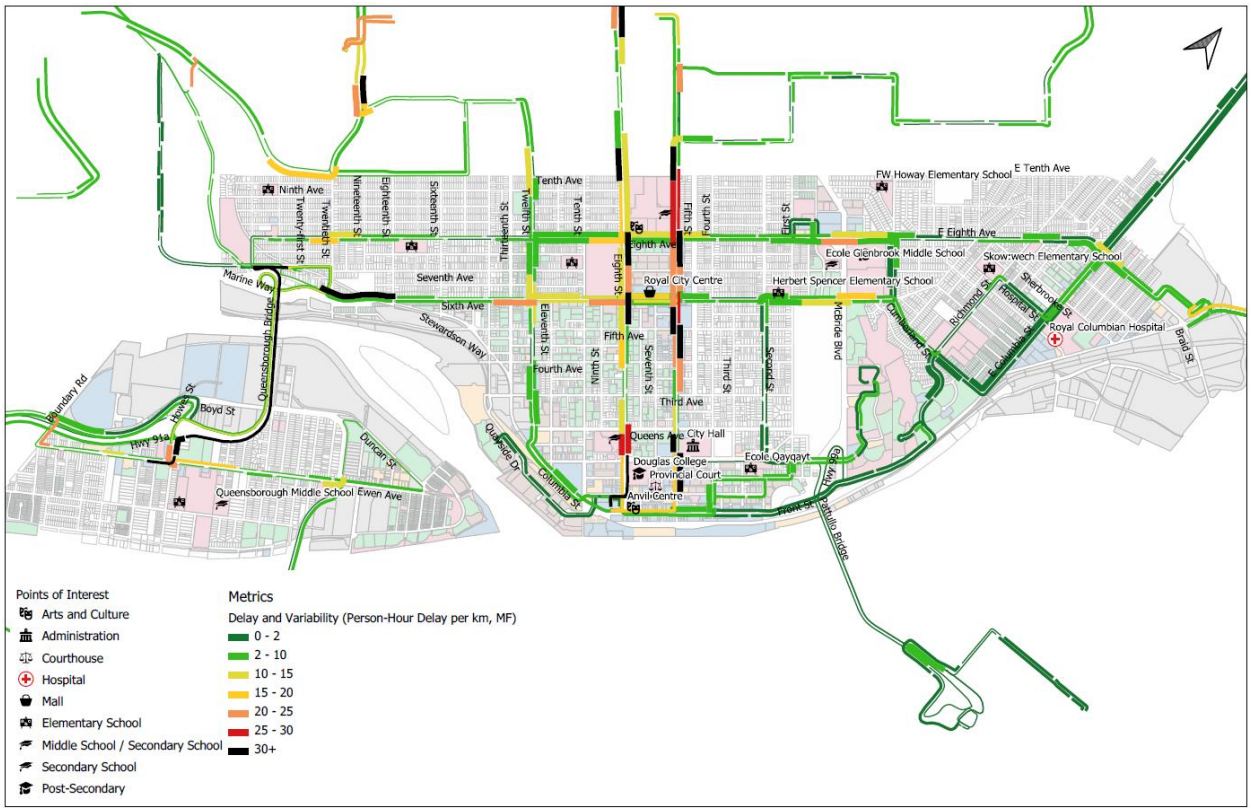


FIGURE 4.1: CITY OF NEW WESTMINSTER PERSON-HOURS OF DELAY AND VARIABILITY BY SEGMENT

4.2 Corridor Bus Speed and Reliability Results

The following section describes the transit services, land use and multimodal contextual information, transit performance statistics (quick facts), and the socioeconomic profile of the corridor's walkshed. Each corridor profile includes a section titled, "Areas of Inquiry" or observations that may warrant further investigation. Additional information regarding the relative ability to save a bus and potential EDI impacts are also included in applicable corridor profiles.

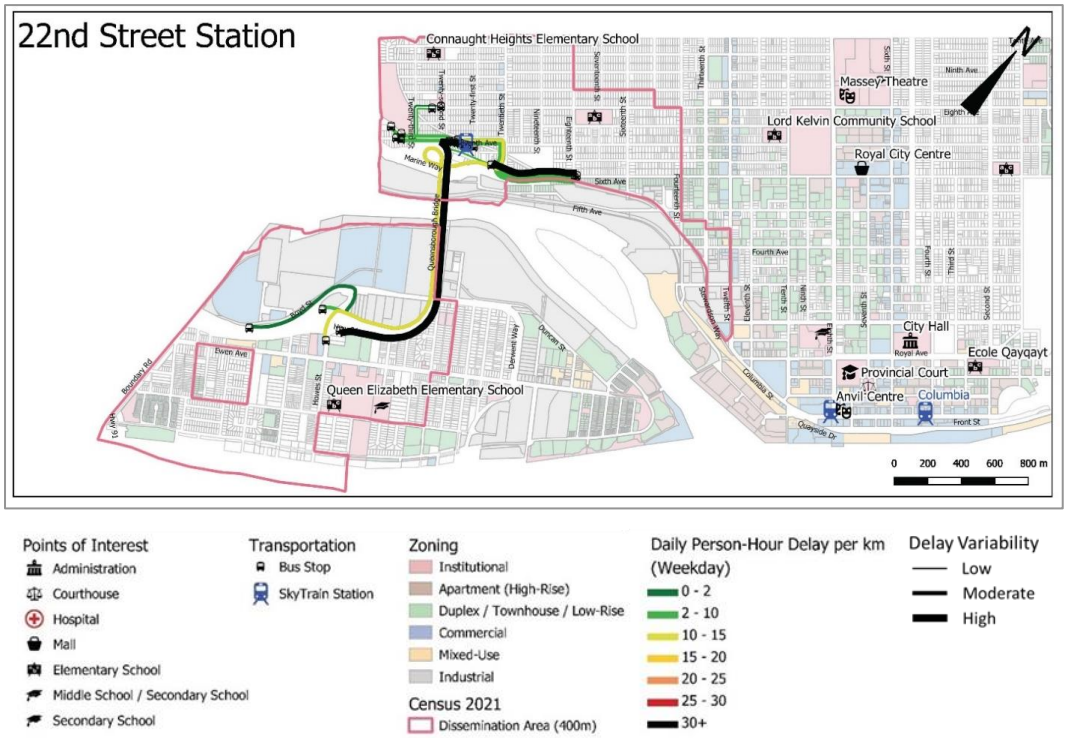
Twelve corridors and focus areas are discussed:

1. 6th Street
2. 6th Avenue
3. 8th Street
4. 8th Avenue
5. Downtown
6. 22nd Street Station
7. Braid Station
8. Ewen Avenue and Queensborough Connector
9. 2nd Street
10. Columbia Street
11. 12th Street
12. Route 155

BUS SPEED AND RELIABILITY REPORT

In TransLink's 2023 Bus Speed and Reliability Report, 6th Street, Queensborough Bridge/Highway 91A, and Canada Way/8th Street are identified corridors in the top 37 regionally ranked by person delay per kilometre.

22ND STREET STATION

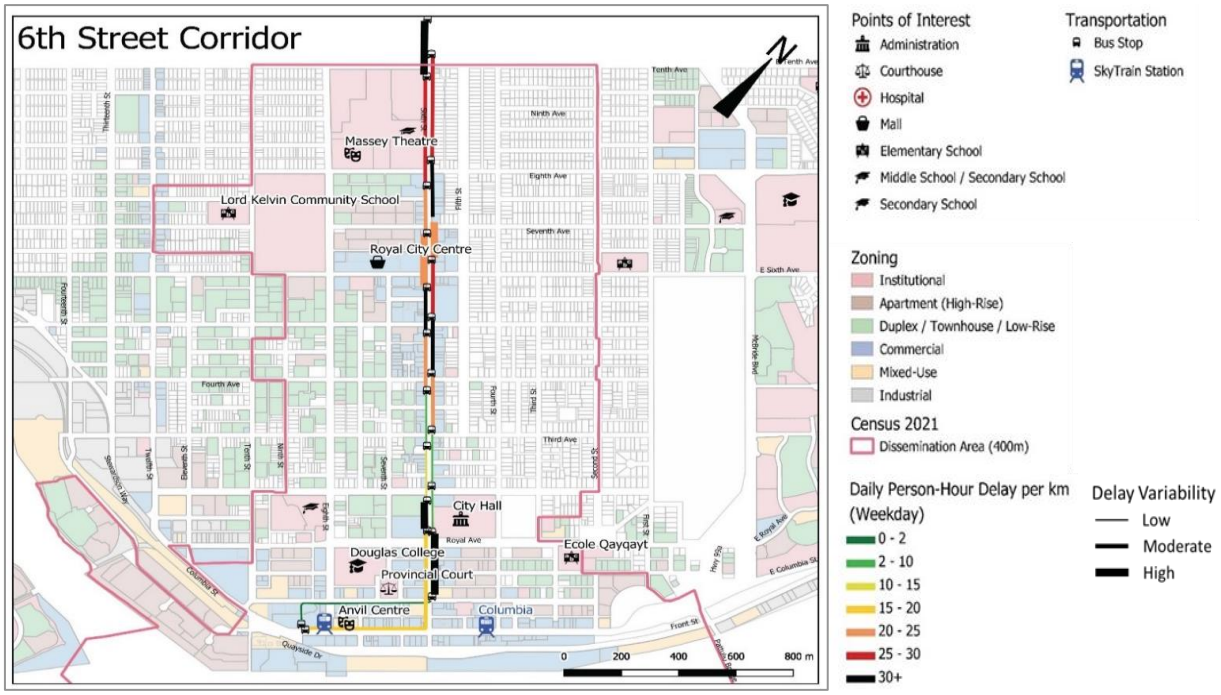


Transit Services
▪ In the AM peak, 42 buses from 9 routes connect to the station per hour. ▪ One-way loop exchange design and one-direction entrance from the west (eastbound along 7th Avenue). ▪ Of the routes connecting to 22nd Street Station, 5 are intra-regional routes connecting New Westminster with Metro Vancouver, 2 serve both local and regional needs (101 and 104) and 2 (128 and 155) are local routes.
Context
▪ Topography: Elevation slopes downwards towards the river, with 7th and 6th Avenue being level, while 12th Street features a significant slope. ▪ Cycling network: Nearby greenways and bike paths include the BC Parkway, the Crosstown Greenway and bike path connections on the Queensborough Bridge. ▪ ROW: Limited right-of-way on 20th Street and 7th Avenue.
Observations
▪ Delay and variability are greatest northbound on the Queensborough Bridge including entrance to 22nd Street Station via 23rd Street and 7th Avenue. ▪ Delay and variability are also significant along westbound 6th Avenue east of 22nd Street Station.

Quick Facts (average weekday)		Rank
Corridor Length	5.4 km	
Routes	100, 101, 104, 128, 155, 340, 388, 410, 418	
Passenger-Hours of Delay	197	1
Bus-Hours of Delay	7.8	2
Average Speed (km/h)	26.4	10
Boardings / Alighting	10,145 / 9,522	1
Total Ridership *(All bus routes on corridor)*	14,891	2
Walkshed Characteristics (400m)		**Rank**
Total Population	10,092	11
Population Density	3,584	12
Indigenous Identity	240	10
Visible Minority	7,085	8
Population Without Knowledge of Either Official Language	445	8
Low Income Households	535	10
One-Parent Families	375	10
Young Children Population	470	11
Senior Citizen Population	1,275	10

Areas of Inquiry	
Save a Bus	Route 100 operating along SE Marine Drive connecting to Marpole only has two bus stops within New Westminster and it is one of three routes that has a promising ability to save a bus by reducing travel times by 6-8 minutes in the peak period. Route 104 and route 410 also present opportunity to save a bus.
Queensborough Exit / 7th Avenue Station Entrance	Given that variability is also high, northbound Queensborough delay may be restricted to certain times of day.
6th Avenue	WB approach to 20th Street high variability and delay.
RapidBus / BRT	RapidBus and/or BRT service planned for Marine Drive connecting to 22nd Street Station.
Station Capacity	Given the number of routes and buses serving 22nd Street Station, is the station exceeding its capacity, resulting in delay due to waiting for a bus bay to become available?
Equity, Diversity & Inclusion	Low impact on EDI metrics for the 400m walkshed, however, 22nd Street Station is a regional hub with routes directly connecting one-third of the region's municipalities (New Westminster to Vancouver, Richmond, Surrey, Delta, Burnaby, and Township of Langley). EDI metrics are not included for areas beyond New Westminster. EDI metrics shown here reflect a fraction of the population impacted by operations at this transit exchange. A more robust EDI evaluation is necessary to better understand ridership demographics.

6TH STREET CORRIDOR

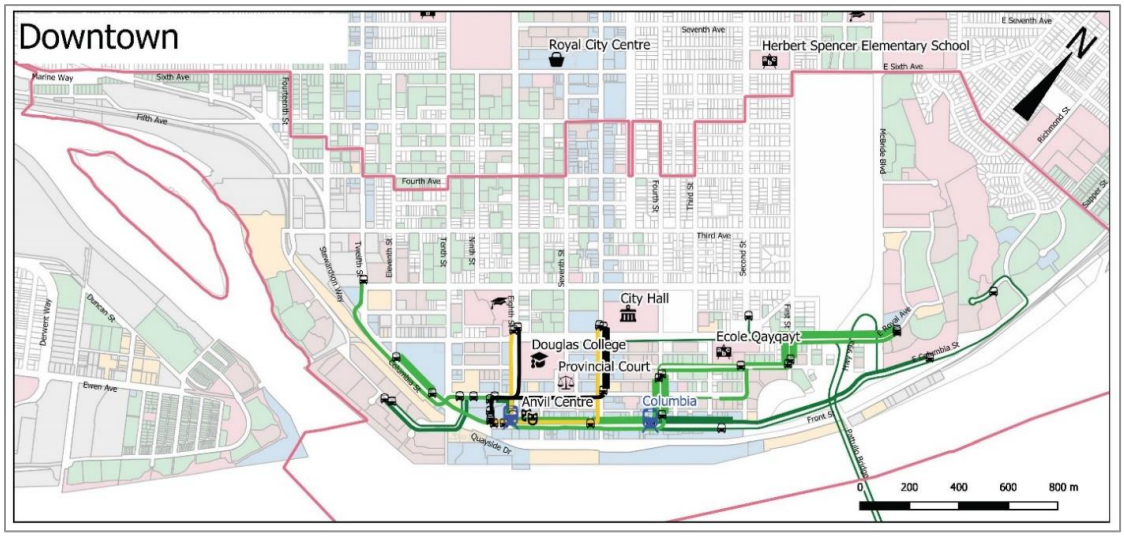


Transit Services
▪ 9 buses per hour in peak periods. ▪ Route 106 operates the entire length of the corridor from New Westminster SkyTrain Station to Edmonds Station in Burnaby: 6 buses/hour in peak and 4 buses/hour mid-day. ▪ Route 101 operates north of 6th Avenue as part of its route between 22nd Street Station and Lougheed Station: 3 buses/hour in peak and 2buses/hour off-peak. ▪ One of two FTN corridors in New Westminster. ▪ Route N19 operates the entire length of the corridor, as part of its route replacing SkyTrain service overnight between Waterfront Station and Surrey Central Station.
Context
▪ Topography: Steep grade / incline between Front Street and 4th Avenue. ▪ Cycling network: Sixth Street Cycling Connector provides a link between New Westminster Secondary School north of 8th Avenue and the Rotary Crosstown Greenway on 7th Avenue; cycling on sidewalk prohibited.
Observations
▪ Delay and variability is extensive throughout the corridor, with the exception of 3rd Avenue and Queens Avenue intersections.

Quick Facts (average weekday)		Rank
Corridor Length	3.3 km	
Routes	101, 106, N19	
Passenger-Hours of Delay	146	2
Bus-Hours of Delay	7.7	3
Average Speed (km/h)	18.9	2
Boardings / Alightings	4,775 / 4,550	3
Total Ridership *(All bus routes on corridor)*	10,350	3
Walkshed Characteristics (400m)		**Rank**
Total Population	29,496	2
Population Density	15,668	1
Indigenous Identity	905	2
Visible Minority	12,005	2
Population Without Knowledge of Either Official Language	810	2
Low Income Households	2,545	1
One-Parent Families	1,015	4
Young Children Population	1,200	3
Senior Citizen Population	5,140	4

Areas of Inquiry	
Route 106 – Save a Bus	Opportunity to save a bus on Route 106 in the peak period.
Delay & Reliability	High ranking across all performance metrics including passenger-hours of delay, ridership, and speed. Ridership on Route 106 is the greatest out of all routes and route segments included in this analysis (only ridership within the city is included).
Royal Avenue Intersection	NB and SB high degrees of delay.
Station Capacity	Improved operations at New Westminster Station will impact routes 106 and N19.
North of 3rd / 4th Avenue	Consistent delay north of 4th Avenue.
RapidBus / BRT	Part of the Major Transit Network – designated on the Frequent Transit Network.
Equity, Diversity & Inclusion	Overall high ranking across all metrics – improvements likely to positively impact equity-seeking groups (namely low-income households, visible minorities, and populations without knowledge of either official language). Service area with greatest population density.

DOWNTOWN

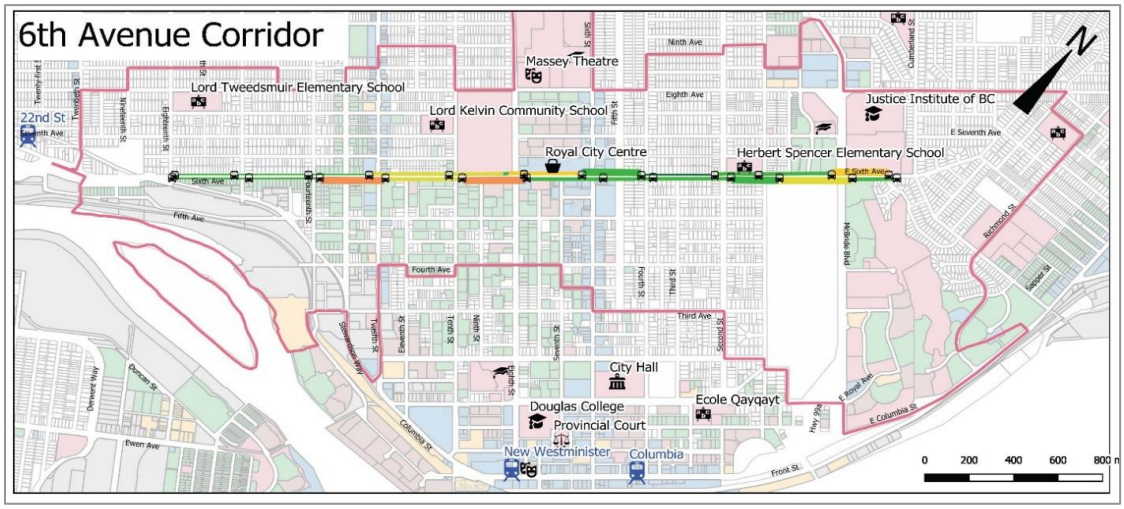


Transit Services
▪ In the peak, 24 buses connect to the station per hour. ▪ 6 bus routes operate in this area. 5 serve local demand and 3 of those also connect to SkyTrain stations in Burnaby. ▪ 10 bus bays along Carnarvon Steet, 8th Street, Columbia Street and underneath the station.
Context
▪ Topography: Steep inclines on all north-south streets. ▪ Cycling network: Central Valley Greenway and Brunette-Fraser Regional Greenway runs along Columbia Street between Begbie Street to east of the Pattullo Bridge. ▪ ROW: Constrained along Columbia Street, Carnarvon Street, 8th Street, and 6th Street.
Observations
▪ High degree of delay and moderate variability at New Westminster Station access and egress. ▪ Moderate and high degrees of variability on E Columbia Street, and E Royal Avenue westbound to First Street. ▪ Delay greatest on 8th and 6th Street, northbound is worse than southbound. ▪ Top 3 ranking in EDI metrics - improvements have potential to have a greater impact on addressing populations with greater need.

Quick Facts (average weekday)		Rank
Corridor Length	7.8 km	
Routes	102, 103, 105, 106, 109, 112, 123, 321	
Passenger-Hours of Delay	119	3
Bus-Hours of Delay	10.5	1
Average Speed (km/h)	18.4	1
Boardings / Alighting	4,486 / 4,905	2
Total Ridership *(All bus routes on corridor)*	17,854	1
Walkshed Characteristics (400m)		**Rank**
Total Population	31,832	1
Population Density	13,098	3
Indigenous Identity	915	3
Visible Minority	12,710	1
Population Without Knowledge of Either Official Language	665	5
Low Income Households	2,370	2
One-Parent Families	1,150	1
Young Children Population	1,380	1
Senior Citizen Population	5,195	3

Areas of Inquiry	
Bus Delay	Focus area with the highest number of bus hours of delay. Northbound 6th and 8th Street have more delay than southbound, but both directions warrant further investigation. Given that this area terminates at Royal Avenue to the north – consult the 6th and 8th Street corridors to determine if the delay extends north of Royal Avenue.
Carnarvon	EB exit from station: LT onto 6th and 8th Street show significant delay.
Station Access (Front Street)	Look into specific causes of delay – station capacity, signals, queueing / congestion, etc.
RapidBus	Future RapidBus planned for Canada Way / 8th Street connecting New Westminster Station to Brentwood (Route 123). Future BRT service planned for King George Blvd – which Route 321 currently operates along, terminating at New Westminster Station in the north. Future BRT is not planned to extend into New Westminster.

6TH AVENUE CORRIDOR



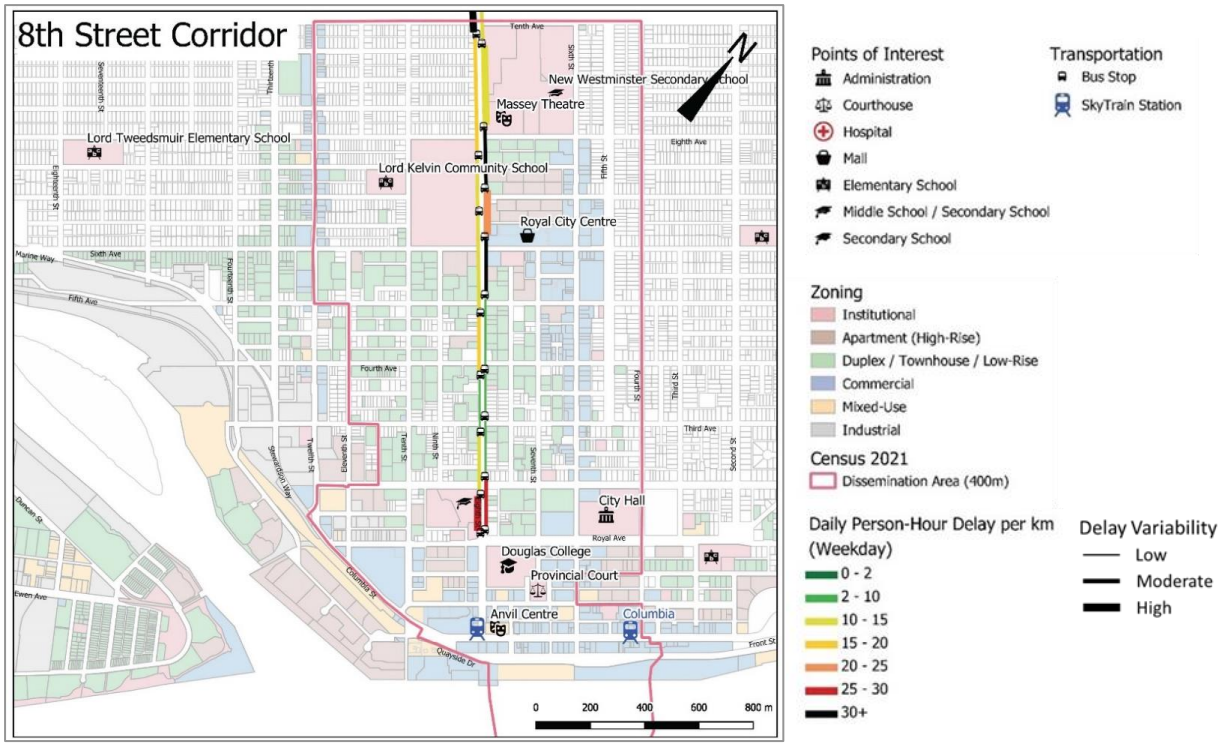


Transit Services
▪ 8 buses per hour operate along 6th Avenue in peak periods. ▪ Route 101 serves 6th Avenue between 22nd Street Station and 6th Street. 3 buses per hour in peak periods and 2 buses per hour mid-day. ▪ Route 105 serves the eastern end of the corridor between 2nd Street and Cumberland Street with 2 buses per hour. ▪ Route 155 provides a direct connection to Braid Station along 6th Avenue, operating 3 buses per hour in the peak and 2 buses per hour mid-day.
Context
▪ Topography: Generally flat with slight down grade heading westbound. ▪ Cycling network: No on-street cycling infrastructure present.
Observations
▪ Variability is greatest eastbound at McBride Blvd, 8th Street and 12th Street. ▪ Delay greatest eastbound at 8th Street all the way to 14th Street. ▪ Delay greatest westbound McBride Blvd and 8th Street.

Quick Facts (average weekday)		Rank
Corridor Length	3.3 km	
Routes	101, 105, 155	
Passenger-Hours of Delay	86	4
Bus-Hours of Delay	5.4	4
Average Speed (km/h)	22.4	5
Boardings / Alightings	1,952 / 2,098	7
Total Ridership *(All bus routes on corridor)*	5,893	6
Total Population	28,702	3
Population Density	10,720	5
Indigenous Identity	1,045	1
Visible Minority	11,740	3
Population Without Knowledge of Either Official Language	770	3
Low Income Households	2,085	4
One-Parent Families	1,145	2
Young Children Population	1,245	2
Senior Citizen Population	5,850	1

Areas of Inquiry	
McBride Intersection	Delay in both directions – westbound is worse.
8th Street Intersection	Delay in both directions – eastbound is worse.
12th Street Intersection	Delay in both directions – eastbound is worse.
Equity, Diversity & Inclusion	Routes serve both local and regional markets. Overall high ranking in all criteria, namely seniors, families with young children, single parent households, visible minorities, and population without knowledge of either official language.

8TH STREET CORRIDOR



Transit Services
▪ Six buses per hour operate along 8th Street in peak periods. ▪ Route 123 operates the entire length of the corridor from New Westminster Station to Brentwood Station in Burnaby. ▪ Route 123 has a frequency of 6 buses per hour in peak and 4 buses per hour mid-day. ▪ Route 105 operates a 2-block section between 6th Avenue and 8th Avenue as part of its northwestern terminus loop. ▪ One of two corridors that comprise the New Westminster FTN connecting downtown to uptown.
Context
▪ Topography: Steep grade / incline between Front Street and 4th Avenue. ▪ Cycling network: Not a part of the designated cycling network. Planned bus lanes from Royal Ave to Columbia St.
Observations
▪ Variability is greatest near schools. ▪ Delay greatest northbound between 10th Avenue and 5th Avenue with increased delay at 8th and 6th Avenue intersections. ▪ Delay southbound is an issue nearly the entire length of the corridor, with multi-block delay leading up to the NW Station, Royal Avenue, 4th Avenue and 8th Avenue.

Quick Facts (average weekday)		Rank
Corridor Length	1.9 km	
Routes	105, 123	
Passenger-Hours of Delay	77	5
Bus-Hours of Delay	3.5	7
Average Speed (km/h)	22.0	3
Boardings / Alightings	1,719 / 2,415	6
Total Ridership *(All bus routes on corridor)*	4,975	7
Walkshed Characteristics (400m)		**Rank**
Total Population	25,772	5
Population Density	14,582	2
Indigenous Identity	905	4.5
Visible Minority	11,160	5
Population Without Knowledge of Either Official Language	835	1
Low Income Households	2,365	3
One-Parent Families	970	5
Young Children Population	1,105	4.5
Senior Citizen Population	4,330	5

Areas of Inquiry	
Opportunities to Save a Bus	Route 123
Major Transit Network (RapidBus / BRT)	One of two FTN corridors in New Westminster. Future RapidBus planned for Canada Way / 6th Street connecting New Westminster Station to Brentwood (Route 123). Potential for corridor-long treatment
Station Access	22nd St Station access/egress to be reviewed.
Southbound Royal Avenue Intersection	High degree of delay and variability.
8th Avenue Intersection northbound and southbound	Look into 8th Avenue intersection operations. Severe delay northbound starting at 8th Avenue, lingering all the way to 6th Avenue. Southbound extreme delay at 8th Avenue also.
6th Avenue Intersection northbound	High degree of delay.
Queens Avenue Intersection northbound	High degree of delay.
4th Avenue Intersection southbound	Moderate degree of delay.
Equity, Diversity & Inclusion	Walkshed population includes a high degree of low-income households, persons without knowledge of either official language, and is relatively densely populated. Functions as both a primary local route and a regional connector, increasing ability to advance social equity (addressing systemic injustices and disadvantaged populations and economic inequality).

EWEN AVENUE & QUEENSBOROUGH CONNECTOR CORRIDOR



Points of Interest
- Administration
- Courthouse
- Hospital
- Mall
- Elementary School
- Middle School / Secondary School
- Secondary School

Transportation
- Bus Stop
- SkyTrain Station

Zoning
- Institutional
- Apartment (High-Rise)
- Duplex / Townhouse / Low-Rise
- Commercial
- Mixed-Use
- Industrial

Census 2021
- Dissemination Area (400m)

Daily Person-Hour Delay per km (Weekday)
- 0 - 2
- 2 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30+

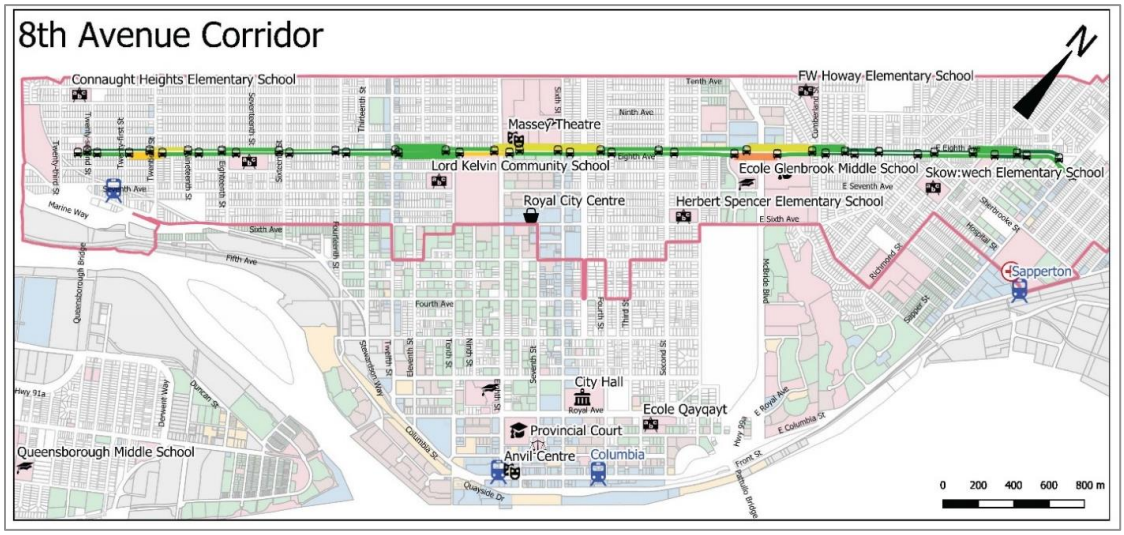
Delay Variability
- Low
- Moderate
- High

Transit Services
▪ Route 104 serves local and regional markets connecting the 22nd Street Station and then south to Delta Annacis Island. ▪ Route 410 is an east-west regional connector from 22nd Street Station to Richmond-Brighouse Station.
Context
▪ Topography: No significant elevation changes. ▪ Cycling network: Overlaps with the Ewen Avenue Greenway on Ewen Avenue, the Boyd Street Trail on Derwent Way, and the Boundary Trail on Boundary Road. ▪ ROW: No significant right-of-way constraints along route.
Observations
▪ Delay and variability are greatest left turn onto Howes Street / Queensborough Bridge approach and left turn approach to Ewen Avenue from Boundary Road. ▪ Delay and variability are also substantial in the WB approach to Howes Street. ▪ Passenger-hours of delay is moderate-opportunity to improve passenger experience.

Quick Facts (average weekday)		Rank
Corridor Length	4.7 km	
Routes	104, 410	
Passenger-Hours of Delay	70	6
Bus-Hours of Delay	2.8	8
Average Speed (km/h)	27.5	12
Boardings / Alighting	1,892 / 2,261	5
Total Ridership *(All bus routes on corridor)*	6,887	5
Walkshed Characteristics (400m)		**Rank**
Total Population	10,983	10
Population Density	3,935	11
Indigenous Identity	120	12
Visible Minority	8,315	7
Population Without Knowledge of Either Official Language	600	7
Low Income Households	495	11
One-Parent Families	345	11
Young Children Population	670	9
Senior Citizen Population	1,100	11

Areas of Inquiry	
Queensborough Bridge Approach	Approach from both directions.
EB Boundary Rd / Ewen Ave	Left-turn movement.
Howes St and Ewen Ave	South-east bound left-turn.
Equity, Diversity & Inclusion	Relatively low impact on equity-seeking populations in the surrounding area, however regional routes operate along this corridor increasing the opportunity to have a positive impact.

8TH AVENUE CORRIDOR



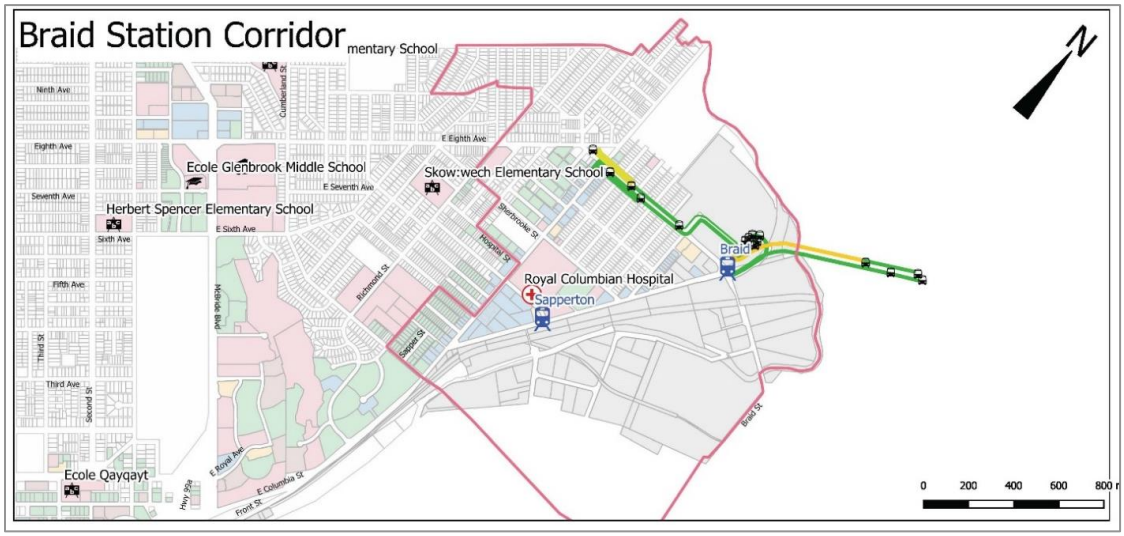


Transit Services
▪ 5-7 buses per hour operate along 8th Avenue in peak periods. ▪ Route 105 operates on portions of the corridor between 8th Street and Cumberland Street with a frequency of 2 buses per hour. ▪ Route 128 operates along the length of the corridor, running between 22nd Street Station and Braid Station. Peak period service frequency is 5 buses per hour, and off-peak service is 3 buses per hour.
Context
▪ Topography: Significant grades at the east end of the corridor, from Braid Street to beyond Richmond Street. ▪ Cycling network: Not a part of the designated cycling network.
Observations
▪ Relatively satisfactory performance. Average speed is quite high, but delay metrics are in the middle, revealing opportunity to realize improvements. ▪ Variability is present WB approach to 12th Street, 8th Street, and McBride Boulevard, and EB approach to McBride Boulevard, 10th Street and 12th Street. ▪ Delay is primarily present on the approach links (in both directions) to 20th Street, 8th Street and McBride Boulevard.

Quick Facts (average weekday)		Rank
Corridor Length	5.6 km	
Routes	105, 128	
Passenger-Hours of Delay	63	7
Bus-Hours of Delay	5.1	5
Average Speed (km/h)	26.4	11
Boardings / Alighting	1,592 / 1,843	9
Total Ridership *(All bus routes on corridor)*	3,347	9
Walkshed Characteristics (400m)		**Rank**
Total Population	27,358	4
Population Density	7,316	7
Indigenous Identity	905	4.5
Visible Minority	11,585	4
Population Without Knowledge of Either Official Language	700	4
Low Income Households	1,685	6
One-Parent Families	1,045	3
Young Children Population	1,105	4.5
Senior Citizen Population	5,255	2

Areas of Inquiry	
12th -10th Street Variability	Not a cause of delay, but worth investigation into causes of variability.
22nd St Station	Route 128 terminates at 22nd Street Station – opportunities for improvement will be analyzed through that focus area.
Bus Stop Balancing	Bus stops appear to be very close together at western end of corridor.
20th Street	EB delay and variability.
8th Street	EB and WB delay, although WB is more significant.
McBride Blvd	Variability significant in both directions, WB delay also significant.
Equity, Diversity & Inclusion	Relatively high population of seniors, one-parent families, visible minorities and persons without knowledge of either official language. Consider topography impacts given high proportion of seniors (and those over 85 years of age).

BRAID STATION



Points of Interest
- Administration
- Courthouse
- Hospital
- Mall
- Elementary School
- Middle School / Secondary School
- Secondary School

Transportation
- Bus Stop
- SkyTrain Station

Zoning
- Institutional
- Apartment (High-Rise)
- Duplex / Townhouse / Low-Rise
- Commercial
- Mixed-Use
- Industrial

Census 2021
- Dissemination Area (400m)

Daily Person-Hour Delay per km (Weekday)
- 0 - 2
- 2 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30+

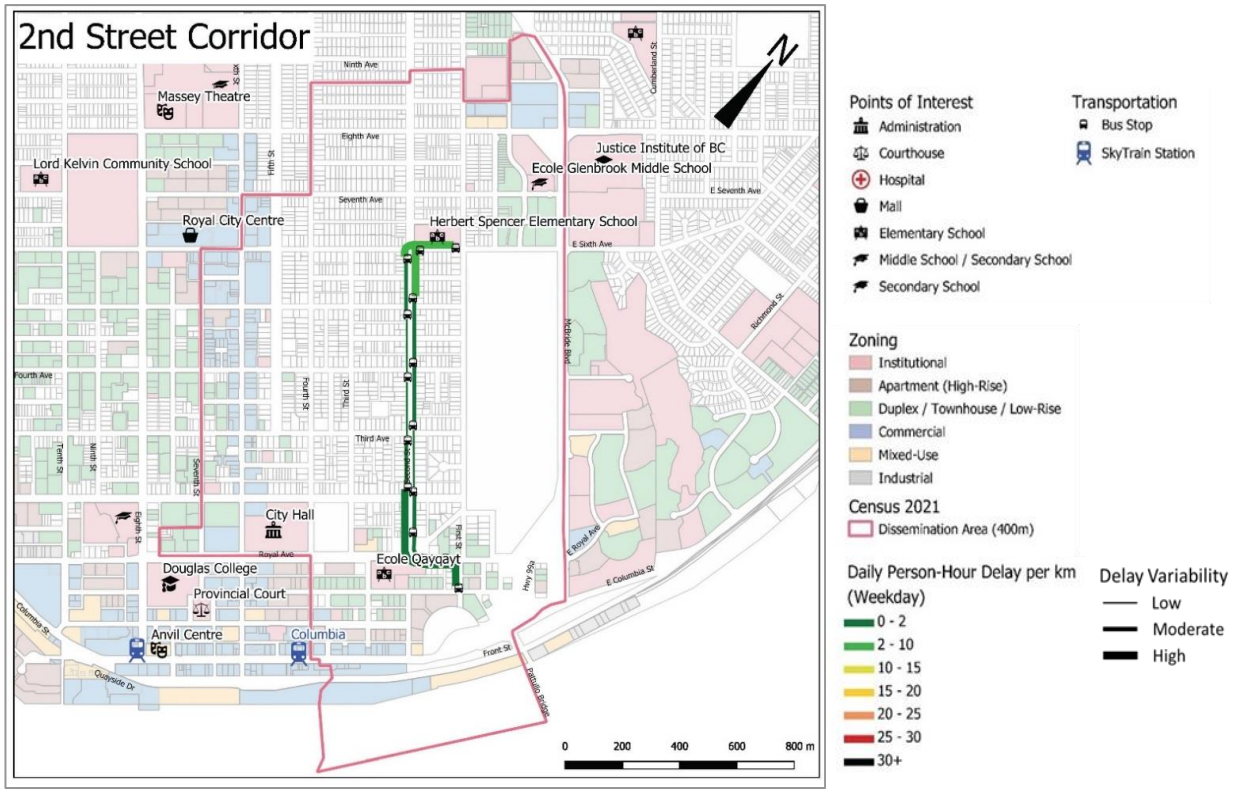
Delay Variability
- Low
- Moderate
- High

Transit Services
▪ In the peak, 21 buses connect to the station per hour. ▪ One-way loop transit exchange design with 6 saw-tooth bays. ▪ 7 routes terminate at Braid Station. 2 are local routes (128 and 155 both of which also connect to 22nd Street Station) and 5 are regional routes connecting Coquitlam, Port Coquitlam, Maple Ridge and Pitt Meadows.
Context
▪ Topography: Moderate grades on Braid Street between Fader St and Brunette Ave ▪ Cycling network: Features connections to the Brunette-Fraser Regional Greenway, which connects to the Central Valley and Crosstown Greenways to the west. ▪ Station area characteristics not reflective of the demographic of impacted riders.
Observations
▪ Variability is greatest east of E Columbia Street on Braid Street ▪ Delay is greatest westbound on Brunette Avenue approaching Braid Street.

Quick Facts (average weekday)		Rank
Corridor Length	1.8 km	
Routes	128, 153, 155, 156, 159, 169, 791	
Passenger-Hours of Delay	49	8
Bus-Hours of Delay	3.7	6
Average Speed (km/h)	22.8	7
Boardings / Alighting	3,272 / 2,708	4
Total Ridership *(All bus routes on corridor)*	8,055	4
Walkshed Characteristics (400m)		**Rank**
Total Population	6,300	12
Population Density	4,657	10
Indigenous Identity	175	11
Visible Minority	2,570	12
Population Without Knowledge of Either Official Language	100	12
Low Income Households	345	12
One-Parent Families	240	12
Young Children Population	310	12
Senior Citizen Population	840	12

Areas of Inquiry	
Rail	Potential to improve variability in westbound approach to Cumberland Road
Braid Street and Brunette Avenue Intersection	Local equity metrics indicate little ability to positively impact equity-seeking groups, but it also provides regional connections.
Braid Street and E Columbia Street Intersection	High degree of variability and moderate delay westbound.

2ND STREET CORRIDOR

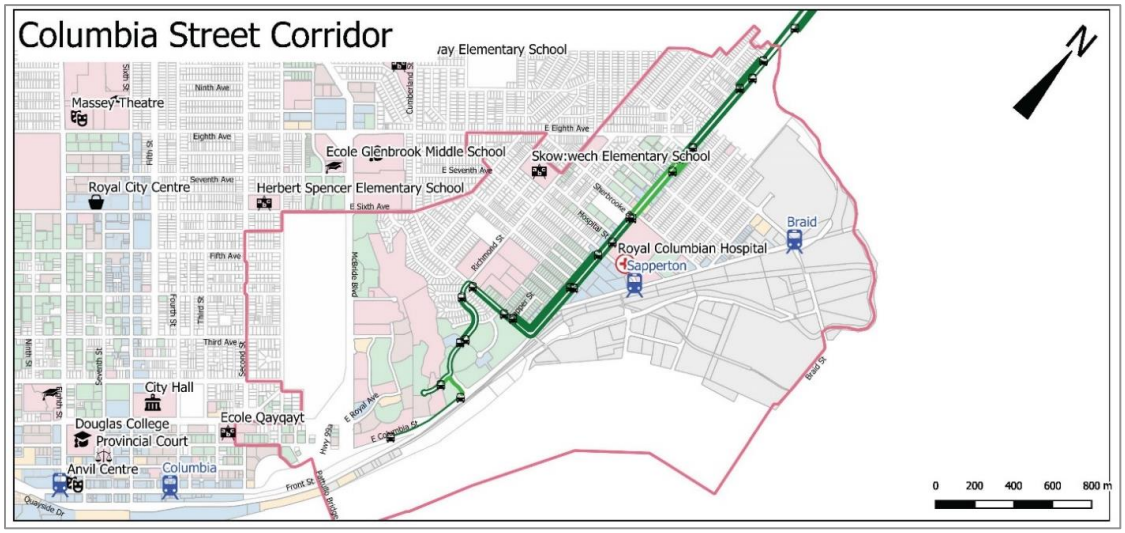


Transit Services
▪ 2 buses per hour operate along this segment all day. ▪ Route 105 is a local route connecting New Westminster Station to Uptown.
Context
▪ Topography: Slopes downward in southeastern direction between Third Avenue and Royal Avenue. ▪ Cycling network: Not a part of the designated cycling network; cycling on sidewalk prohibited. ▪ ROW: 2nd Street right-of-way includes green space boulevards, a central greenspace median, and on-street parking and is therefore unconstrained.
Observations
▪ Variability is greatest at the approach to 6th Avenue in both directions, and in the southbound approach to Royal Avenue. ▪ This corridor operates relatively well and has little delay (0.6 bus hours of delay per day).

Quick Facts (average weekday)		Rank
Corridor Length	1.5 km	
Routes	105	
Passenger-Hours of Delay	4	12
Bus-Hours of Delay	0.6	12
Average Speed (km/h)	22.5	6
Boardings / Alightings	47 / 92	12
Total Ridership *(All bus routes on corridor)*	754	11
Walkshed Characteristics (400m)		**Rank**
Total Population	12,048	9
Population Density	7,731	6
Indigenous Identity	370	9
Visible Minority	4,095	11
Population Without Knowledge of Either Official Language	250	10
Low Income Households	945	7
One-Parent Families	415	9
Young Children Population	475	10
Senior Citizen Population	2,180	9

Areas of Inquiry	
Equity, Diversity & Inclusion	Low impact on equity-seeking populations included in this analysis.

COLUMBIA STREET CORRIDOR

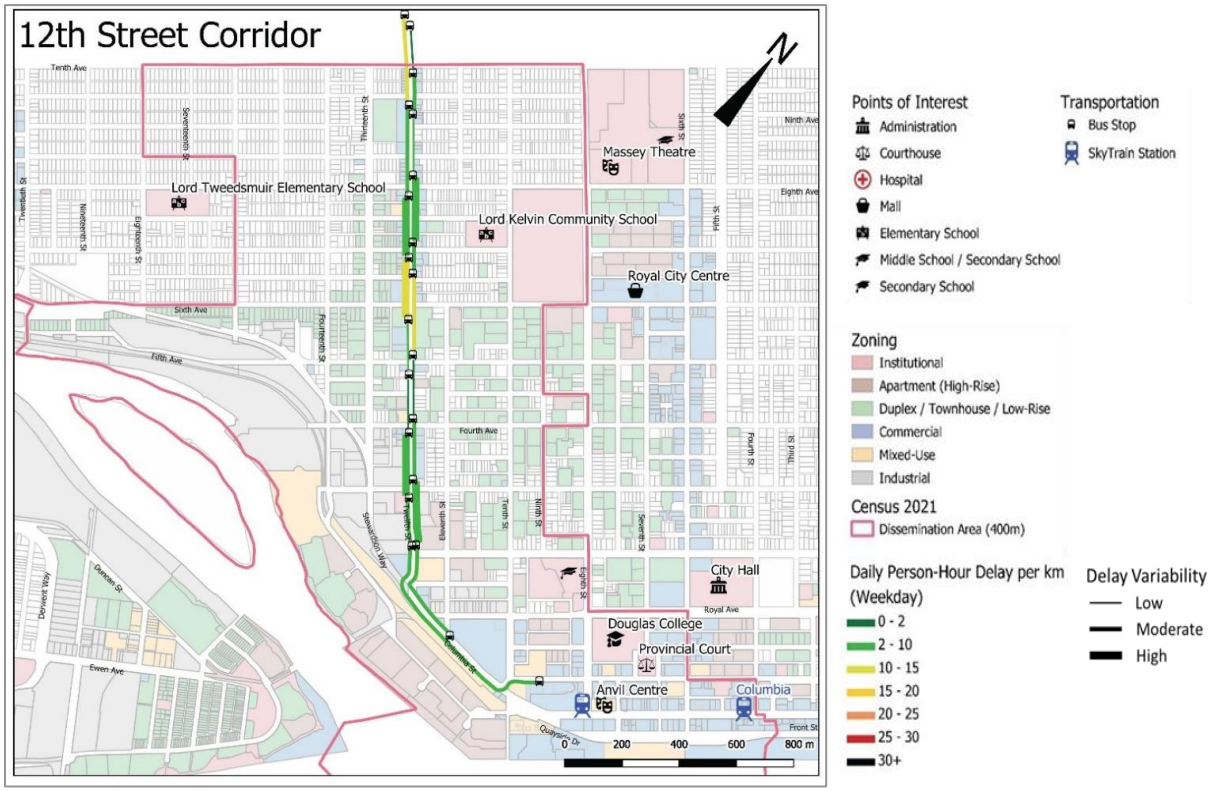


Transit Services
▪ Route 109 has a frequency of 2 buses per hour in the peak and 1 bus per hour in the off-peak. ▪ Local and regional route connecting New Westminster Station to Lougheed Town Centre Station. ▪ Route 155 also operates along a short segment of Columbia Street between Hospital Street and Braid Street.
Context
▪ Cycling network: Connections to the Central Valley Greenway which overlaps on Columbia Street between Brunette Avenue and Sherbrooke Street, as well as on Cumberland Street between Columbia Street and Sapper Street. ▪ ROW: Mostly constrained along Columbia Street north of Cumberland Street, although there are some areas where on-street parking can be repurposed.
Observations
▪ Variability is greatest on the westbound approach to Cumberland Street. ▪ Variability is also present at the northbound approach to Braid Street. ▪ Very little delay on this corridor.

Quick Facts (average weekday)		Rank
Corridor Length	3.6 km	
Routes	102, 105, 109	
Passenger-Hours of Delay	7	11
Bus-Hours of Delay	1.9	11
Average Speed (km/h)	23.6	9
Boardings / Alighting	165 / 176	11
Total Ridership *(All bus routes on corridor)*	256	12
Walkshed Characteristics (400m)		**Rank**
Total Population	14,861	8
Population Density	6,024	8
Indigenous Identity	385	8
Visible Minority	5,590	10
Population Without Knowledge of Either Official Language	245	11
Low Income Households	770	9
One-Parent Families	575	8
Young Children Population	710	8
Senior Citizen Population	2,665	8

Areas of Inquiry	
Variability at Cumberland Road	Potential to improve variability in westbound approach to Cumberland Street.
Equity, Diversity & Inclusion	Local equity metrics indicate little ability to positively impact equity-seeking groups, but it also provides regional connections.

12TH STREET CORRIDOR

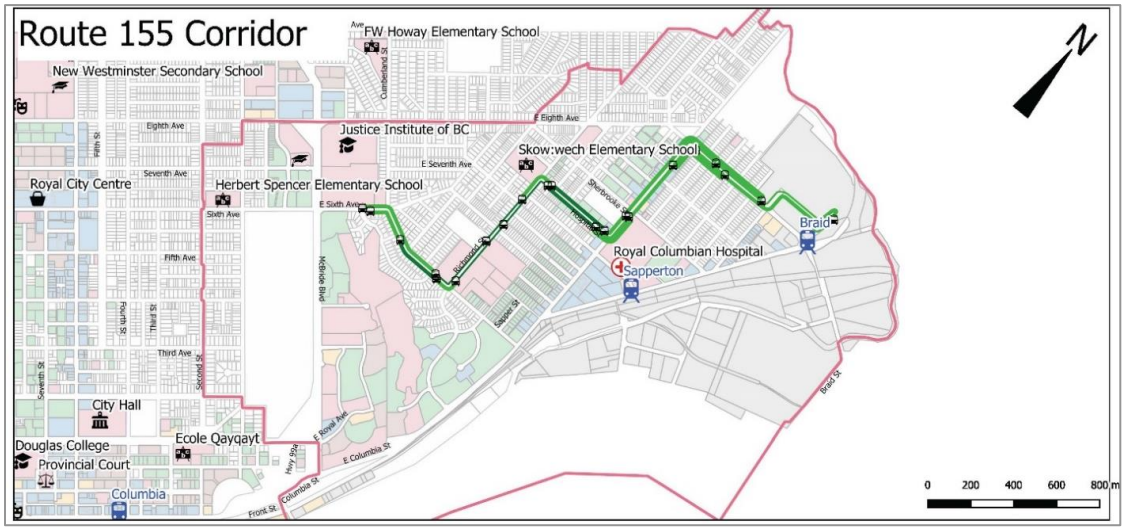


Transit Services
▪ Route 112 has a frequency of 4 trips per hour all day. ▪ Route 112 serves the local and regional markets by connecting New Westminster Station with Edmonds Station in Burnaby and operating along 12th Street.
Context
▪ Topography: Increasing slope northwest of 3rd Avenue on 12th Street. Most significant slope occurs between 3rd Avenue and 6th Avenue. ▪ Cycling network: No cycling infrastructure on 12th Street. ▪ ROW: Limited available right-of-way along Twelfth Street. Potential modifications may impact either on-street parking, sidewalks, or properties.
Observations
▪ Relatively good performance along the entire corridor. ▪ Variability is greatest along Queens Avenue in both directions, southbound between 6th Avenue and 8th Avenue, and northbound approach to 8th Avenue. ▪ Delay is greatest at SB approach to London Avenue, 6th Avenue intersection in both directions, northbound approach to 7th Avenue.

Quick Facts (average weekday)		Rank
Corridor Length	2.5 km	
Routes	112	
Passenger-Hours of Delay	31	9
Bus-Hours of Delay	2.8	9
Average Speed (km/h)	22.1	4
Boardings / Alighting	2,002 / 1,782	8
Total Ridership *(All bus routes on corridor)*	3,816	8
Walkshed Characteristics (400m)		**Rank**
Total Population	24,173	6
Population Density	12,711	4
Indigenous Identity	840	6
Visible Minority	10,960	6
Population Without Knowledge of Either Official Language	605	6
Low Income Households	1,815	5
One-Parent Families	955	6
Young Children Population	1,015	6
Senior Citizen Population	3,465	6

Areas of Inquiry	
6th Avenue	Moderate delay experience in the northbound and southbound approach to 6th Avenue.
Equity, Diversity & Inclusion	Moderate ability to positively impact equity-seeking groups within the 400m walkshed. Regional connection increases the impact potential.

ROUTE 155 CORRIDOR



Transit Services
▪ Route 155 has a frequency of 3 buses per hour in the peak and 2 buses per hour mid-day.
Context
▪ Topography: Primarily level on Cumberland Street, Richmond Street, and Columbia Street. Downwards slopes to the east on Hospital Street and Braid Street, with significant grades. ▪ Cycling network: Both Cumberland Street and Richmond Street are classified as Bike Routes. The segment of Columbia Street between Hospital Street and Sherbrooke Street is part of the Central Valley Greenway. ▪ ROW: Cumberland Street, Richmond Street, and Hospital Street all have some available right-of-way, while Columbia Street has some adaptability with regards to on-street parking. Braid Street is constrained with a full four-lane cross section.
Observations
▪ This route segment that performs relatively well compared to the other focus areas in New Westminster. ▪ Variability is greatest Braid Street approaching E Columbia Street, and Hospital Street / Columbia Street intersections.

Quick Facts (average weekday)		Rank
Corridor Length	3.2 km	
Routes	155	
Passenger-Hours of Delay	22	11
Bus-Hours of Delay	2.4	11
Average Speed (km/h)	22.9	9
Boardings / Alightings	681 / 631	10
Total Ridership *(all bus routes on corridor)*	1,312	11
Walkshed Characteristics (400m)		**Rank**
Total Population	16,476	8
Population Density	5,842	10
Visible Minority	6,335	10
Population Without Knowledge of Either Official Language	270	10
Low Income Households	810	9
One-Parent Families	630	8
Young Children Population	800	8
Senior Citizen Population	2,940	8

Areas of Inquiry	
Station Access	Route 155 connects both Braid Station and 22nd Street Station – improvements at these station areas will benefit this route.
6th Avenue	Improvements made to 6th Avenue will also benefit operations of Route 155.
Equity, Diversity & Inclusion	Relatively low impact to equity-seeking groups identified.

5. Bus Speed and Reliability Project Alternatives

Transit delay reduction strategies, or bus speed and reliability improvement alternatives, are described by corridor for those areas with significant delay. For each improvement alternative, a sketch (not-to-scale) diagram and a description of the BSR treatment is contrasted to the existing condition.

5.1 Methodology

To establish transit speed and reliability improvement strategies, transit performance is first analyzed at the corridor level, looking for transit route level and multi-block patterns of delay. The corridors are ranked by severity of delay and are then reviewed to ensure that corridors with the greatest socioeconomic diversity are prioritized for potential improvements. The corridors upon which routes with the fewest minutes to be saved in order to remove a bus from service through travel time improvements are also identified. The results of the corridor prioritization process are shown in ***Table 5.1.***

TABLE 5.1: CORRIDOR PRIORITIZATION PROCESS RESULTS

	PHD	BHD	EDI PRIORITY	SAVE A BUS?
Tier 1 Corridors				
22nd Street	1	2	9.5*	#100, #410
6th Street	2	3	2.8	#106
Downtown	3	1	1.8	#106, #123
6th Avenue	4	4	2.5	
8th Street	5	7	4.5	#123
Tier 2 Corridors				
Ewen Avenue	6	8	10	#410
8th Avenue	7	5	2.8	

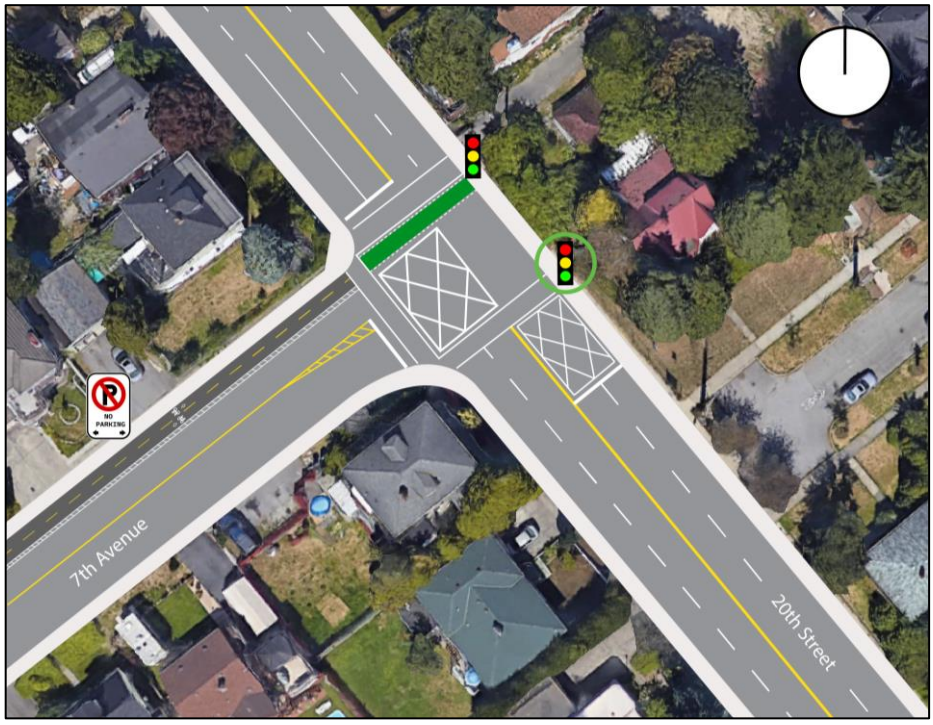
Next, a more focused analysis of each corridor is performed to identify specific intersections, blocks, and multi-block segments with the most delay. Additional land use, traffic and transit data were applied to investigate the cause(s) of delay before potential delay-reduction strategies are developed. Knowing that the outcome is an affordable five-year implementation strategy, the top 15 hot spots were initially selected for solution development. Practical solutions are not possible in all locations, and some locations had more than one potential solution. Ultimately, nineteen solutions are proposed for the top six corridors which are described in the following sections. While it did not occur, if there were not enough BSR projects to fill the five-year capital plan from the top 15 hotspots, the team would have advanced the next hot spots on the list to develop BSR treatments.

5.2 22nd Street Station Area

6TH AVENUE AT 20TH STREET

Treatment	Westbound lane capacity expansion via a new westbound left turn lane on 6th Avenue at 20th Street. The new dedicated westbound through lane shared by bus and GP traffic will function as a queue jump lane because most of the traffic is turning left.
Notes	▪ Requires elimination of on-street parking on 6th Avenue. ▪ Requires near-complete removal of the median south of the westbound 6th Avenue lanes. ▪ Requires restriping. ▪ No signal timing or curb modification required. ▪ Requires coordination and approval from BC MoTI.
Transit Delay	PHD = 20.5 BHD = 1.1
Existing Conditions	
Treated Conditions	

7TH AVENUE AT 20TH STREET

Treatment	To enable 7th Avenue eastbound buses to safely make a right-turn onto 20th Street, the northbound stop line is moved 10-15m upstream on 20th Steet. A northbound 20th Street signal is added to the nearside traffic signal post at the new stop line (which is further emphasized with no-stop hatching).
Notes	▪ Requires re-striping and signal head installation. ▪ Protected, constrained-width bi-directional bicycle facility northside of 7th Avenue identified in the ATNP for implementation in 2024 (shown in treated conditions diagram below). BSR treatments are exclusive to 20th Street and should not impact/be impacted by bike lane plans. ▪ Consider adding nearside signal in the southbound direction to discourage intersection blocking (not included in cost estimate).
Transit Delay	PHD = 95.4 BHD = 3.7
Existing Conditions	
Treated Conditions	

20TH STREET AT 6TH AND 7TH AVENUE OPTION 1

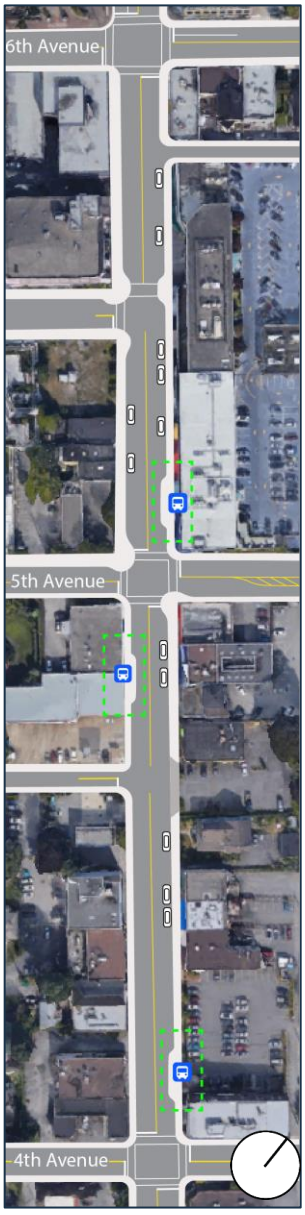
Treatment	To address southbound delay departing 22nd Street Station, coordinate signals on 20th Street at 6th Avenue and 7th Avenue to reduce southbound 20th Street delay.
Notes	▪ Signal timing changes should allow southbound queues to dissipate at 6th Avenue before 7th Avenue light turns green. ▪ Requires inter-agency collaboration with BC MoTI.
Transit Delay	PHD = 95.4 BHD = 3.7
Existing Conditions	
Treated Conditions	

20TH STREET AT 6TH AND 7TH AVENUE OPTION 2

Treatment	Dedicated bus lane running along SkyTrain ROW between 22nd Street Station and 6th Avenue to enable buses to circumvent delay westbound on 6th Avenue at 20th Street and eastbound 7th Avenue at 20th Street.
Notes	▪ Requires ~380m of paving of existing gravel road adjacent to BC Parkway. May require road base reconstruction. ▪ Contingent on redevelopment of adjacent properties. Driveway access must be prohibited. ▪ Two new bus-activated signals at 20th Street. ▪ Requires coordination with BC MoTI and TransLink. ▪ Bidirectional operation west of 20th Street and unidirectional (WB) east of 20th Street. ▪ The dedicated bus lane are a potential desire line for pedestrians and cyclists; consider active pathway adjacent to the bus lane.
Transit Delay	6th Ave PHD = 21.6 BHD = 1.2 7th Ave PHD = 95.4 BHD = 3.7
Existing Conditions	
Treated Conditions	

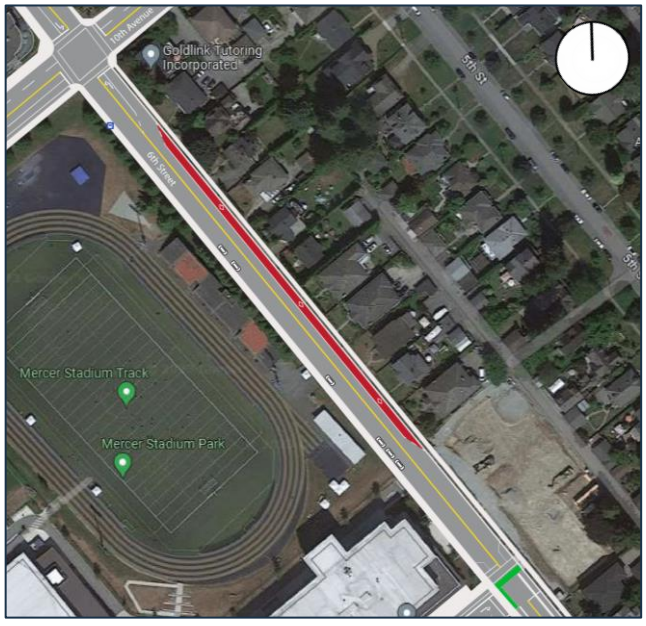
5.3 6th Street Corridor

6TH STREET: 4TH - 10TH AVENUE

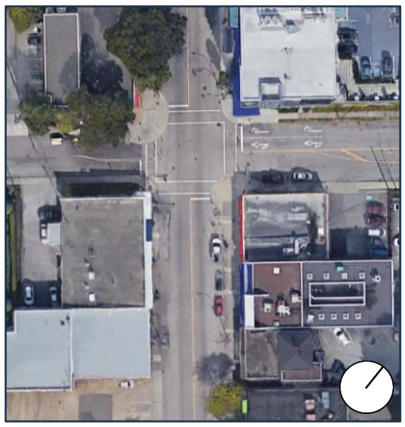
Treatment	Bi-directional bus bulges between 4th and 10th Avenue to allow for in-lane stopping, eliminating delay caused by buses waiting to merge into traffic upon departure from curbside bus stops. Intersections in bold indicate priority (highest degree of delay).
Notes	▪ Northbound bus bulges: **4th**, **5th**, **6th** Avenue (8th Avenue already has in-lane bus stop) ▪ Southbound bus bulges: **4th**, **5th**, **8th** and **10th** Avenue (6th Avenue bus stop is likely to be relocated)
Transit Delay	Northbound PHD = 18.4 Southbound PHD = 38.1 Northbound BHD = 0.9 Southbound BHD = 2.5
Existing Condition	
Treated Condition	

*Note, the images of the treated conditions above illustrate a snapshot of the proposed treatments along the corridor.

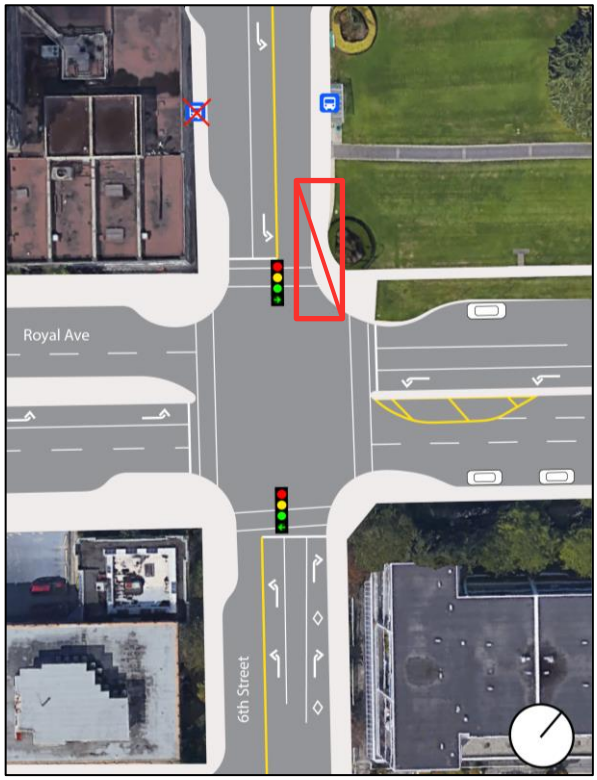
6TH STREET AT 10TH AVENUE

TREATMENT	Northbound transit approach lane on 6th Street at 10th Avenue (~150m) to enable buses to move through the intersection faster.
NOTES	▪ Potential to implement time restricted transit approach lane initially to address greater delays in the PM peak period. ▪ Requires northbound parking restrictions to accommodate the approach lane within the existing curb. ▪ Requires new lane striping and potential to paint the approach lane red if it is operational all of the time. ▪ Approach lane terminates when the northbound left turn lane begins due to spatial constraints. ▪ Must be reconciled with 2022 ATNP, which includes the extension of uni-directional protected bicycle lanes from 10th Street south to the mid-block crosswalk at New Westminster Secondary School. The ATNP notes that impacts to bus speed and reliability must be evaluated prior to implementation.
TRANSIT DELAY	PHD = 11.7 BHD = 0.8
EXISTING CONDITION	
TREATED CONDITION	

6TH STREET AT 5TH AVENUE

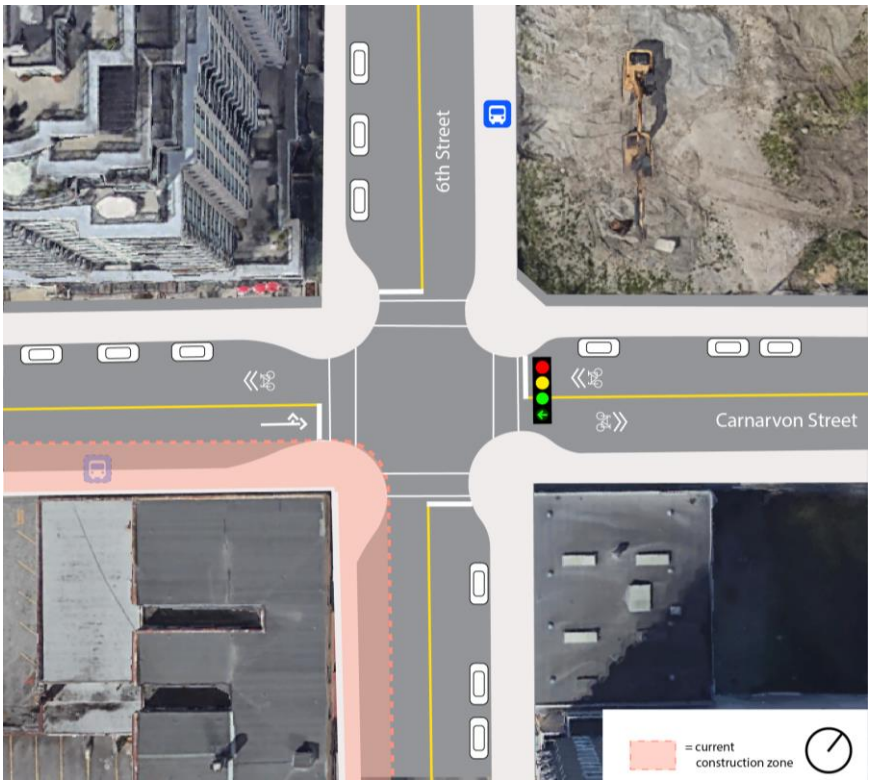
Treatment	Bi-directional queue jump lanes on 6th Street at 5th Avenue in both directions to enable transit to bypass intersection queues.
Notes	▪ Requires elimination of curb extensions (complementary to planned bike infrastructure along 5th Avenue). ▪ Can be implemented incrementally. Expanding capacity by removing the curb extension, and then adding transit priority to curb-side lanes if required. ▪ Requires parking restrictions. ▪ Requires replacement of signal to enable transit signal priority.
Transit Delay	Northbound PHD = 7.5, Southbound PHD = 5.8 Northbound BHD = 0.3, Southbound BHD = 0.3
Existing Condition	
Treated Condition	

6TH STREET AT ROYAL AVENUE

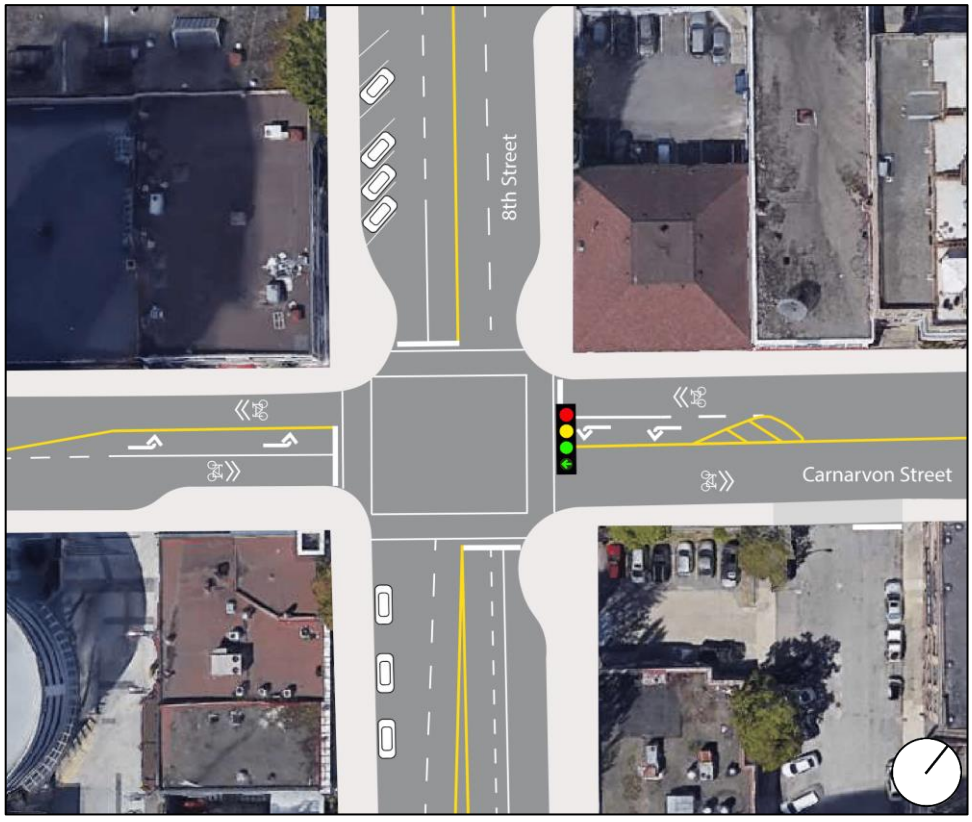
Treatment	Lead lag phasing, curb modifications and combined northbound approach right-turn lane and bus-only through lane to improve bus performance and eastbound safety.
Notes	▪ Requires full signal replacement. ▪ Requires removal of NE corner curb bulge and extension of SE corner curb into east crosswalk. ▪ Requires removal of SB bus stop at Royal Avenue.
Transit Delay	Northbound PHD = 17.4 Southbound PHD = 4.0 Northbound BHD = 0.7 Southbound BHD = 0.1
Existing Condition	
Treated Condition	

5.4 Downtown Area

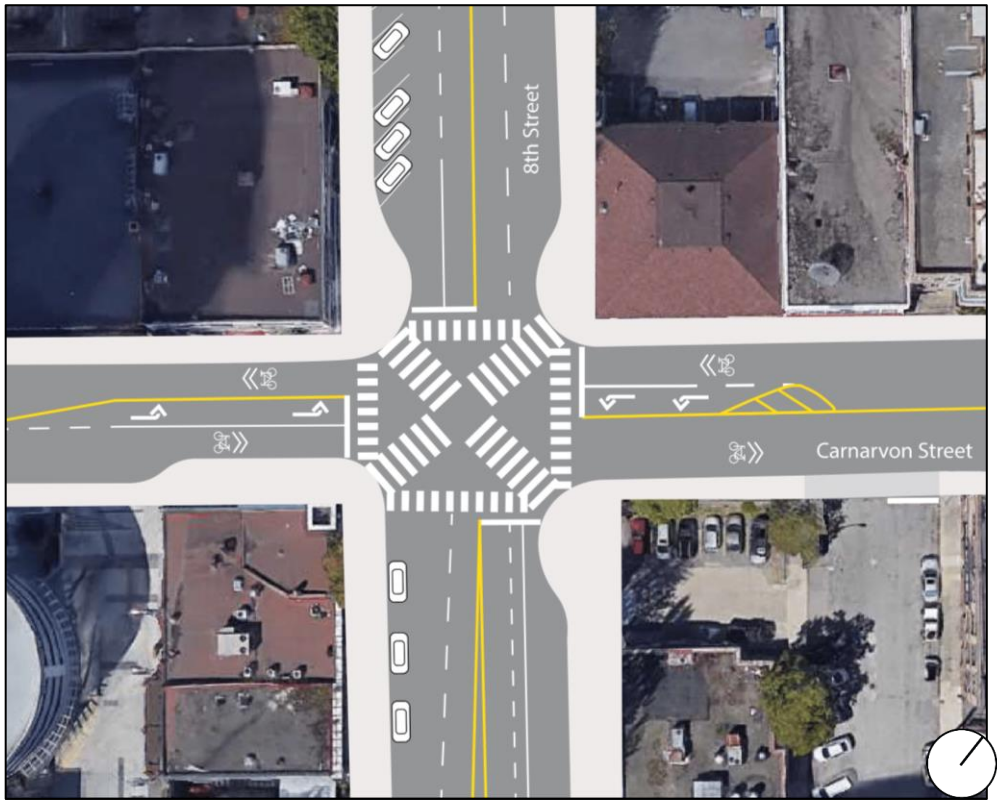
CARNARVON STREET AT 6TH STREET

Treatment	Eastbound left protected phase to enable buses to clear the intersection faster.
Notes	▪ Requires new signal head installation and re-timing (longer signal cycle or shorter phases for other movements). ▪ Requires pavement marking (directional arrow stamp).
Transit Delay	PHD = 16.4 BHD = 0.7
Existing Condition	
Treated Condition	

CARNARVON STREET AT 8TH STREET OPTION 1

TREATMENT	Eastbound left protected phase to enable buses to clear the intersection faster.
NOTES	▪ Simple, quick intervention with high value to transit. ▪ Requires new signal head installation and signal optimization. ▪ Note that unidirectional protected mobility lanes on 8th Street between Royal Avenue and Columbia Street are identified in the ATNP (2022).
TRANSIT DELAY	PHD = 42.4 BHD = 2.4
EXISTING CONDITION	
TREATED CONDITION	

CARNARVON STREET AT 8TH STREET OPTION 2

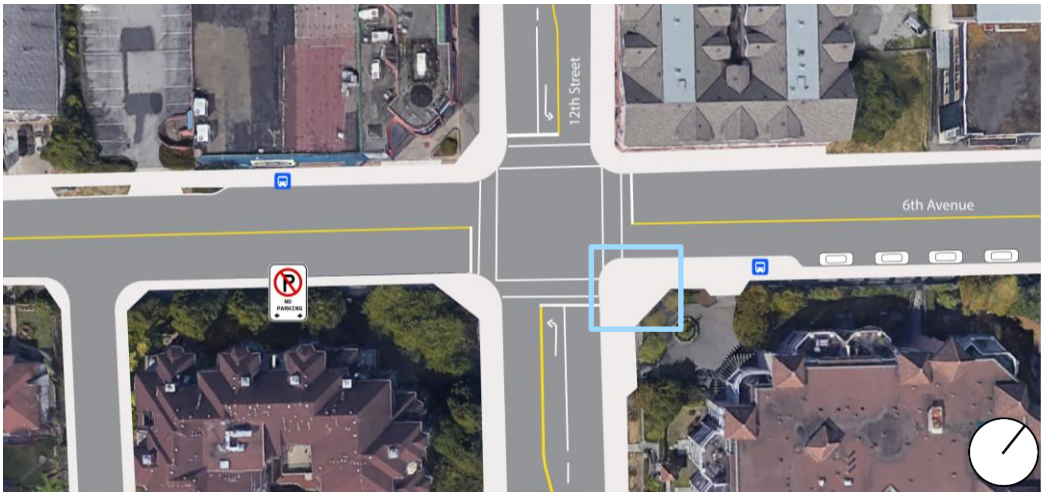
Treatment 2	Pedestrian scramble to more efficiently and safely flush future higher volumes of pedestrians through the intersection.
Notes	▪ Align implementation with increased density and activity resulting from future developments. ▪ Highest pedestrian movements are diagonal (NW Station to Douglas College). ▪ Pedestrian movement restricted to scramble phase to increase efficiency. ▪ Requires no right on red.
Transit Delay	PHD = 42.4 BHD = 2.4
Existing Condition	
Treated Condition	

5.5 6th Avenue Corridor

6TH AVENUE AT 8TH STREET

Treatment	To improve eastbound travel time, the right-of-way is increased slightly to add a third lane eastbound 6th Avenue (lanes include a dedicated left-turn, through, and right turn/bus only lane). A leading pedestrian interval is added to the signal.
Notes	▪ Requires adjusting parking restrictions north side of 6th Avenue west of 8th Street. ▪ Requires adjustment to existing curb on north side of 6th Avenue, west of 8th Street. ▪ Requires paint removal and pavement marking installation. ▪ Requires signal modifications to implement leading pedestrian interval.
Transit Delay	PHD = 14.4 BHD = 0.5
Existing Condition	
Treated Condition	

6TH AVENUE AT 12TH STREET

Treatment	Eastbound delay reduced by increasing capacity. New eastbound 6th Avenue parking restrictions. Right turn only curb lane (a through lane and an informal right turn lane) nearside 12th Street and a new farside bus bulge.
Notes	▪ Curb extension recommended with the bus bulge to restrict curb lane through movements (i.e., right-turn only). ▪ Can be implemented in phases (lower cost parking restrictions first, followed by the farside bus bulge).
Transit Delay	PHD = 6.0 BHD = 0.3
Existing Condition	
Treated Condition	

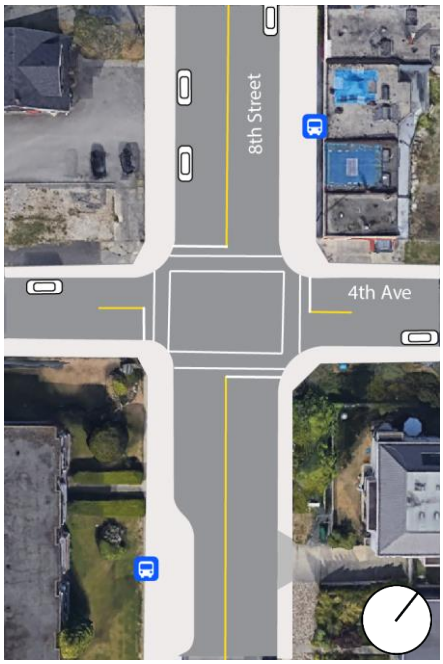
5.6 8th Street Corridor

8TH STREET: CARNARVON – 10TH AVENUE OPTION 1

Treatment	Corridor delay north of Carnarvon Street addressed through six bus bulges between Carnarvon Street and 10th Avenue. Northbound bus bulges: Royal, 6th Avenue, and 7th Avenue. (4th, 5th, and 6th Avenue stops experience minor delay). Move 4th Avenue stop to far side from near side. Southbound bus bulges: 4th Avenue, 8th Avenue and 10th Avenue.
Notes	▪ Northbound 8th Street at Queens experiences significant delay. Existing condition includes one shared through and left-turn-lane and one ~18m long right-turn only except buses lane (effectively a transit queue jump depending on right-turn volumes). Consider restricting parking further south to extend right-turn only lane commiserate with high right-turn volumes to flush the queue and reduce transit delay. Also consider potential signal modifications to provide a northbound advanced left turn phase or Leading Pedestrian Interval (LPI) for pedestrians, depending on queue lengths and volumes. Fraser River Middle school located in southwest corner of intersection. ▪ Northbound 7th Avenue bus bulge with potential for additional curb extension to intersection (replicate existing curb and bus bulge at 8th Avenue). ▪ Northbound 6th Avenue remains single through lane where bus bulge is proposed. Widens to two through lanes just north of bus bulge. ▪ Northbound Royal Avenue construction of bus bulge and curb extension northbound farside of Royal Avenue. ▪ Northbound 8th Avenue existing curb extension and bus pull out. Fill in bus pull out to align with curb extension. ▪ Southbound Royal existing stop is nearside due to steep slope south of Royal intersection. No room to add a bus bulge within existing cross section despite significant transit delay. ▪ Can be implemented as pilot projects using temporary materials, or as fixed infrastructure using more permanent materials.
Transit Delay	Northbound PHD = 34.0 Southbound PHD = 19.5 Northbound BHD = 1.3 Southbound BHD = 1.3
Existing Condition	 

Treated Condition

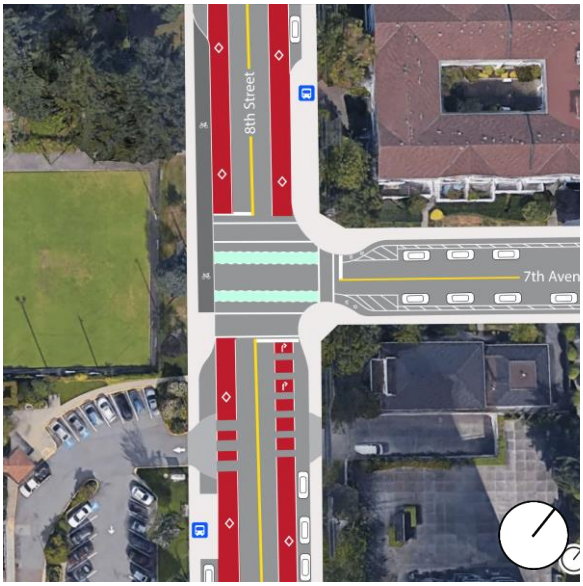


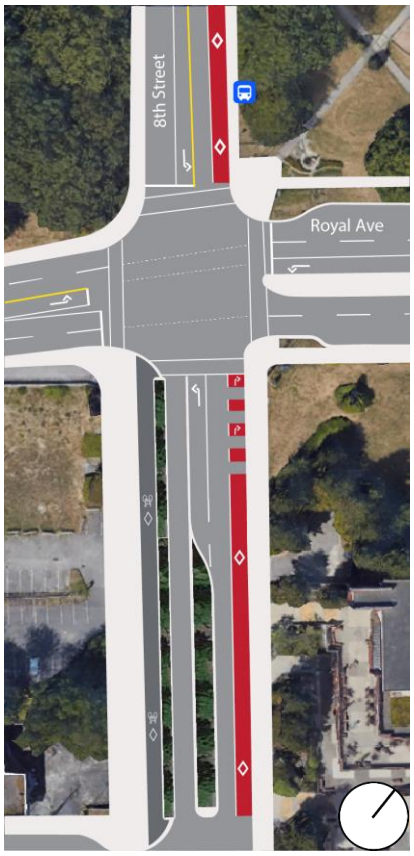




*Note, the images of the treated conditions above illustrate snapshots of treatments along the corridor. The final treatment would extend along the whole of the corridor, from Carnarvon Street to 10th Avenue.

8TH STREET: CARNARVON – 10TH AVENUE OPTION 2

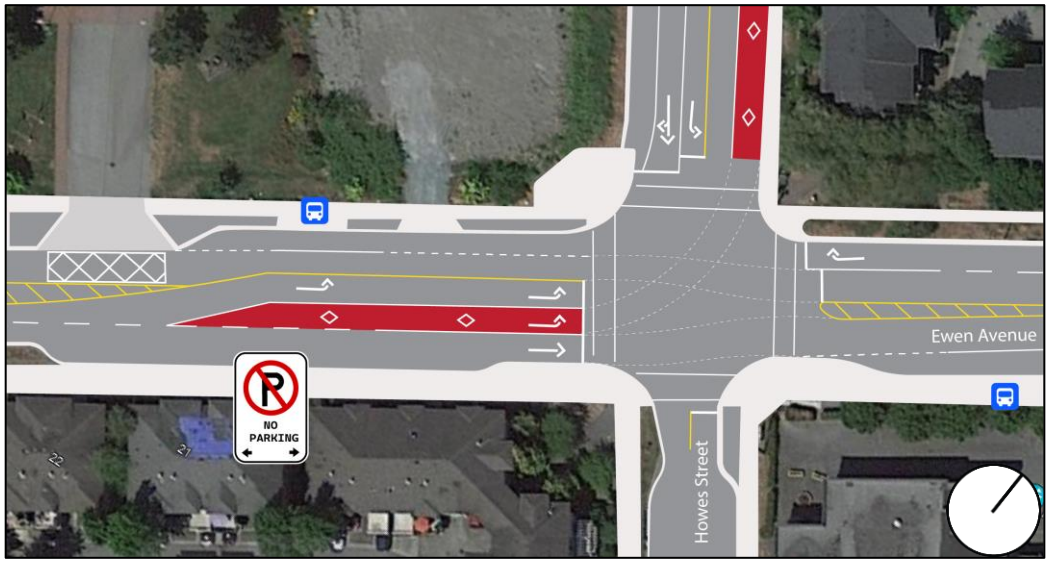
Treatment	Dedicated (peak hours only or all-day) curbside bus lanes from Carnarvon Street to 10th Avenue.
Treatment Notes	▪ Aligns with TransLink's Transport 2050 which identifies 8th Street as a future RapidBus or BRT corridor. ▪ Requires parking restrictions in both directions (all-day or peak hours only, to complement bus lanes regulations). ▪ Requires elimination of nearside curb extensions at 5th Avenue and 3rd Avenue in both northbound and southbound directions and pavement painting. ▪ Consider signal priority to realize additional time savings. ▪ Consider right turn restrictions at intersections with high right turn volumes that cause significant transit delay.
Transit Delay	Northbound PHD = 55.8 Southbound PHD = 44.4 Northbound BHD = 2.2 Southbound BHD = 2.4
Existing Conditions (Left) & Treated Conditions (Right)	   

Existing Conditions (Left) & Treated Conditions (Right)		

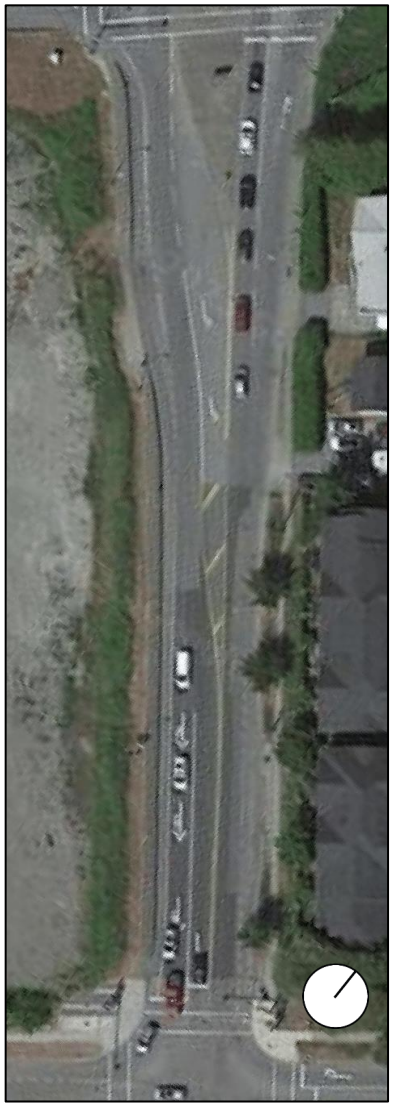
*Note, the images of the treated conditions above illustrate snapshots of treatments along the corridor. The final treatment would extend along the whole length of the corridor, from Carnarvon Street to 10th Avenue.

5.7 Ewen Avenue & Queensborough Connector

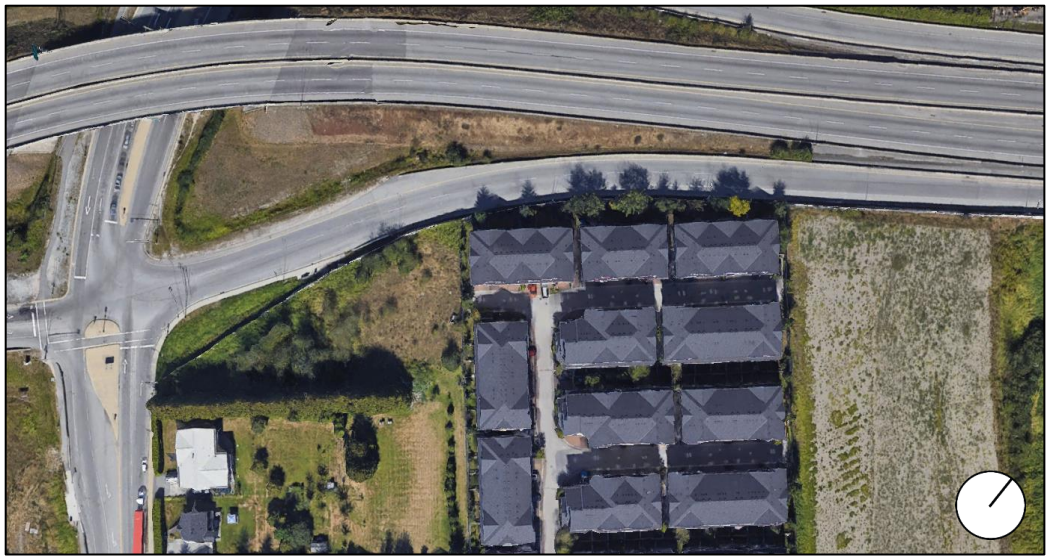
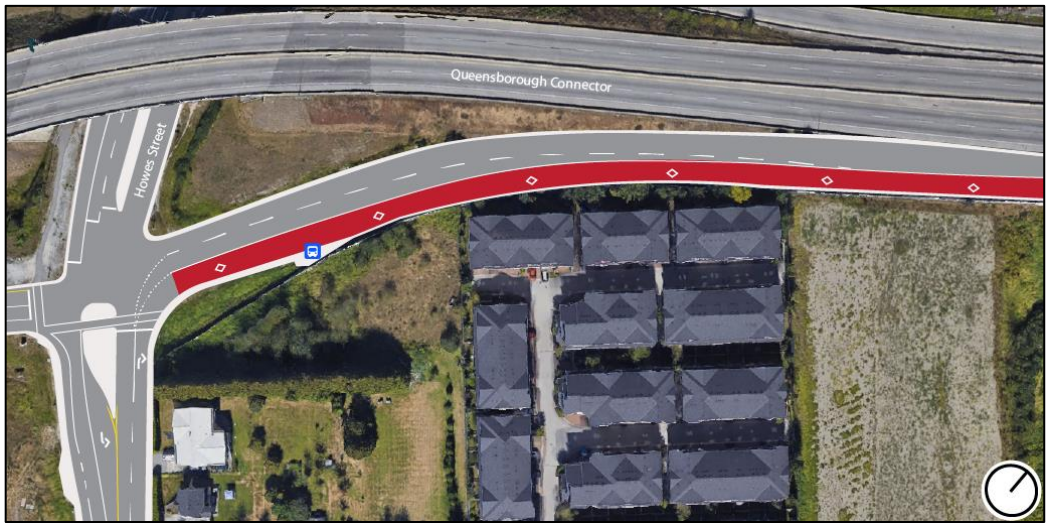
EWEN AVENUE AT HOWES STREET

Treatment	Creation of second left turn pocket for buses only to reduce delay caused by congestion.
Notes	▪ Requires width removal of Ewen Avenue eastbound curb extension (nearside) and Ewen Avenue westbound (farside) grass buffer. Removal must maintain intersection skew of less than 1:20 for eastbound and westbound through movements. ▪ Requires removal of parking on Ewen Avenue (eastbound direction, nearside) for one block approaching Howes Street intersection. ▪ Requires removal of curb extension on northeast corner of Howes Street to create two receiving lanes for the double left-turn approach lanes on Ewen Avenue. ▪ Requires pavement painting. ▪ Requires signal head upgrades. ▪ Review eastbound left turn queue lengths to confirm left turn bay lengths and to ensure transit vehicles are able to bypass the queue.
Transit Delay	PHD = 7.6 BHD = 0.2
Existing Condition	
Treated Condition	

HOWES STREET AT EWEN AVENUE

Treatment	Dedicated northbound bus lane on Howes Street between Ewen Avenue and the Queensborough Connector. Removal of Howes Street bus stop.
Notes	▪ Requires curb extension width reduction at northeast corner of Ewen Avenue and Howes Street intersection. ▪ Requires boulevard width reduction and removal of street trees northbound (eastern side) Howes Street. ▪ Requires pavement painting. ▪ Requires coordination and approval from BC MoTI. ▪ Future consideration: Northbound Howes Street approaching the Queensborough Connector lane expansion to add an additional right turn lane for general purpose traffic. Requires median island cutback.
Transit Delay	PHD = 11.0 BHD = 0.2
Existing Condition	 

QUEENSBOROUGH ON-RAMP

Treatment	Bus on shoulder operations on ramp from Howes Street to Queensborough Connector to enable buses to jump queues onto the Queensborough Bridge.
Notes	▪ Requires approach lane widening (north side of ramp) and pavement painting. ▪ Requires construction of retaining wall on north side. ▪ Fully within BC MoTI jurisdiction. ▪ Potential for future intervention: additional northbound right lane from Howes Street onto the Queensborough Connector.
Transit Delay	PHD = 75.1 BHD = 2.5
Existing Condition	
Treated Condition	

6. Implementation Strategy

Bus speed and reliability solutions that are financially feasible and compatible with the City's transportation construction projects and redevelopment plans are presented below in a three phased strategy over a five-year period. Prioritization considerations include implementation level of effort, cost and amount of transit passenger delay. Those projects that are relatively quick to implement, low cost and address areas of high delay are prioritized (not all potential bus speed and reliability projects made it into the City's 5-year implementation strategy and capital plan). The cost estimation methodology is described before presenting the three implementation packages of bus speed and reliability projects.

In total, the five-year implementation strategy includes fourteen projects, estimated to cost approximately $3.2M (see ***Table 6.1***).

TABLE 6.1: IMPLEMENTATION STRATEGY COST ESTIMATE SUMMARY

PHASE	ESTIMATED COST
Short term (year 1)	$521,000
Medium term (years 2 & 3)	$465,000
Long term (years 4 & 5)	$1,669,000
Total	**$2,655,000**

6.1 Cost Estimation Methodology

Unit price cost estimating is applied to develop Class D cost estimates for each bus speed and reliability project to inform the City of New Westminster's capital planning (see ***Table 6.2***). Individual requirements of each bus speed and reliability project are estimated using the descriptions and illustrative sketches provided in the previous section. These estimates are not inclusive of any additional detailed analysis or design. The quantity of each project element is multiplied by the estimated unit cost, which is derived from a general market analysis of current material, construction, and labor costs, and validated with actual costs from recently completed New Westminster transportation infrastructure projects. Finally, all individual project component subtotals are summed, and a 50% contingency is added to arrive at the estimated total project cost.

TABLE 6.2: EXAMPLE OF UNIT COST ESTIMATING METHODOLOGY

7TH AVENUE AT 20TH STREET	SUBTOTAL	UNIT COST	NUMBER OF UNITS
Paint marking removal	$76	$12	6
Pavement marking installation	$3,240	$1.2	2,700
Traffic signal	$75,000	$75,000	1
Sign relocation	$700	$700	1
Subtotal	$79,016		
Contingency (50%)	$39,508		
Total	**$119,000**		

6.2 Phase 1 – Short Term (Year 1)

The first phase of bus speed and reliability projects in the City of New Westminster includes six projects designed to reduce delay for transit vehicles exiting 22nd Street Station (the area with the most person hours of delay in the city) and New Westminster Station, and 6th Avenue eastbound vehicles. PHD and BHD specific to each hotspot are included and are not normalized by distance. They are summarized below:

	PHD	BHD	Cost
7th Avenue at 20th Street Relocation of the northbound 20th Street stop line upstream, no-stop hatching, and installation of near side signal heads. This project includes paint removal and pavement marking installation, traffic signal installation, and sign relocation.	95.4	3.7	$119,000
Carnarvon Street at 6th Street Installation of an eastbound protected left turn phase. This project includes a new signal head installation, signal retiming, and pavement marking installation.	16.4	0.7	$114,000
Carnarvon Street at 8th Street Installation of an eastbound protected left turn phase. This project includes a new signal head installation.	42.4	2.4	$113,000
6th Avenue at 8th Street Reconfiguration of eastbound lanes to include right turn/transit queue jump lane, through lane, and left turn bay and leading pedestrian interval added to the signal timing. This project includes paint removal and pavement marking installation, curb removal, curb construction, sign removal, sign installation, and signal modifications.	14.4	0.5	$130,000
6th Avenue at 12th Street Restriction of eastbound nearside parking and new farside bus bulge with curb extension on 6th Avenue. This project includes sign installation, curb removal, curb and sidewalk construction, and sign relocation.	6.0	0.3	$37,000
20th Street at 6th and 7th Avenue Signal coordination between two intersections on 20th Street: 7th Avenue and the 6th Avenue, allowing queues at 6th Avenue to clear before southbound traffic begins at 7th Avenue. This project only includes signal retiming.	95.4	3.7	$8,000
Phase 1 Cost Estimate Total			**$521,000**

6.3 Phase 2 – Medium Term (Years 2 & 3)

The second phase of bus speed and reliability projects in the City of New Westminster includes three projects (one of which is under BC MoTI jurisdiction) designed to continue the improvement of the 22nd Street transit exchange operations (addressing delay experienced accessing the exchange and along 6th Street (the corridor with the second highest person-hours of delay in the city). PHD and BHD specific to each hotspot are included and are not normalized by distance. They are summarized below:

City of New Westminster Projects	PHD	BHD	Cost
6th Street at 10th Avenue Northbound transit approach lane (~150 metres) within the existing curb and new parking restrictions. This project includes lane painting, symbol painting, and sign replacement.	11.7	0.8	$22,000
6th Street at 5th Avenue Bi-directional queue jump lanes on 6th Street. This project includes a signal replacement and relocation, sign installation, curb removal, curb and sidewalk construction, and painting.	NB 7.5 SB 5.8	NB 0.3 SB 0.3	$443,000
Phase 2 Cost Estimate Total			**$465,000**

BC MoTI Project	PHD	BHD	Cost
6th Avenue at 20th Street 6th Avenue widening in the westbound direction to separate left turning vehicles and through traffic. This project includes sign replacement, sign relocation, concrete median and curb removal, concrete median and curb construction, paint removal and paint installation.	20.5	1.1	TBD

6.4 Phase 3 – Long Term (Years 4 & 5)

The third phase of the five-year implementation plan for bus speed and reliability projects includes five projects (two of which are under MOTI jurisdiction) designed to improve transit service on two primary north-south corridors: 6th Street and 8th Street and accessing the Queensborough Bridge and 22nd Street Station via Ewen Avenue, Howes Street and the on-ramp. PHD and BHD specific to each hotspot are included and are not normalized by distance. They are summarized below:

City of New Westminster Projects	PHD	BHD	Cost
6th Street from 4th to 10th Avenue Installation of bus bulges along the 6th street, north of 4th avenue. This project includes seven bus bulges which each require curb removal, curb and sidewalk construction, and sign relocation.	NB 18.4 SB 38.1	NB 0.9 SB 2.5	$368,000

City of New Westminster Projects	PHD	BHD	Cost
6th Street at Royal Avenue Implementation of lead lag phasing and curb modifications. This project includes a full replacement of signal infrastructure, sign removal, curb removal, curb and sidewalk construction, and painting.	NB 17.4 SB 4.0	NB 0.7 SB 0.1	$686,000
8th Street Corridor Six new bus bulges along 8th street in both directions where delay is greatest. Each bus bulge includes curb removal, curb and sidewalk construction, and sign relocation.	NB 34.0 SB 19.5	NB 1.3 SB 1.3	$315,000
Ewen Avenue at Howes Street Creation of a bus-only left turn lane on Ewen Avenue westbound direction and a northbound receiving lane on Howes Street. This project includes curb removal, curb construction, paint removal, paint installation, sign relocation, sign installation, and signal head upgrades.	7.6	0.2	$300,000
Phase 3 Cost Estimate Total			**$1,669,000**

BC MoTI Projects	PHD	BHD	Cost
Queensborough Connector On-Ramp Bus-on-shoulder operations along on-ramp to the Queensborough Connector. This project includes lane widening and paving, retaining wall construction, paint removal, and paint installation.	75.1	2.5	TBD