Part 4: Bus Priority Infrastructure

WE ARE MAKING PROGRESS IN REDUCING BUS DELAY

Significant investments in transit priority are working

Bus delay is a problem that can be solved by transit priority measures. To that end, TransLink's Bus Speed & Reliability (BSR) Funding Program has invested more than $50 million—and the RapidBus program an additional $57 million—to support more than 80 bus priority projects. This is the greatest expansion of bus priority in the region's recent history.

TransLink is reporting the results of the bus priority projects implemented across the region during this period. The 2023 Bus Speed & Reliability Report evaluated 35 projects that were completed by fall 2022. The 2025 Report evaluates an additional 27 projects completed by fall 2025. This section of the Bus Speed and Reliability Report examines which projects were most effective and what factors led to success.

Overall, we found that:

- **Transit priority improved bus performance.** Bus priority projects improved bus speeds by 5–35% depending on project type, location, and scale.
- **Most projects yield a return-on-investment within 10 years—many within two years.** Expanding bus priority will allow us to make better use of limited resources, now and in the future.
- **RapidBus** projects hit targeted 20% travel time savings. This provides momentum for future corridor-scale projects, including Bus Rapid Transit routes.
- **Transit priority works best at scale.** Customers and TransLink accrue the most benefits when priority measures are focused along a corridor. We can reinvest these savings to expand or enhance service.

Evaluating each bus priority project by type, we are also learning from experience and developing regional knowledge about best practices for future investments. This will inform future work by TransLink and municipalities on bus priority, including future proposals for the Bus Speed and Reliability (BSR) municipal funding program.

Bus priority projects improve travel time, reliability, customer experience, and safety

Travel Time: Transit service operates at an optimal speed throughout the day, with minimal delay from traffic congestion, and passengers can board and alight efficiently.

Reliability: Transit operates on schedule and is consistent and predictable throughout the day and each day of the week.

Customer Experience: Bus priority projects are an opportunity to improve travel options and enhance stop amenities and pedestrian infrastructure to make transit feel appealing, comfortable, safe, and easy-to-use.

Safety: Transit operates efficiently while supporting the safety of customers, pedestrians, cyclists, or other drivers.

How Speed and Reliability Improvements Benefit our Customers.

When the bus is faster, I have time to do a few errands before dinner.

Even if there's traffic, I can count on the bus to get me to school on time.

This bus route is so much better, I don't need to use my car as often.

Fewer cars are speeding now that there's a red bus lane.

We have many tools to improve the speed and reliability of bus service

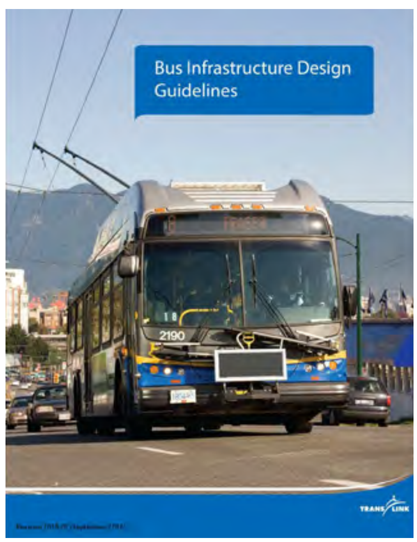
These interventions range from dedicated bus-only lanes that separate buses from congestion, to fare-payment policies that allow customers to board and alight more quickly. Transit approach lanes and queue jumps allow buses by bypass congested intersections. Turn pockets can move private vehicles out of the bus's path. Bus stops can be removed, or shifted out from the curb, in order to reduce the time buses spend merging; and traffic signals can be designed to recognize and prioritize bus movements. This portion of this report provides more discussion about these bus priority measures.

TransLink has developed a Transit Priority Toolkit (see next page) that provides examples of bus priority measures and the challenges they address. These tools vary in terms of cost, effectiveness, complexity, and visibility.

GUIDANCE TRANSLINK AND MUNICIPALITIES USE TO IMPLEMENT BUS PRIORITY

TransLink and municipalities have drawn upon resources developed by TransLink and organizations such as the National Association of City Transportation Officials (NACTO) when implementing bus priority projects. These include the following:

TransLink Transit Priority Toolkit



TransLink Bus Infrastructure Design Guidelines

NACTO Transit Street Design Guide

TransLink Transit Priority Toolkit

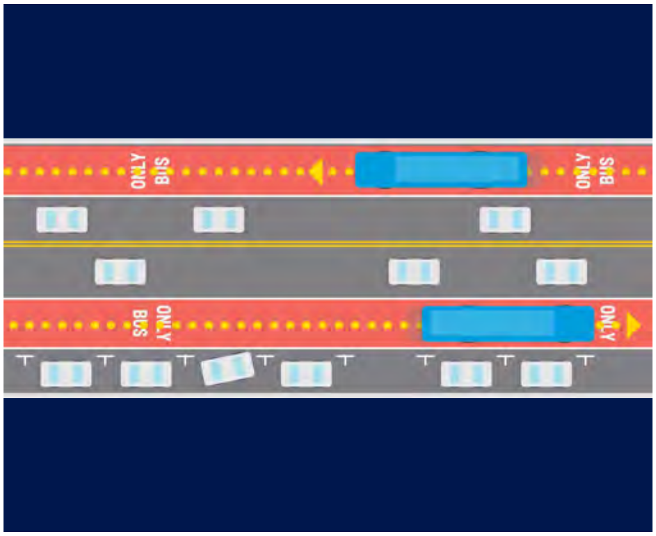
	SPECIFIC CHALLENGES													
	INTERSECTION	ROADWAY	SIGNAL	RIGHT TURN	LEFT TURN	ACCESS TO BUS STOP	LEAVING BUS STOP	DWELL TIME	INSUFFICIENT RUNNING TIME	PEDESTRIANS	CYCLISTS	MOTORISTS		
STRATEGY	CONGESTION		DELAY			OPERATIONS				SAFETY			COST/COORDINATION	
A. Bus Stop and Curb Management														
A1. Bus Stop Placement	★		★			★★★	★★	★	★	★★	★★		$–$$	Medium/ High
A2. Curb Management		★				★★	★	★		★	★	★	$–$$	Medium
B. Traffic Regulations														
B1. Movement Restrictions	★★★		★	★★★	★★★		★★		★★	★	★	★★	$–$$$$	Medium/ High
C. Street Design														
C1. Bus Stop Infrastucture						★★	★★	★★★		★★★	★★★		$–$$$	Low
C2. Turn Pockets	★		★★	★	★							★★	$–$$	Medium
C3. Vertical Control Devices		★★★				★★	★		★★	★★★	★★★	★	$	Medium
C4. Queue Jumps	★★★		★★★						★★				$–$$	Medium
C5. Transit Approach Lane	★★★		★★★						★★				$	Medium
C6. Peak-Hour Bus Lane	★★	★★		★★	★★	★★	★★	★★	★★★		★	★★	$$–$$$$	High
C7. Dedicated Bus Lane	★★★	★★★		★★★	★★★	★★★	★★★	★★★	★★★		★	★★	$$–$$$$	High
D. Signal Priority														
D1. Passive Signal Priority	★★	★	★★						★★	★	★	★★	$–$$	Medium
D2. Transit Signal Priority (Active)	★★★		★★★	★★★	★★★				★★★				$$–$$$$	High
E. TransLink Practices and Policy														
E1. All-Door Boarding								★★★	★★	★				Low
E2. Schedule/Operator Recovery									★★★					Low

Cost/Coordination:
- $ UNDER $50K
- $$ $50,000 - $100K
- $$$ $100,000 - $250K
- $$$$ OVER $250K

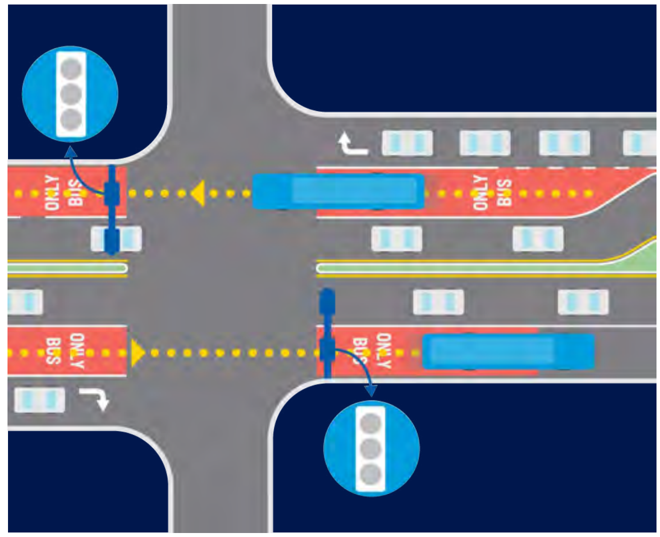
Benefits: ★ LOW ★★ MEDIUM ★★★ HIGH

THERE ARE MANY TYPES OF BUS PRIORITY PROJECTS

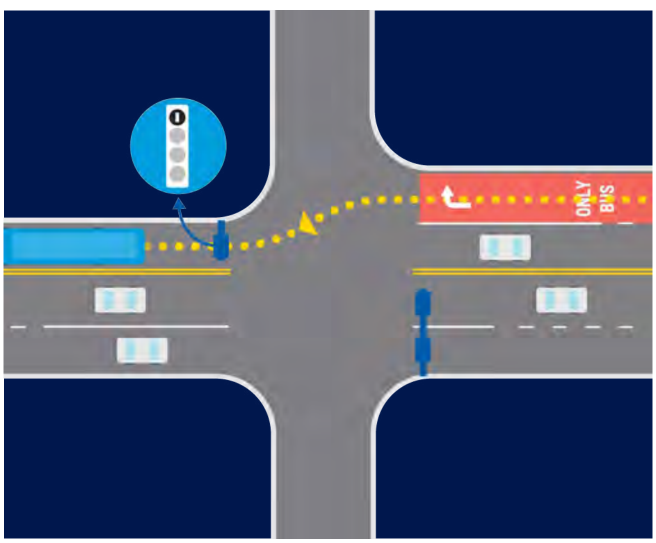
Different bus priority measures address different kinds of delay



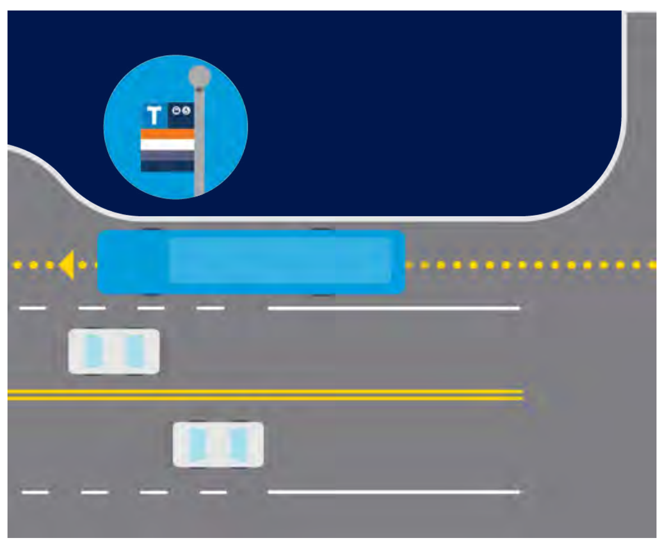
Bus / BAT Lanes: Bus lanes are lanes reserved for the use of buses. Dedicated bus lanes are exclusive to buses at all times, whereas Business Access & Transit (BAT) lanes allow vehicles to make right-turns. Peak-hour bus lanes allow for general use or parking during off-peak times.



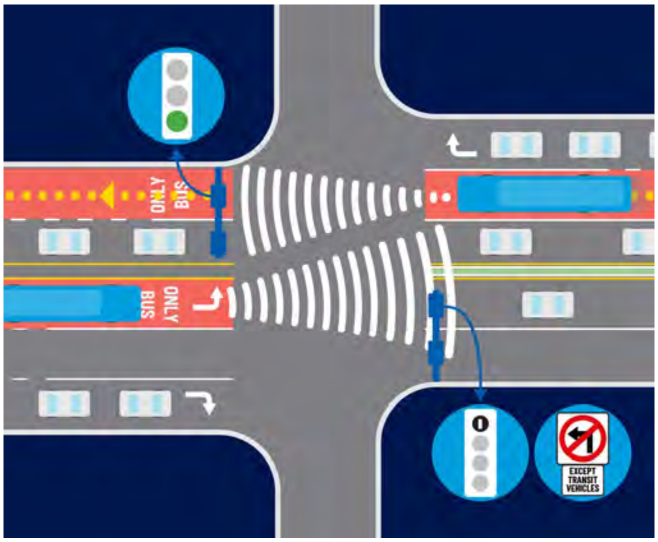
Approach Lanes: Approach lanes are short, dedicated lanes at intersections that separate buses from traffic queues. Approach lanes allow buses to bypass traffic queues and proceed through the intersection on the green light with other motorists.



Queue Jumps: Queue jump lanes are short dedicated transit lanes (similar to approach lanes) or a shared turn pocket paired with a transit signal treatment that allows transit vehicles to get ahead of traffic at an intersection.

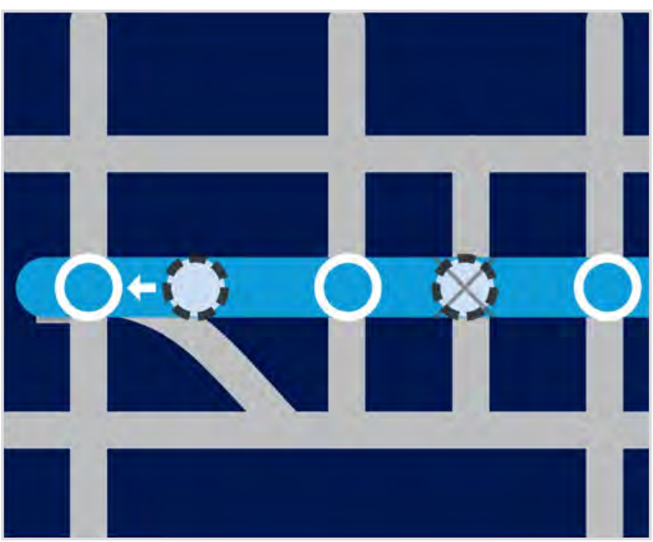


In-Lane Stops (Bus Bulbs / Floating Bus Stop): In-lane bus stops allow buses to stop directly in the travel lane in front of the bus stop. Bus bulbs or island bus stops may be used to create the in-lane stop.

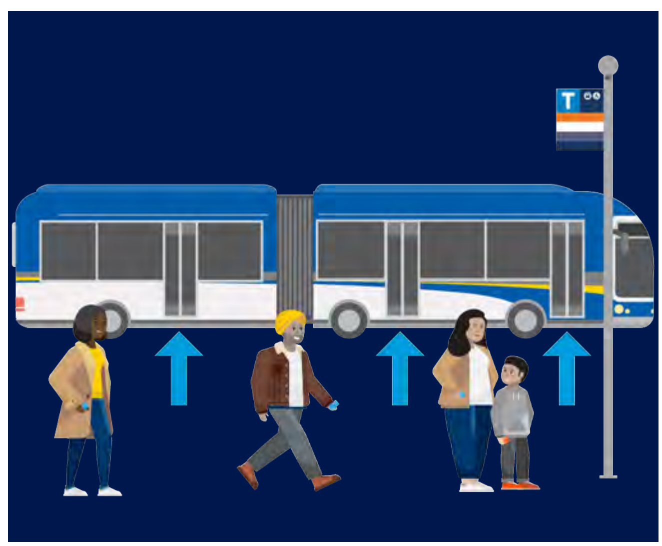


Signal Upgrades and Transit Signal Priority (TSP): Signal upgrades may add a new traffic signal or change the length of a signal phase. TSP enables traffic signals to detect approaching buses and adjust signal timing to prioritize bus travel through an intersection.

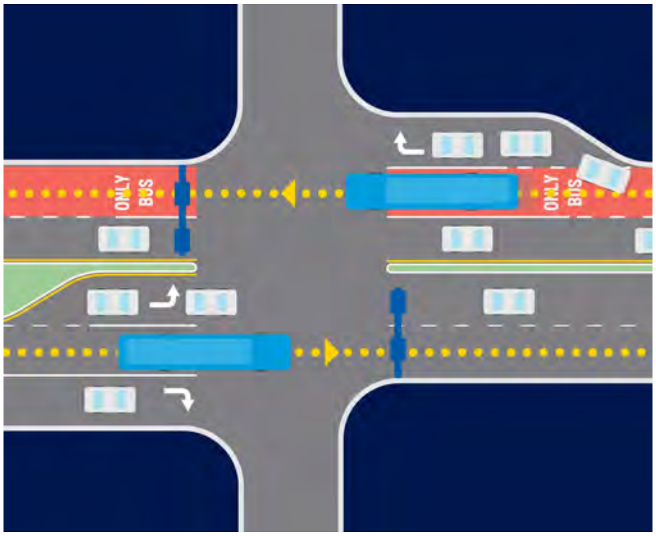
Routing Adjustments: Routing adjustments change the alignment of a bus route to bypass high delay locations such as around busy intersections, reduce the number of turns, or travel on roadways with lower volumes.



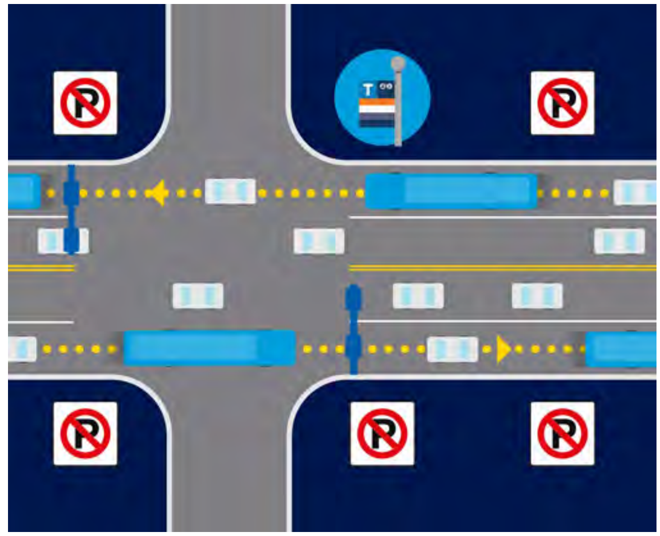
Bus Stop Balancing: Bus stop balancing (also called “bus stop consolidation”) includes thoughtful removal and/or relocation of bus stops along a corridor to achieve more consistent spacing, maintain convenient access, and provide faster, more reliable service.



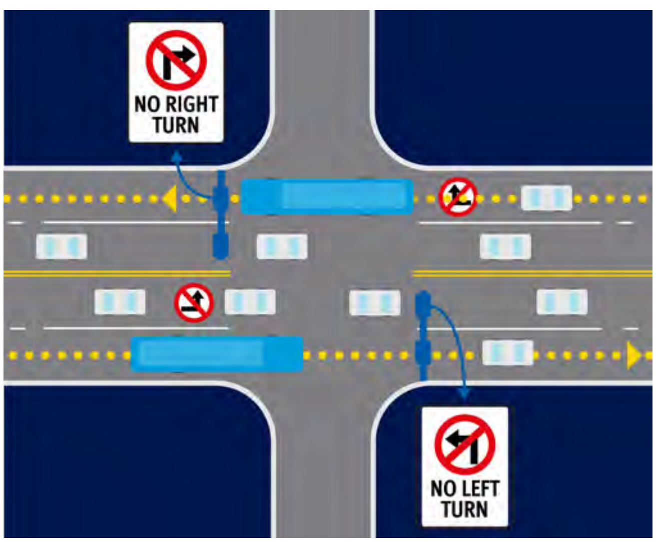
All-Door Boarding: All-door boarding is an operational policy that allows customers to board a bus at any open door.



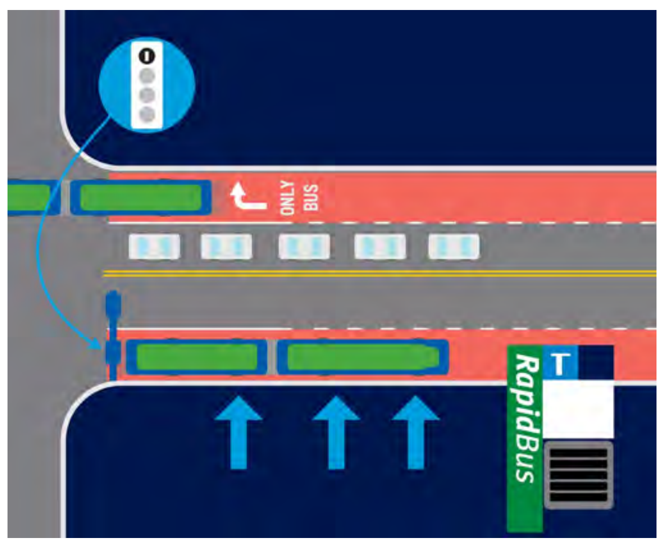
Turning Lanes: Turning lanes are dedicated lanes at intersections that allow vehicles to make left or right turns without blocking vehicles travelling through the intersection.



Parking Restrictions: Parking restrictions along a roadway limit where and when vehicles may park to keep travel lanes clear.



Turn Restrictions: Turn restrictions prohibit or limit turning movements to maintain or improve safety and vehicle travel.



RapidBus: RapidBus is TransLink's brand of fast and frequent bus service. RapidBus routes have extensive transit priority, all-door-boarding, and limited stopping for a faster ride. RapidBus has upgraded stops for a better rider experience.

REGIONAL INVESTMENTS IN BUS PRIORITY

Faster and more reliable bus service is a keystone of the region's growth.

Metro Vancouver's regional transportation strategy—Transport 2050—aims to put transit within a short walk of most homes and jobs. This goal is to be achieved by quadrupling the size of the rapid transit network from 100 to 400 kilometres—relying in large part on buses. Enhancements to the bus network can be quicker and more cost-effective than other approaches, and these investments will build on TransLink's previous efforts to provide high quality bus service across the region.

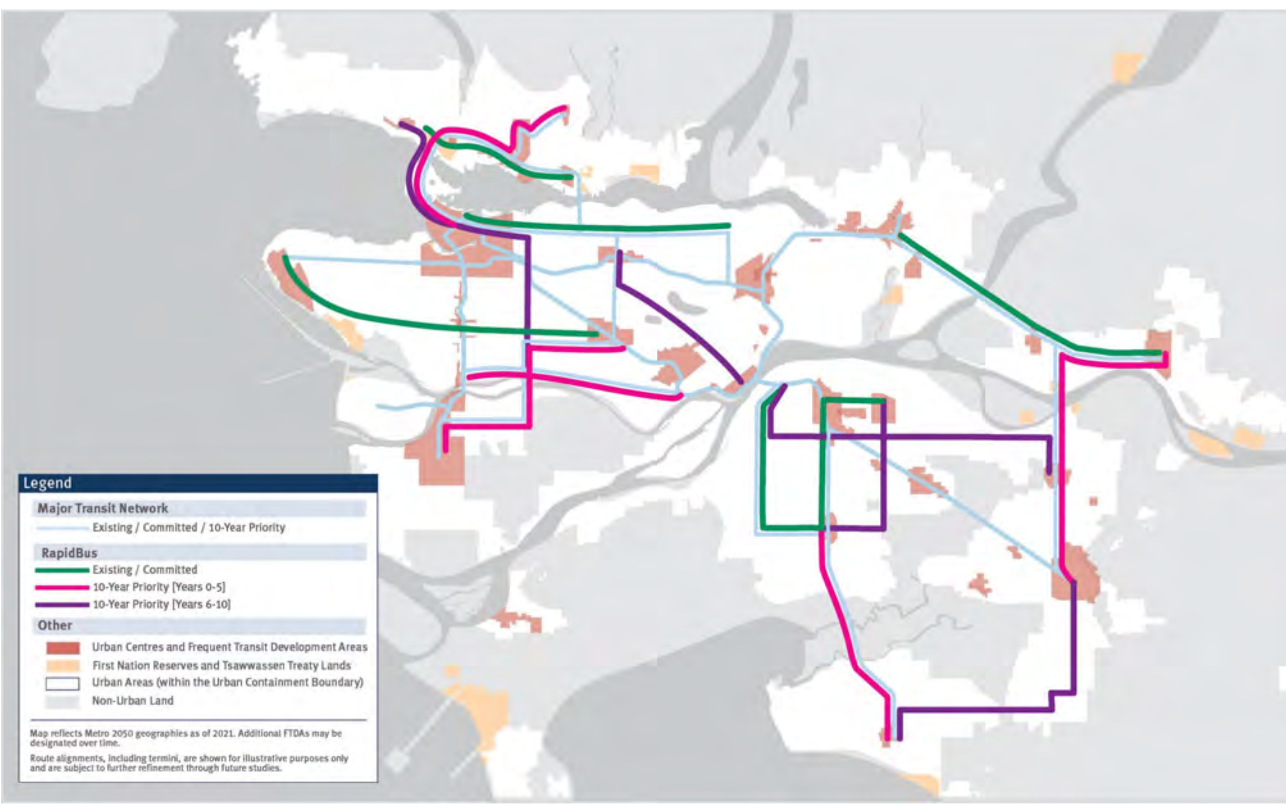
The RapidBus Program is an effective new brand of bus service.

In 2020, TransLink launched a new brand of service —"RapidBus"—along five corridors. RapidBus aims to be 20% faster than local buses—via fewer stops, all-door boarding, and extensive bus priority. All six of the new RapidBus lines have achieved the program's goal of having bus priority measures such as bus lanes, transit approach lanes, and queue jumps on at least one-third of each corridor. RapidBus routes accounted for 15% of systemwide bus ridership in 2024.

A **further 11 new RapidBus lines** are prioritized for the implementation of Transport 2050.[27] The R2 RapidBus will also be extended to advance the "Metrotown-North Shore" BRT Corridor. See map on page 49.

An additional **7 new Express bus routes** are prioritized as well. Also supported by extensive transit priority, these will provide connections over longer distances.

Existing (and Planned) RapidBus Routes



Source: Transport 2050: 10-Year Priorities (RapidBus)

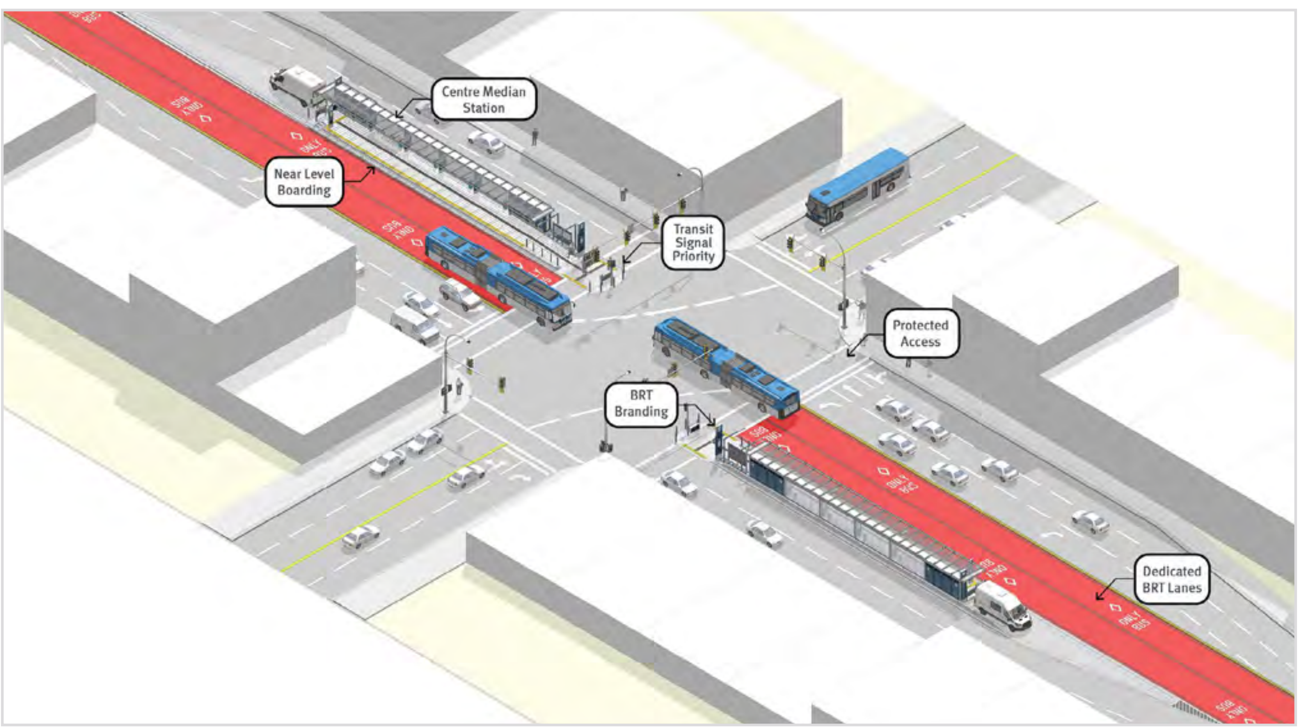
Bus Rapid Transit routes will provide rapid transit on the bus network.

Building on the success of RapidBus, Bus Rapid Transit (BRT) will deliver the next generation of fast and reliable bus service along some of the region's busiest corridors. BRT combines frequent, limited-stop service with significant infrastructure investments that allow buses to operate more like rapid transit—including dedicated bus lanes for most of the corridor, transit signal priority at intersections, and enhanced passenger facilities such as high-quality stations and improved accessibility.

Compared with local bus service, BRT is designed to deliver substantial improvements to travel time and reliability. Dedicated running ways allow buses to bypass congestion, while intersection priority reduces delays at traffic signals. Together, these measures help create a consistent, high-speed transit experience along major arterial corridors. In Metro Vancouver, BRT is expected to be up to 40% faster than local bus service, while also providing additional travel time savings compared with RapidBus routes.

BRT also represents a cost-effective way to expand rapid transit across the region. Because BRT operates at street level using existing road corridors, it can often be planned and delivered more quickly and at lower cost than rail-based rapid transit. This allows rapid transit-level service to reach more communities sooner while complementing investments in SkyTrain and other parts of the transit network.

TransLink's Centre-Runnng BRT Running Way and Station Access Concept



Conceptual Centre Median BRT Station (TransLink BRT Station Design Manual)

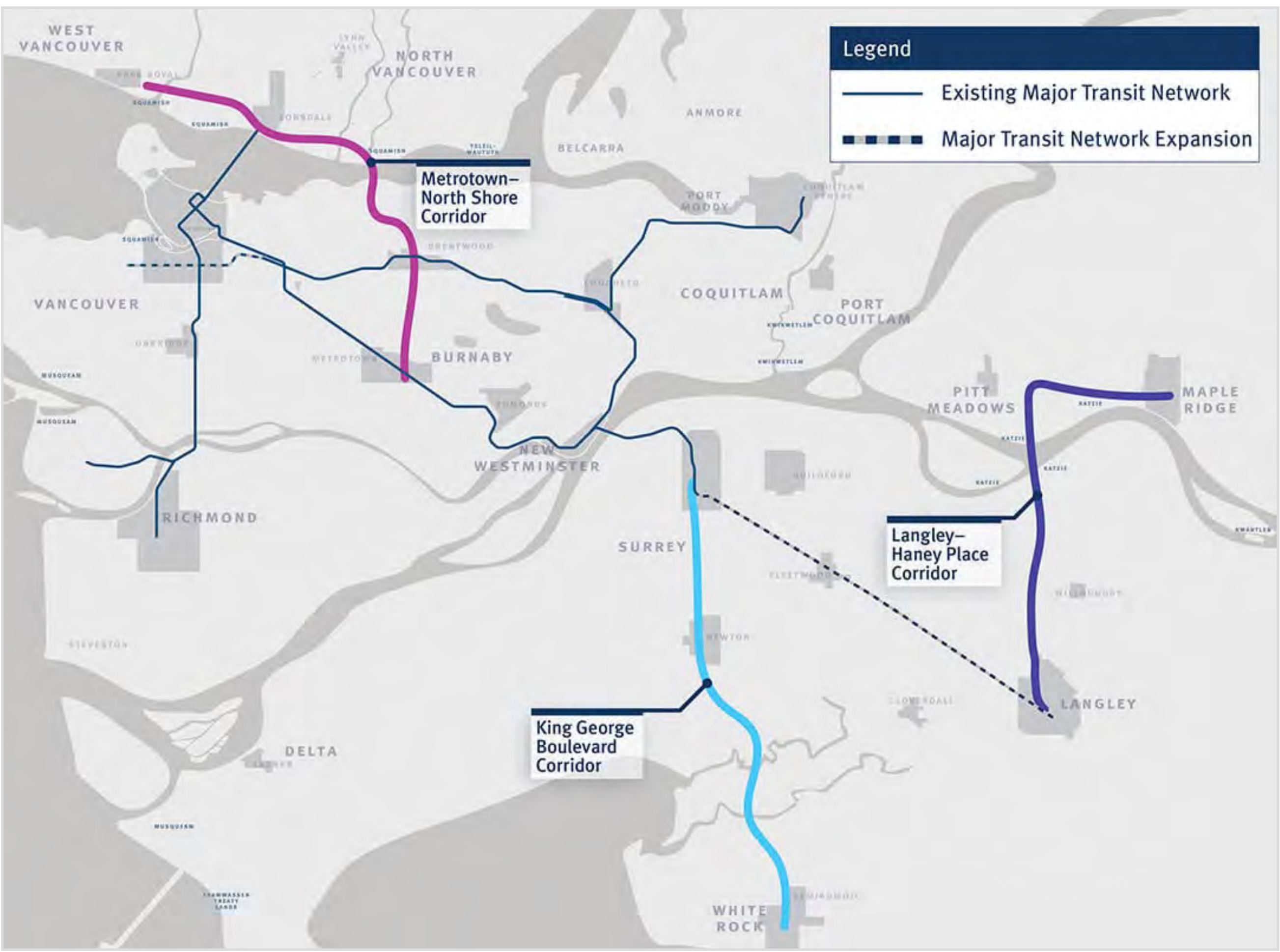
The Transport 2050 implementation plan prioritizes up to nine future BRT corridors across the region. The first three corridors advancing through planning and design are:

- **King George Boulevard:** A 20-kilometre corridor with 12 stations, providing a direct connection between Surrey City Centre and Semiahmoo Town Centre. This route will reduce travel time by 40 per cent to approximately 40 minutes.
- **Langley–Haney Place:** A 22-kilometre corridor with 13 stations, connecting the Township of Langley and Maple Ridge. It will offer a direct connection between Willowbrook and Haney Place, cutting travel time by 40% to around 40 minutes.
- **Metrotown–North Shore:** A 21-kilometre corridor linking major destinations like Park Royal, Brentwood, Lower Lonsdale, BCIT, and Metrotown, with seamless connections to SkyTrain at Brentwood Town Centre Station on the Millennium Line and Metrotown Station on the Expo Line.

Other corridors may initially be introduced as RapidBus routes, with targeted bus priority measures implemented first and additional infrastructure upgrades added over time as part of a future transition to BRT.

Delivering BRT will require close collaboration between TransLink, municipalities, and other partners to implement new transit priority infrastructure and redesign key arterial corridors to support faster and more reliable transit service.

Priority BRT Corridors



Source: translink.ca

Centre-Running Bus Lanes

Centre-running bus lanes are an important component of BRT and a newer design approach for bus priority in Metro Vancouver. Instead of operating beside the curb, buses travel in dedicated lanes located in the centre median of the roadway.

This design can provide important operational advantages on busy arterial streets. Side-running bus lanes are often affected by curbside activity such as right-turning vehicles, parking, loading, and passenger drop-offs. Centre-running lanes remove buses from these conflicts, helping maintain more consistent speeds and reliability.

Centre-running lanes are often a defining feature of BRT systems around the world because they can provide measurable travel time benefits compared with side-running lanes. However, they are not appropriate for every street. Implementing centre-running lanes typically requires a sufficiently wide roadway and may involve changes to intersections, station placement, and pedestrian crossings.

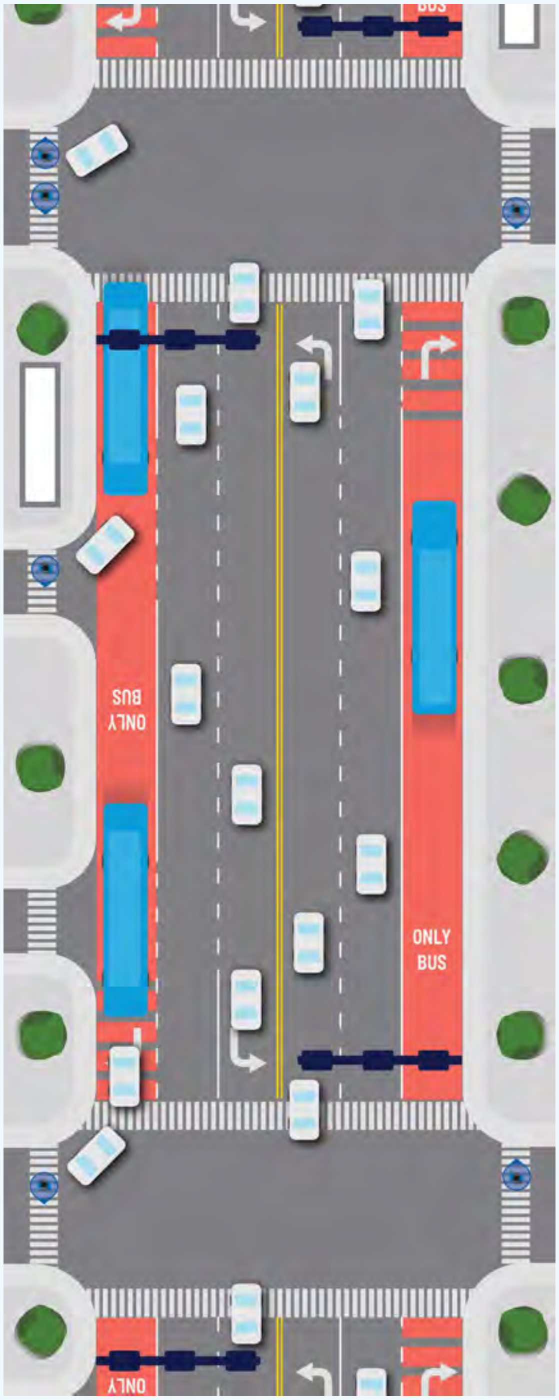
There are also trade-offs to consider. While centre-running lanes reduce delays caused by curbside activity, they may introduce additional interaction between buses and left-turning vehicles. These conflicts can be managed through intersection design, signal timing, and turn restrictions, but they require careful planning.

Although centre-running bus lanes are still relatively uncommon in Metro Vancouver, there are a few precedents. The former 98 B-Line operated in median bus lanes along parts of No. 3 Road in Richmond before the Canada Line opened. More recently, the R6 RapidBus corridor includes a short section where buses use the centre median near Scott Road Station, with median stops integrated into the roadway.

As new BRT and bus priority projects are developed, centre-running bus lanes may be used more frequently where roadway conditions allow and where they can provide the greatest improvements to bus speed and reliability.

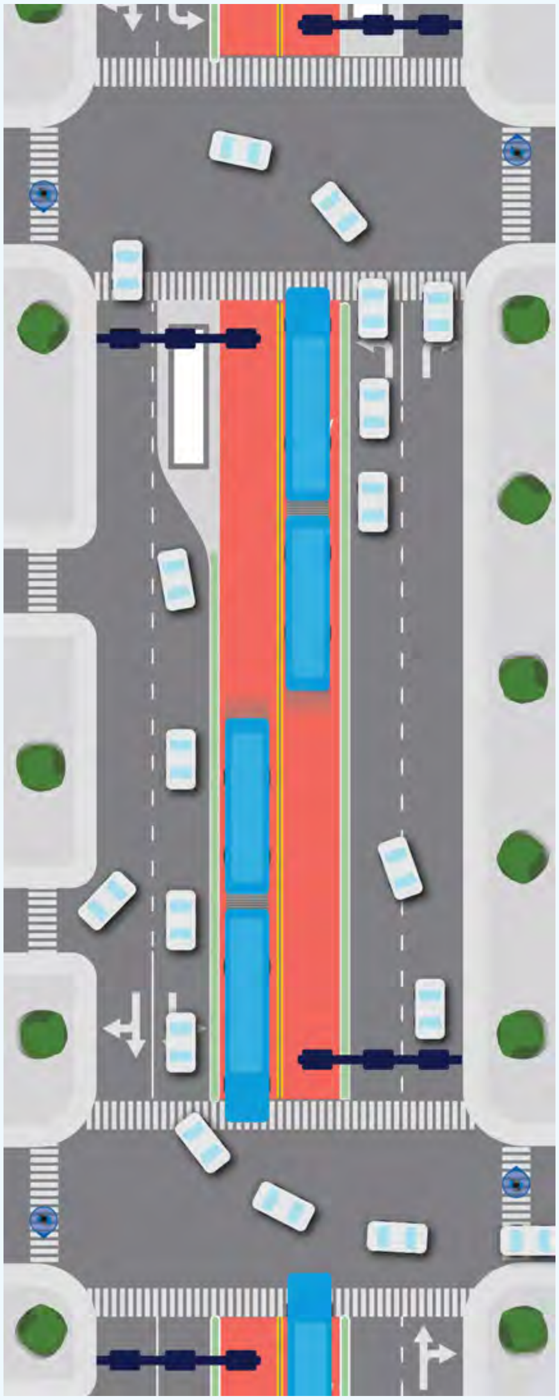
Source: translink.ca

Side-Running Bus Lanes and Right Turns



Buses in curb-side lanes are slowed by right-turning vehicles. Left side: Buses in curb-side lanes are slowed by right-turning vehicles. Right side: Curb-side lanes are most effective where there are few intersections or driveways.

Centre-Running Bus Lanes and Left Turns



Centre-running lanes encounter friction with left-turning vehicles. Where roadway conditions allow, centre-running bus lanes avoid friction with curbside activities—improving overal speed and reliability. However they introduce friction with left-turning vehicles, which need to be managed via careful intersection design, signal timing, and/or turn restrictions.

The Bus Speed & Reliability Program makes investments across the Frequent Transit Network.

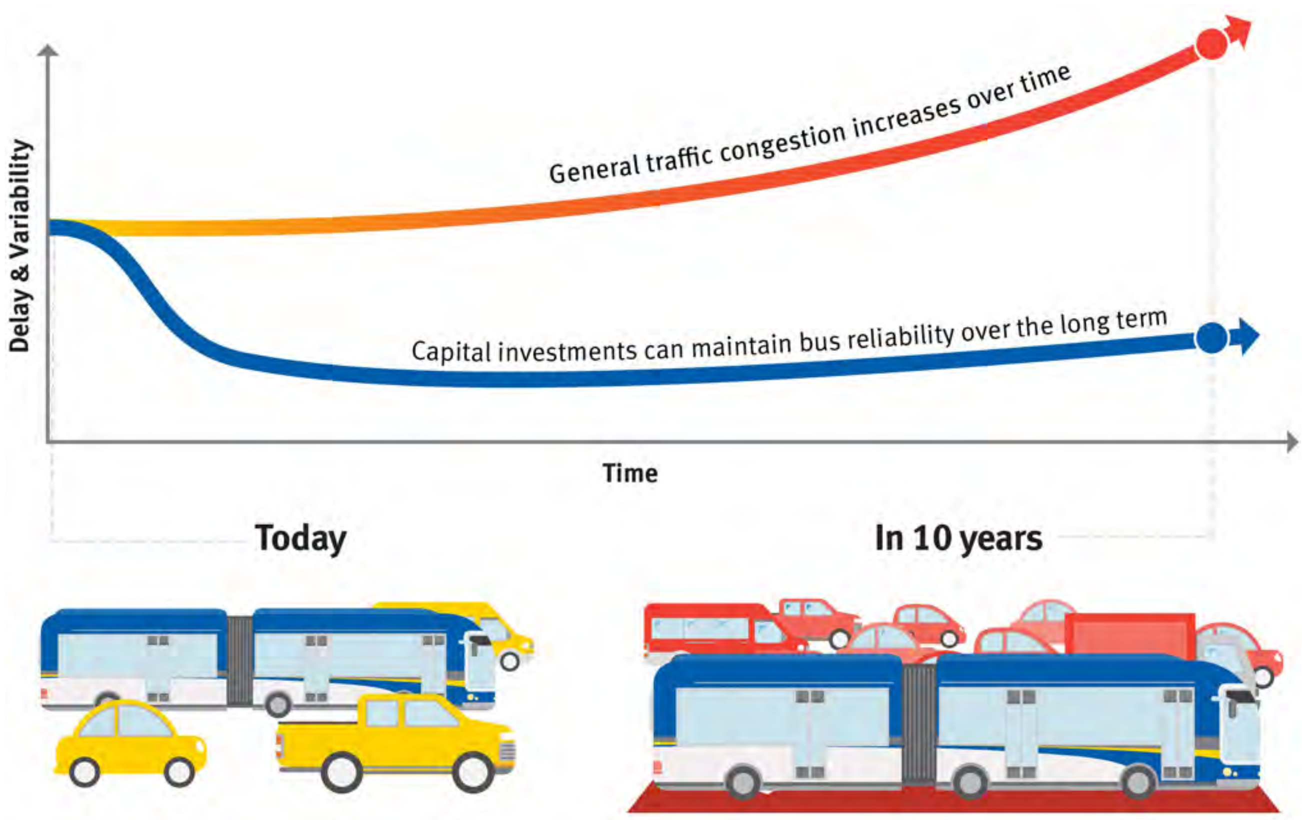
TransLink's BSR Funding Program helps improve bus performance along parts of the network that carry the most riders and experience the highest delay —regardless of whether they are future RapidBus or BRT corridors. Bus priority interventions at high delay locations can reduce travel times by 5% to 10%. These minutes add up and help improve the access available by transit.

Between 2019–2025, TransLink has worked with municipalities to complete 80 bus priority projects (including studies) totaling almost $50 million. This includes $57 million invested in transit priority on RapidBus routes and an additional $50 million allocated for small to medium projects from the BSR Funding Program. TransLink aims to expand bus priority measures to the entirety of the existing frequent bus network and up to 25% of an expanded frequent bus network.[28]

Investments are increasingly being focused on high-impact "hotspots" (i.e., bottlenecks that affect many bus trips each day) and "corridors of high delay" where many bus priority measures are targeted to achieve benefits at scale—often achieving travel time reductions of 10% or more along a full corridor.

These projects will not only improve the speed and reliability of the buses running today. By investing now, we can ensure bus service remains reliable, even if traffic congestion increases in the future.

Conceptual Illustration of the Long-Term Impact of Speed and Reliability Improvements



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BUS PRIORITY PROJECTS COMPLETED SINCE 2019

TransLink has invested over $100 million in bus priority since 2019.

Our investments include:

- $57 million for RapidBus bus priority construction, including the R2, R3, R4, and R6 lines.
- $50 million in small- to medium-scale bus priority improvements made possible by the BSR Funding Program, including 80 studies and projects.

This has been a historic expansion of transit priority.

The region has added nearly 80 km of new bus priority measures since 2019, an expansion of over 55%. This report evaluated over 60 bus speed and reliability projects including four new RapidBus routes that were completed between 2019 and 2025 (R2, R3, R4, and R5 lines), across all seven subregions. The number of projects includes some individual projects built as part of RapidBus projects.

These projects:

- Serve nearly 100 routes that carried over half of TransLink's ridership in fall 2024.[29]
- Address network segments that accounted for over 300 hours of bus delay (over 10% of the systemwide total) and nearly 7,000 hours of person delay (over 15% of the systemwide total) per weekday in 2024. These segments represent 7% of the of TransLink bus network.
- Make service faster and more reliable for nearly 190,000 passenger trips that pass through these network segments on an average weekday (2024), which is approximately a third of the total.

Approach lane on Edmonds St at Kingsway in Burnaby.

Bus-only signal at Metrotown.

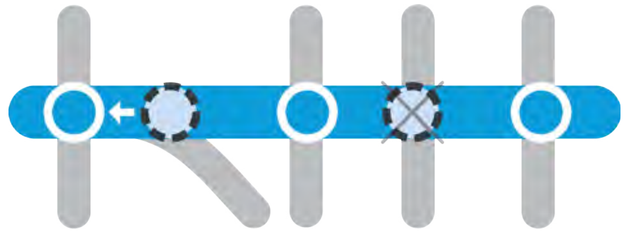
Kennard Intersection Transit Improvement project on the North Shore.

Quantity of Bus Priority Measures Evaluated, by Project Type, 2019–2025

RapidBus

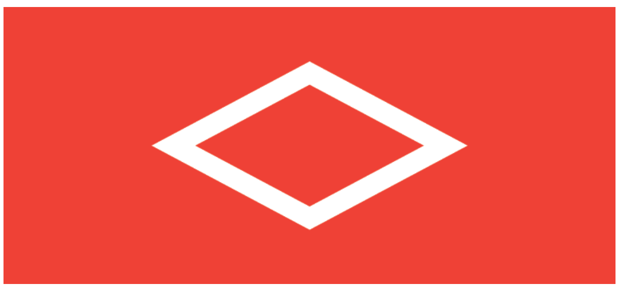
4 RapidBus routes with new transit priority including over 38 km of bus or BAT lanes

Bus stop balancing and optimization



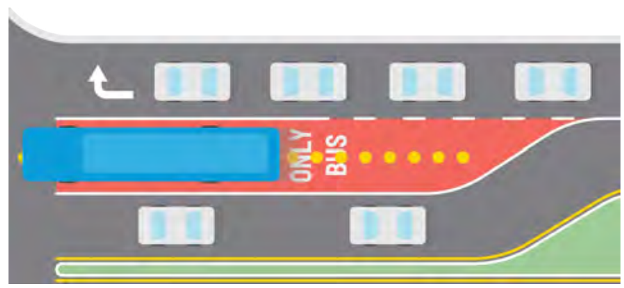
5 routes optimized by consolidating or relocating 86 stops, and 2 projects optimizing specific stops

Bus/BAT lanes



16 projects creating nearly 55 km of bus or BAT lanes

Approach lanes



6 projects improving the approach to 8 intersections

Queue jumps

6 projects improving the approach to 7 intersections

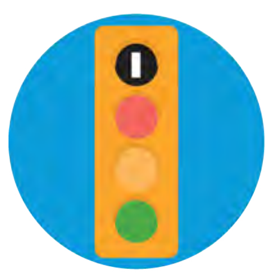
In-lane bus stops

6 projects creating 21 in-lane bus stops

Turn and parking restrictions

3 projects optimizing traffic flow at 20 locations

Signal upgrades



14 projects upgrading 20 signals

Routing Adjustments

4 route modifications

OUR APPROACH TO MEASURING PROJECT EFFECTIVENESS

We use metrics based on customer experience and operating costs.

We talk about “travel time savings”—rather than “speed”—to describe the customer experience along an average trip. We look at percentage improvements in travel times to compare different scales of projects.

We also look at seconds or minutes saved per trip in comparison to the project costs. The improvement in operational efficiency can be multiplied by the cost of delivering bus service—including all bus routes that serve a location—to generate a “payback period” for a project. Even modest improvements—just a few seconds per trip—add up quickly when they benefit tens of thousands of trips each year.

We focus where new bus priority measures are expected to have an impact.

We evaluate travel time changes along only the bus stop segments directly affected by new treatments, which removes data noise from unrelated parts of a corridor. For most projects, the project area covers a few blocks or less. For RapidBus routes, it is the entire corridor.

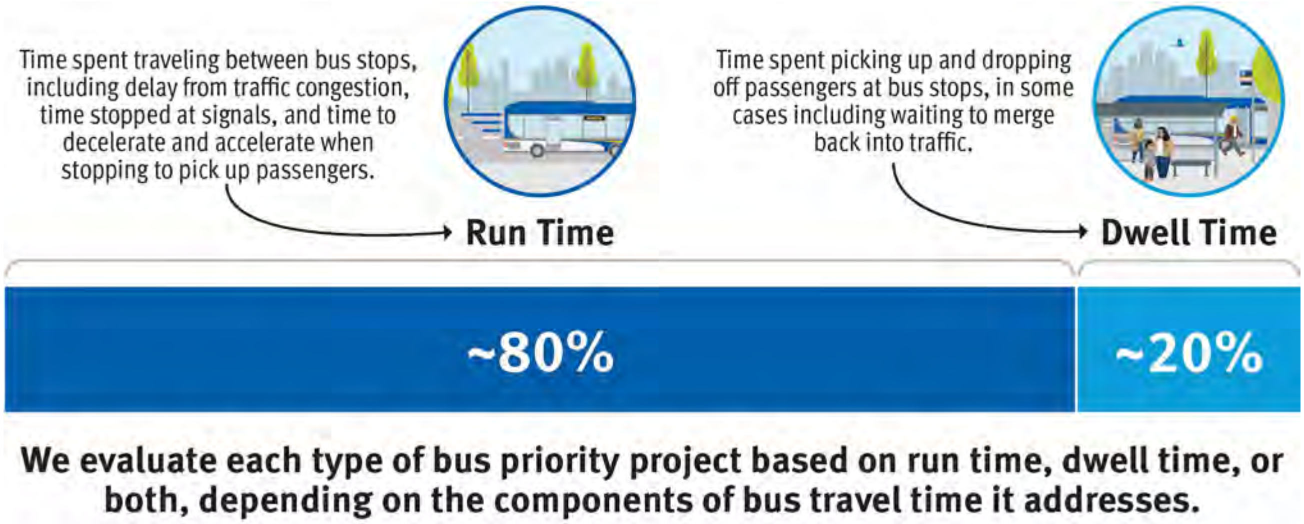
In most cases, stop-to-stop travel times are derived from AVL stop events. Where stop spacing is very long—such as on highway segments with on-ramps, tunnels, or bridges—we instead estimate travel times using GPS ping data in the project area. This remove distortions from other roadway impacts, but results in smaller sample sizes.

For most projects, we evaluate just the travel time between stops and—exclude “dwell” time spent picking up and dropping off passengers at stops—to avoid distortion due to changes in bus ridership. However, we include dwell time for projects designed to reduce time spent at stops (e.g., bus stop balancing and in-lane bus stops).

We look at average travel times across the full day, as well as at peak travel times—when bus delay is greatest. If a project is expected to provide benefits at only a certain time of day, we look only at that time period.

What measures did we use?

We evaluated particular types of projects depending on how they improve travel time and reliability for people on buses. The graphic below illustrates the different components of bus travel time—run time and dwell time. We evaluated the change in travel time over the extent of new bus priority that was implemented, including all bus routes that serve the location.



The table below describes the benefits we expect to see from each type of project and whether we evaluated it based on run time, dwell time, or both.

Project Type(s)	Expected Benefits	How can we measure benefits? [1]	
		Run Time	Dwell Time
Queue Jumps and Approach Lanes (Includes Turn Pockets)	Buses move through signalized intersections with less delay	✓	
Bus/BAT Lanes	Buses have priority through a congested area including multiple intersections [1]	✓	
In-Lane Bus Stops	Buses do not have to merge into traffic from a bus stop (reduces wait time)	✓	✓
Signal Upgrades	Buses spend less time waiting for a green light and don't have to wait for multiple signal cycles	✓	
Turning Restrictions for All Traffic	Prevent vehicles from backing up at intersections and delaying buses (and other vehicles)	✓	
Route Adjustments	Buses can take a more direct route, saving run time—and in some cases dwell time as well	✓	✓ (varies)
Bus Stop Balancing	Avoids overly frequent stops and saves buses time to accelerate, decelerate, and merge back into traffic	✓	✓
RapidBus Route	RapidBus includes multiple types of treatments	✓	✓
All-Door Boarding	Allows passengers get on the bus efficiently using all doors of the bus and reduces dwell time at bus stops		✓

Notes: 1. See page 22 for an illustration of how we measured bus travel time and delay. 2. In cases where bus lanes replace on-street parking, they can also result in more in-lane bus stops, which also reduces dwell time.

We identify the cleanest before and after comparisons.

Our general approach compares the first full month after a project has been fully completed with the same month in the following year—unless unrelated construction or other disruptions warrant adjusting that window. This reduces data distortions due to seasonal variability in traffic and ridership. For projects completed amidst the COVID-19 pandemic, we considered fall 2021 the time by which background traffic (and bus delay) roughly returned to normal.

Nonetheless, data from the real world can be complex.

It can be challenging to isolate the impact of a bus priority project. Projects can include multiple components: for example, a stop relocation and turn restriction may be built in tandem with a road diet and new bike lane, as part of the same roadway project.

GPS data on bus locations—the basis of travel time estimates—are not always precise or frequent enough to give a clear picture of traffic changes. In some places, bus layover activities, or shared bus exchange spaces create travel time patterns difficult to interpret. These challenges are more pronounced on corridors with long distances between stops, where travel times are estimated from GPS pings rather than stop events. In these cases, fewer usable observations and variability in ping frequency can make changes harder to detect with confidence.

Most significantly, broader trends—such as traffic congestion, ridership growth, and operator behavior shaped by schedule adherence rules—also affect travel times in ways unrelated to priority measures. These changes are uneven across the region and between bus routes. And while third party traffic datasets on traffic speeds can offer context, they often include long segments or inconsistent coverage, especially around overpasses, tunnels, or complex intersections.

We contextualize data to interpret project performance carefully.

To understand what's really happening on the ground, we look at several months, year over year changes, and changes in background traffic speed from Google before drawing conclusions.

Importantly, we seek input from bus operators and transit supervisors who know the corridor best, and we often conduct site visits to observe conditions directly, especially where multiple factors appear to influence performance.

Ultimately our goal is to turn insights into better projects over time.

Each evaluation—whether results are clear cut or complicated—helps refine our understanding of what works, under what conditions, and how to design future measures that deliver stronger, more reliable improvements.

Bus Location Data

Bus location data is foundational to how we assess the effectiveness of bus priority investments. Accurate, timely location information allows us to understand where buses are delayed, how they move through intersections, and whether priority measures are delivering the intended benefits.

However, the quality of bus location data available today presents limitations. Vehicle locations are typically reported at relatively low and variable update rates, often on the order of tens of seconds, and in some cases approaching a minute or more between position updates. When combined with occasional data gaps, connectivity issues, or GPS drift in complex environments, this can result in "ghost buses," or bus positions that lag behind actual movements or appear slightly off route. These effects are especially noticeable when evaluating short corridor segments, individual intersections, or treatments designed to save only a few seconds per stop or signal.

Despite these challenges, the existing data remains suitable for understanding broader patterns of bus delay and overall corridor performance, especially when hundreds or thousands of bus trips are recorded. In most cases, it supports high level before and after comparisons and helps identify if bus priority measures are generally working as intended. As the region pursues more targeted and sophisticated approaches, there is significant opportunity and value in improving both the frequency and accuracy of vehicle location reporting.

Higher quality location data, reported every few seconds rather than every half minute or longer, would unlock several benefits. Customers would benefit from more accurate real time information while they wait for their bus to arrive. Evaluations of bus priority measures, such as those in this Report, could avoid any systemic errors in data for some projects, and generate more precise and nuanced conclusions for all projects. Transit priority tools that require real-time feedback would become easier to implement – including advanced transit signal priority and bus headway management. (See sidebars on page 110 and page 120.)

Improvements to bus location data are underway at TransLink. Over time, these enhancements will strengthen the region's ability to manage operations efficiently and deliver more customer-centric service.

GPS bus location data

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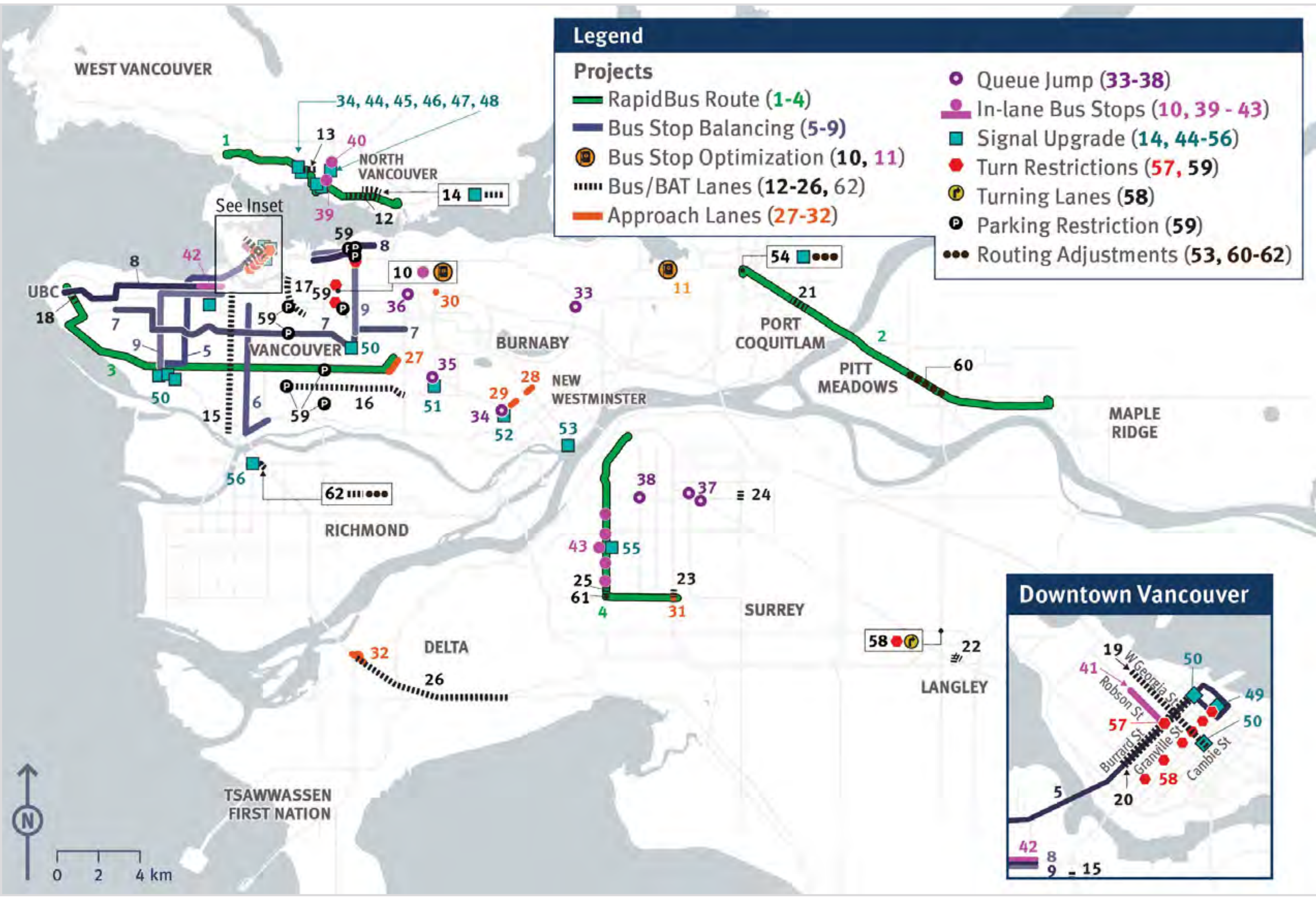
MAP AND INVENTORY OF BSR PROJECTS

The map below shows the projects funded by the BSR Funding Program since 2019 and evaluated for this report. (Additional bus priority projects completed during this time period, including municipal-led projects, were not evaluated for this report and are not shown on the map.)

The table on the following page provides a description of each project including the sub-region(s) where it is located; the type of project and the metrics used to evaluate each type of project; time periods used in the evaluation; a summary of travel time savings; and the projected return on investment.

Map of Completed BSR Projects Evaluated in this Report, 2019–2025



Summary of Implemented Projects, 2019–2025, Percent Change in Transit Travel Time, Before and After Implementation, and Projected Return on Investment

Project Name	Map	Year Evaluated	Sub-Region	Run Time Metric	Dwell Metric	Before Period Compared	After Period Compared	Change in Transit Travel Time Daily [1] 6am–10pm	Change in Transit Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	TransLink Cost [3]	Cost-Benefit Payback Period [4] Years
RapidBus												
R2 Marine Dr RapidBus: R2 vs 239	1	2023	North Shore	X	X	Sep 2018	Sep 2021	**-24%**	**-26%**	-	$8,096,000	**[3]**
R3 Lougheed Hwy RapidBus: R3 vs 701	2	2023	Northeast & Maple Ridge/Pitt Meadows	X	X	Sep 2018	Sep 2021	**-35%**	**-35%**	-	$8,096,000	**[3]**
R4 41st Ave RapidBus: R4 vs Local (41)	3	2023	Vancouver/UBC	X	X	Sep 2018	Sep 2021	**-26%**	**-27%**	-	$7,683,000	**[3]**
R6 RapidBus: R6 vs Local (319)	4	2025	Southwest & Southeast	X	X	Fall 2023	Fall 2024	**-18%**	**-20%**	-	$33,000,000	**[3]**
Bus Stop Balancing & Optimization												
Route 2 - Bus Stop Balancing	5	2023	Vancouver/UBC	X	X	Sep 2019	Sep 2021	**-11%**	**-14%**	-	$82,000	**0.3**
Route 4 - Bus Stop Balancing	6	2023	Vancouver/UBC & Burnaby/New Westminster	X	X	Apr 2019	Apr 2022	**-8%**	**-7%**	-	-	**-**
Route 7 - Bus Stop Balancing	7	2023	Vancouver/UBC	X	X	Apr 2019	Apr 2022	**-7%**	**-4%**	-	-	**-**
Route 17 - Bus Stop Balancing	8	2023	Vancouver/UBC	X	X	Nov 2019	Nov 2021	**-6%**	**-7%**	-	$142,000	**0.6**
Route 25 - Bus Stop Balancing	9	2023	Vancouver/UBC & Burnaby/New Westminster	X	X	Nov 2019	Nov 2021	**-6%**	**-6%**	-	$163,000	**0.4**
Commercial Dr (2nd to 4th) - Bus Stop Optimization & Bus Bulbs	10	2025	Vancouver/UBC	X	X	Fall 2022	Fall 2023	**-4%**	**-3%**	-	$228,000	**20**
St. Johns & Moody - Relocate EB Stop	11	2025	Northeast	X	X	Fall 2022	Fall 2023	**16%**	**14%**	> 5%	$70,944	**-**

TRANSLINK

Project Name	Map	Year Evaluated	Sub-Region	Run Time Metric	Dwell Metric	Before Period Compared	After Period Compared	Change in Transit Travel Time Daily [1] 6am–10pm	Change in Transit Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	TransLink Cost [3]	Cost-Benefit Payback Period [4] Years
Bus/BAT Lanes												
East 3rd St - Bus Lanes [4]	12	2023	North Shore	X	-	Sep 2018	Sep 2021	**-4%**	**-4%**	-	-	**[5]**
West Keith Rd - Transit Project	13	2023	North Shore	X	-	Nov 2019	Nov 2021	**-9%**	**-9%**	-	$108,000	**9.9**
Kennard Intersection Transit Improvements (KITI)	14	2025	North Shore	X	-	Jan 2022	Jan 2024	**-7%**	**-12%**	-	$2,470,000	**> 20**
Granville St - Bus Lanes	15	2023	Vancouver/UBC	X	-	Sep 2019	Sep 2021	**-6%**	**-7%**	-	$171,000	**4.8**
49th Ave - Transit Project	16	2023	Vancouver/UBC	X	-	Sep 2019	Sep 2021	**-4%**	**-5%**	-	$48,000	**0.4**
Main St and Kingsway - Bus Lanes	17	2023	Vancouver/UBC	X	-	Sep 2019	Sep 2021	**-4%**	**-4%**	-	$97,000	**8.3**
Wesbrook Mall - Bus Lane	18	2023	Vancouver/UBC	X	-	Sep 2019	Sep 2021	**-15%**	**-13%**	-	$500,000	**5.7**
W Georgia St - Bus Lanes	19	2023	Vancouver/UBC	X	-	Sep 2019	Sep 2022	**-3%**	**5%**	-	$41,000	**1.5**
Burrard - Extension of NB/ SB Bus Lane Hours	20	2025	Vancouver/UBC	X	-	Jan 2022	Jan 2023	**-**	**-3%**	-	$44,678	**-**
Lougheed Hwy - Bus Lanes	21	2023	Northeast	X	-	Sep 2018	Sep 2021	**-5%**	**-11%**	-	-	**[5]**
Langley City - Bus Lanes	22	2023	Southeast	X	-	Sep 2018	Sep 2021	**-3%**	**-3%**	-	$146,000	**7.7**
KGB between 72 Ave and 74 Ave - NB Bus Lanes	23	2025	Southeast	X	-	Jan 2023	Jan 2024	**-0.3%**	**-3%**	> 35%	$497,789	**-**

Project Name	Map	Year Evaluated	Sub-Region	Run Time Metric	Dwell Metric	Before Period Compared	After Period Compared	Change in Transit Travel Time Daily [1] 6am–10pm	Change in Transit Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	TransLink Cost [3]	Cost-Benefit Payback Period [4] Years
Scott Rd / 120 St from 75A Ave to 72 Ave - BAT Lanes	25	2023	Southwest & Southeast	X	-	SEP 2019	Sep 2022	**4%**	**3%**	> 5%	$65,000	**-**
152 St from 96 to 98 Ave - BAT Lane	24	2025	Southeast	X	-	Jan 2024	Jan 2025	**-20%**	**-19%**	-	$750,000	**>20**
Hwy 99 - Bus-on-Shoulder Transit Lanes [6]	26	2025	Southwest	X	-	Fall 2023	Fall 2024	**-17%**	**-18%**	-	MOTT Funded	**-**
Bridgeport Rd - Bus Connection [6]	62	2025	Southwest	X	-	Jan 2022	Jan 2023	**-26%**	**-22%**	-	MOTT Funded	**-**
Approach Lanes												
Joyce St - Approach Lanes (Part of R4 RapidBus) [4]	27	2023	Vancouver/UBC	X	-	Sep 2018	Sep 2021	-34%	-33%	-	-	**[5]**
Edmonds St at Canada Way - Approach Lanes	28	2023	Burnaby/New Westminster	X	-	Sep 2019	Sep 2021	**0%**	**-3%**	-	$59,000	**> 20**
Edmonds St & Kingsway - Approach Lanes	29	2023	Burnaby/New Westminster	X	-	Sep 2019	Sep 2021	**-2%**	**-2%**	-	$59,000	**> 20**
Lougheed & Willingdon - Approach Lane	30	2025	Burnaby/New Westminster	X	-	Fall 2021	Fall 2023	**19%**	**22%**	> 5%	$37,846	**-**
KGB & 72 Ave - SB Approach Lane	31	2025	Southeast	X	-	Jan 2022	Jan 2023	**9%**	**9%**	> 40%	$750,000	**-**
Highway 99 and 17A - Off-Ramp Widening [6]	32	2025	Southwest	X	-	Jan 2022	Jan 2023	**-28%**	-32%	-	MOTT Funded	**-**
Queue Jumps												
Broadway and Gaglardi Way - Queue Jumps	33	2023	Burnaby/New Westminster	X	-	Sep 2019	Sep 2021	**-15%**	**-15%**	-	$52,000	**4.1**

TRANSLINK

Project Name	Map	Year Evaluated	Sub-Region	Run Time Metric	Dwell Metric	Before Period Compared	After Period Compared	Change in Transit Travel Time Daily [1] 6am–10pm	Change in Transit Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	TransLink Cost [3]	Cost-Benefit Payback Period [4] Years
Edmonds & Griffiths - Queue Jump	34	2025	Burnaby/New Westminster	X	-	Fall 2022	Fall 2023	**-1%**	**0%**	-	$160,000	**-**
Kingsway & Willingdon - Approach Lane with Signal	35	2025	Burnaby/New Westminster	X	-	Jan 2023	Jan 2024	**1%**	**-1%**	> 30%	$531,821	**-**
Lougheed & Boundary - Conversion to Shared RT Lane	36	2025	Burnaby/New Westminster	X	-	Jan 2023	Jan 2024	**4%**	**2%**	> 10%	$16,401	**-**
Fraser Hwy - Queue Jumps	37	2023	Southeast	X	-	Jun 2019	Jun 2021	**-15%**	**-21%**	-	$443,000	**3.3**
96 Ave & 128 St - Queue Jump	38	2025	Southeast	X	-	Jan 2024	Jan 2025	**16%**	**15%**	-	$561,000	**-**
In-Lane Bus Stops												
Commercial Dr (2nd to 4th) - Bus Stop Optimization & Bus Bulbs	10	2025	Vancouver/UBC	X	X	Fall 2022	Fall 2023	**-4%**	**-3%**	-	$228,000	**20**
Lonsdale Ave, 4th St & 5th St - Bus Bulbs	39	2023	North Shore	X	X	Nov 2019	Nov 2021	**-5%**	**-3%**	-	$395,000	**> 20**
Lonsdale Ave, 15th St - Bus Bulbs	40	2023	North Shore	X	X	Sep 2019	Sep 2021	**-5%**	**0%**	-	$94,000	**7.5**
Robson St - Transit Project	41	2023	Vancouver/UBC	X	X	Sep 2019	Sep 2022	**-8%**	**-8%**	-	$100,000	**1.8**
West 4th Ave - Bus Bulbs	42	2023	Vancouver/UBC	X	X	Oct 2019	Oct 2022	**-14%**	**-16%**	-	$52,000	**0.3**
Scott Rd / 120 St - Bus Pullout Infills	43	2023	Southwest & Southeast	X	X	Sep 2018	Sep 2022	**0%**	**-4%**	-	$427,000	**19.3**

Project Name	Map	Year Evaluated	Sub-Region	Run Time Metric	Dwell Metric	Before Period Compared	After Period Compared	Change in Transit Travel Time Daily [1] 6am–10pm	Change in Transit Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	TransLink Cost [3]	Cost-Benefit Payback Period [4] Years
Signal Upgrades												
Kennard Intersection Transit Improvements (KITI)	14	2025	North Shore	X	-	Jan 2022	Jan 2024	**-7%**	**-12%**	-	$2,470,000	**> 20**
Lonsdale Ave at East Esplanade - Signal Upgrade	44	2023	North Shore	X	-	Sep 2020	Sep 2021	**-3%**	**-6%**	-	$12,000	**1.8**
Marine Dr at Keith Rd and Bewicke Ave - Signal Upgrade	45	2023	North Shore	X	-	Sep 2019	Sep 2021	**-9%**	**-9%**	-	$12,000	**0.4**
Marine Dr at Fell Ave - Transit Signal	46	2025	North Shore	X	-	Fall 2023	Fall 2024	**0.2%**	**0%**	> 25%	$120,000	**-**
Chesterfield at 1st St - New Traffic Signal	47	2025	North Shore	X	-	Fall 2022	Fall 2023	**25%**	**30%**	-	$188,000	**-**
Transit Detection Signals on 15th Street (2021 CNV)	48	2023	North Shore	X	-	Jan 2021	Apr 2022	**-2%**	**-2%**	-	$45,000	**9.8**
Granville & Hastings - WBLT and NBRT Signal Phase Overlap	49	2025	Vancouver/UBC	X	-	Fall 2023	Fall 2024	**-1%**	**-1%**	-	$231,000	**>20**
Various Locations - Minor Signal Timing Modifications	50	2025	Vancouver/UBC	X	-	2022 - 2024 (Varies)	2022 - 2024 (Varies)	**2%**	**3%**	-	$80,000	**-**
Metrotown Bus Loop - Signal Upgrade	51	2023	Burnaby/New Westminster	X	-	Sep 2019	Sep 2021	**-18%**	**-19%**	-	$70,000	**1.8**
18th Ave at Griffiths Dr - Signal Upgrade	52	2023	Burnaby/New Westminster	X	-	Sep 2019	Sep 2021	**-11%**	**-13%**	-	$10,000	**0.2**
Columbia & 10th St - Transit Signal	53	2025	Burnaby/New Westminster	X	-	Fall 2023	Fall 2024	**5%**	**14%**	> 20%	$55,000	**-**
Coquitlam Central - Midblock Signal	54	2025	Northeast	X	-	Fall 2022	Fall 2023	**-19%**	**-22%**	-	$28,000	**0.3**

Project Name	Map	Year Evaluated	Sub-Region	Run Time Metric	Dwell Metric	Before Period Compared	After Period Compared	Change in Transit Travel Time Daily [1] 6am–10pm	Change in Transit Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	TransLink Cost [3]	Cost-Benefit Payback Period [4] Years
NB Scott Rd at 84 Ave - Signal Upgrade	55	2023	Southeast	X	-	Sep 2018	Sep 2019	**-15%**	**-7%**	-	$40,000	**16.8**
Great Canadian Way - Signal Coordination	56	2025	Southwest	X	-	Apr 2023	Apr 2024	**7%**	**10%**	> 10%	$33,750	-
Turn & Parking Restrictions												
Robson St - Turn Restriction [5]	57	2023	Vancouver/UBC	X	-	Sep 2019	Sep 2022	**-9%**	**-6%**	-	-	**[6]**
64 Ave & 200 St - Extend WBLT lane	58	2025	Southeast	X	-	Fall 2023	Fall 2024	**4%**	**6%**	> 5%	$30,000	**-**
Various Locations - Minor Signage Modifications	59	2025	Vancouver/UBC	X	-	Jan 2023	Jan 2024	**-0.3%**	**0%**	-	$80,000	**>20**
Routing Adjustments												
Coquitlam Central - Midblock Signal	54	2025	Northeast	X	-	Fall 2022	Fall 2023	**-19%**	**-22%**	-	$28,000	**0.3**
R3 Routing Adjustment in vicinity of Pitt Meadows (Harris Rd - 203 St)	60	2025	Northeast & Maple Ridge/Pitt Meadows	X	X	Sep 2018	Sep 2021	**-67%**	**-67%**	-	-	**[5]**
R6 Routing Adjustment between Scott Rd/75A Ave and 72Ave/124 St	61	2025	Southwest & Southeast	X	X	Fall 2023	Fall 2024	**-11%**	**-16%**	-	-	**[5]**
Bridgeport Rd - Bus Connection [6]	62	2025	Southwest	X	-	Jan 2022	Jan 2023	**-26%**	**-22%**	-	MOTT Funded	**-**

Notes: 1. Transit travel time change is a trip-weighted average calculated by hour from TransLink AVL data for the before and after time periods. 2. Background auto travel times are provided where relevant data was available and slowing due to traffic was significant. 3. Costs are based on values provided by municipalities in funding applications, funding reallocations, or submitted invoices (if received). RapidBus launch also included significant investments in stop amenities and service increases. The brand is an upgraded service rather than strictly efficiency improvements. Some projects lacked sufficient cost data to estimate a payback period. Some of the projects listed were constructed using temporary/interim measures, while others may be more permanent and have different associated costs. 4. Benefit is based on travel time savings, the number of bus trips, and the monetized value of bus service hours. Both cost and benefit values reflect evaluation-year dollars and are not inflation-adjusted. 5. Subset of a project constructed as part of RapidBus implementation. 6. Robson Street turn restrictions project may include some run-time benefits from stop consolidation, implemented concurrently, which could not be isolated as a separate project. 7. Where stop-to-stop distances are long, segment travel times are derived from GPS ping data rather than stop events, which reduces sample size.

TRANSLINK

EVALUATING COMPLETED BUS PRIORITY PROJECTS

What did we learn?

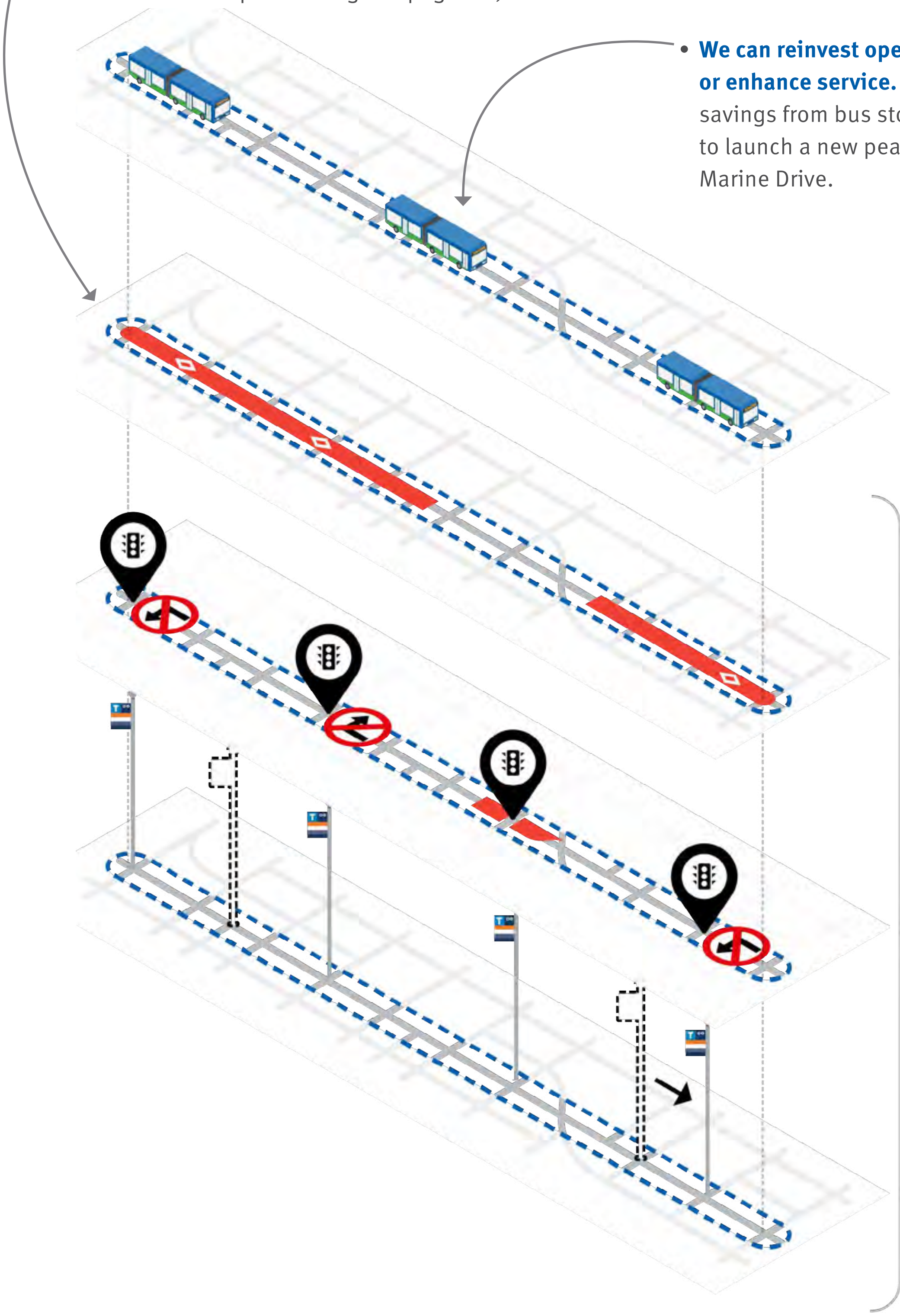
- **Transit priority improved bus performance.** Most projects provided the benefits expected, generally ranging from 5–35% reduction in travel time.
- **RapidBus projects exceeded targeted 20% savings.** The R2, R3, and R4 lines with new transit priority achieved significant improvements over the previous local service—each in different contexts. The R6 line achieved 18% savings overall—and up to 20% in the peak periods.
- **Most projects pay for themselves within 10 years.** Faster and more reliable buses can provide more trips each day. They support more efficient schedules and reduce the need to add resources in the future, due to increasing traffic, ridership, etc. We quantified the return on investment (ROI) based on operating cost savings that are realized as bus schedules can be adjusted to take advantage of faster and more reliable bus run times and shorter dwell times at stops. Some projects perform even better, with an ROI of only 1–2 years. Even after the payback period, speed and reliability savings continue to accrue. And projects can reduce the need to add buses in the future to maintain frequencies due to increasing traffic.
- **Service levels affect return on investment.** Projects along high-frequency corridors pay back faster because they benefit many trips.

Travel Time and Return on Investment from Bus Priority

Project Type	# of Projects Evaluated [1]	Travel Time Savings (Weekdays) [2]	Typical Return on Investment [4]
RapidBus Routes [3]	4	20–35%	N/A [4]
Bus Stop Balancing and Optimization [3]	7	5–10%	<1 year
Bus/BAT Lanes	14	Up to 15%	0-10 years
Approach Lanes	6	Up to 35%	5-15+ years
Queue Jumps	6	Up to 15%	< 5 years
In-lane Bus Stops [3]	6	Up to 15%	0–15+ years
Signal Upgrades	14	Up to 20%	0–15 years
Turn and Parking Restrictions	3	Up to 10%	N/A [5]
Routing Adjustments	4	10-25% (or more)	N/A [5]

Notes: 1. Some projects were evaluated for multiple types of improvements and are counted in multiple categories. 2. Daily travel time savings between 6 am and 10 pm. 3. Benefits include both faster travel time between stops AND reduced dwell time at stops. 4. Costs are TransLink's costs, focused on the bus speed & reliability measures where possible (e.g., excluding other RapidBus costs like stop improvements and also associated costs like bike lanes for co-mingled projects. Costs are based on values provided by municipalities in funding applications, funding reallocations, or submitted invoices (if received). The payback periods are theoretical, based on run-time saved, trips per year, and hourly operational costs. 5. RapidBus launch also included significant investments in stop amenities and service increases. The brand is an upgraded service rather than strictly an efficiency improvement. 6. Insufficient data to assess return on investment for some types of projects. Some improvements were part of larger projects and costs could not be isolated.

- **Transit priority works best at scale.** Customers and TransLink accrue the most benefits when priority measures are focused along a corridor or full route—such as RapidBus and bus stop balancing projects that include bus stop consolidation at a corridor level. Larger-scale projects are more likely to yield schedule changes that result in actual operational savings. (See project highlights from “RapidBus” on page 70 and “Bus Stop Balancing” on page 85.)



- **We can reinvest operational savings to expand or enhance service.** For example, we reinvested savings from bus stop balancing into service to launch a new peak-hour bus route along Marine Drive.

Between stops, bus and BAT lanes keep buses moving when streets are congested.

They also make queue jumps, signal priority, and turn restrictions more effective.

At the intersection, queue jumps, signal priority, and turn restrictions help buses get through the lights.

This means they’re able to get to stops faster.

At stops, in-lane stops as well as all-door boarding on RapidBus make it faster to pick up passengers.

Bus stop balancing means spacing stops so that buses are faster and more reliable.

BUS PRIORITY PROJECT HIGHLIGHTS

Project Highlights: RapidBus

RapidBus is TransLink's brand of fast and frequent bus service operating along key corridors in the Vancouver region.

Supported by extensive transit priority, all-door-boarding, and limited stopping, RapidBus routes run all-day, every day—at least every 10 minutes during peak times and 15 minutes during off-peak times.

Passengers also benefit from enhanced passenger amenities such as real-time schedule information and accessibility features such audio information and tactile walking surface indicators.

The first five RapidBus routes (R1–R5) launched in 2020, with extensive new transit priority along three of the routes (R2, R3, and R4) as well as enhancements to 116 bus stops and a significant expansion in service levels, via 110 new articulated buses.

A sixth route, R6, launched in 2024, and represented the biggest service expansion since the pandemic.

Map of RapidBus Projects

Overview of RapidBus Performance

Since its launch in 2020, the RapidBus brand set a target of at least 20% faster service compared to previous local buses.

The three RapidBus routes implemented in 2022 with new transit priority (R2, R3, and R4) achieved 24% to 35% savings in combined run and dwell time on weekdays, compared to comparable local bus routes. This demonstrates success for the RapidBus brand in three different contexts across the region. These savings are due to extensive new transit priority measures as well as shorter dwell times due to bus stop consolidation and all-door boarding onto larger 3-door buses.

- The R2 saved 24% in end-to-end travel time all day, between 5 to 12 minutes.
- The R3 saved 35%, with savings ranging from 11 to 28 minutes.
- The R4 saved 26% overall, ranging from 11 to 19 minutes during the day.
- The R6, the most recently implemented route, achieved overall savings of 18% in combined run and dwell time on weekdays—and an average of 20% savings in the AM/PM Peak. In the PM peak, the savings were 28% (12 minutes per trip) southbound and 20% (9 minutes per trip) northbound.

The two RapidBus routes that were pre-existing routes (R1 and R5) benefited from improved stop amenities, new buses, all-door-boarding, and greater frequencies.

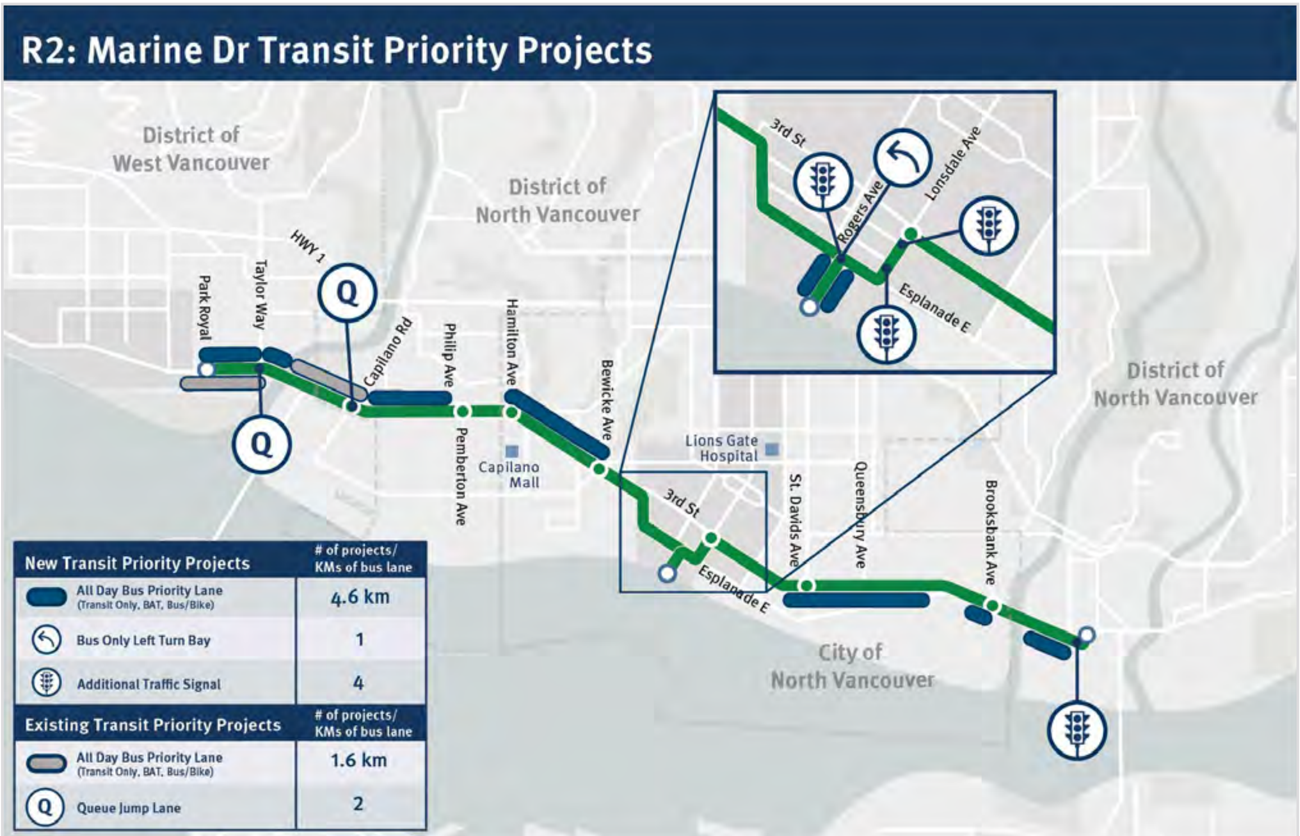
Peer Highlight: In the Seattle (WA) region, King County Metro's RapidRide arterial BRT service has also achieved its goal of up to 20% faster travel time. Ridership increased by 70% on its six lines in service as of 2019, before the pandemic.[40]

RapidBus routes have succeeded in different parts of the region. Top: R4 at Kingsway.
Middle: R3 at Coast Meridian Rd.
Bottom: R2 at Lonsdale Ave.

R2 RapidBus: Marine Drive

The R2 RapidBus runs between Park Royal, Lonsdale Quay, and Phibbs Exchange via Marine Drive, 3rd Street and Main Street. The R2 RapidBus replaced local bus Route 239 and introduced new transit priority including bus lanes, queue jumps, turn pockets, and transit priority signals along with reducing the number of stops, allowing all-door boarding, and improving bus stops.

Map of R2 RapidBus Transit Priority



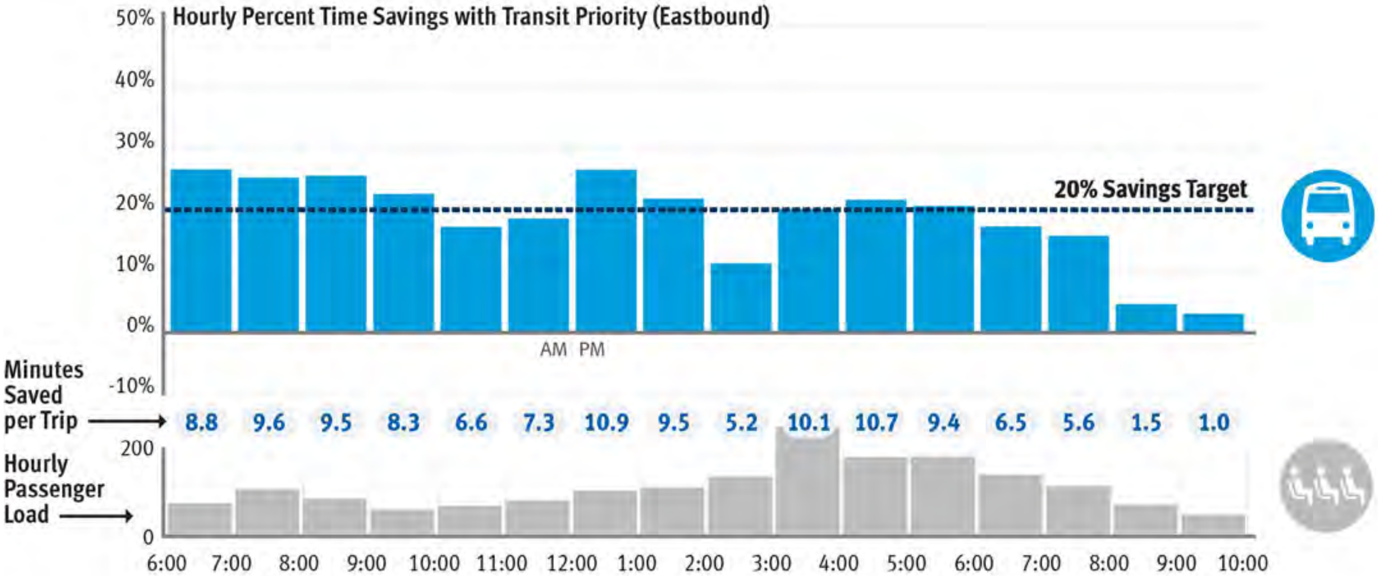
Overview of R2 RapidBus Performance

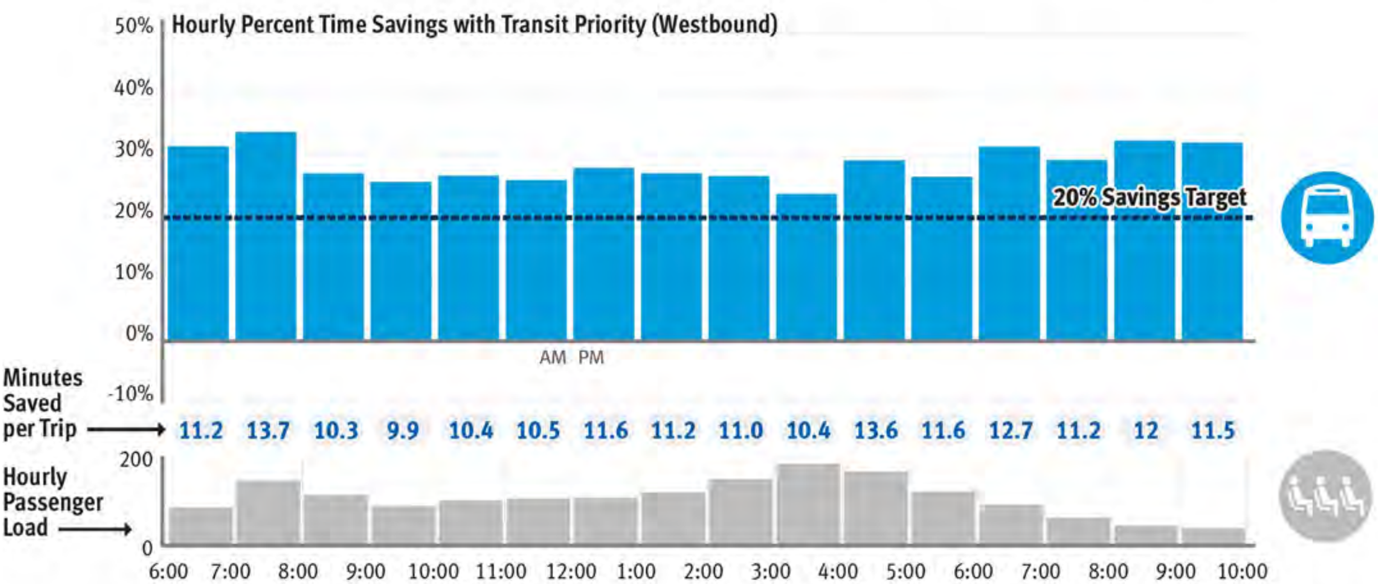
- Compared to Route 239, the R2 RapidBus reduced run time and dwell time by 24% on weekdays between Park Royal and Brooksbank Avenue in the City of North Vancouver.
- Travelling eastbound, the R2 experienced run time savings at all times of the day, with the highest percent savings between 6am–9 a.m., 12 p.m.–1 p.m., and 3 p.m.–6 p.m.
- The R2 experienced higher and more consistent run time savings travelling westbound, exceeding 20% at all times of the day.

R2 Implementation Challenges

- The western terminus of the proposed route was truncated from Dundarave to Park Royal in response to some community members' concerns about service levels and bus priority measures.
- Travel lanes along Marine Dr, 3rd St, and Main St vary between three and one, so transit priority measures for the R2 are intermittent.
- Construction around the Mosquito Creek Bridge delayed implementation of bus lanes originally planned to support the route at launch.

R2 RapidBus Travel Time Savings by Hour, Weekdays, R2 vs Route 239, between Park Royal and Brooksbank Ave





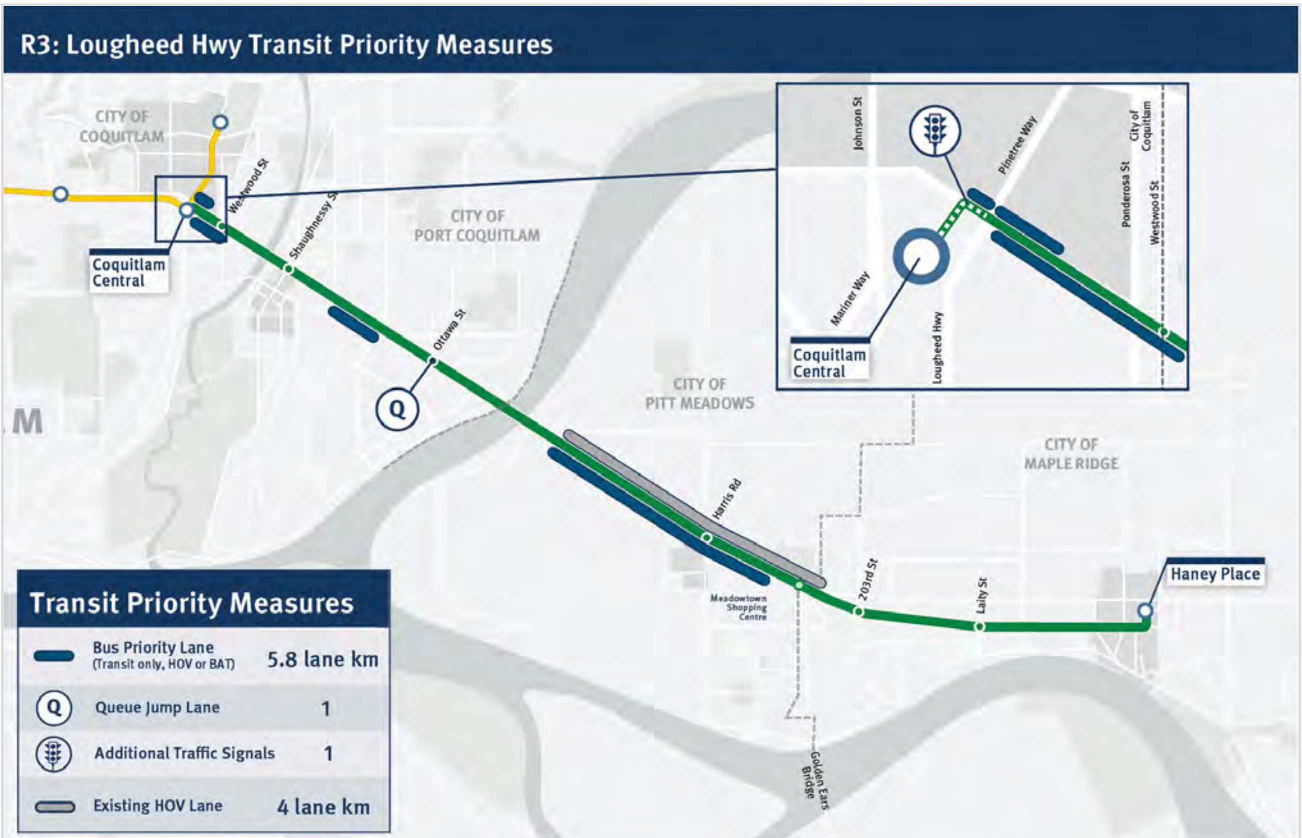
The blue vertical bars (top) show the percentage savings by hour of day, relative to RapidBus' target of 20% faster service compared to previous local buses; the labels below the bars show the average minutes saved per trip. The grey bars (bottom) show the passenger load (number of passengers on board) in each hour.

Note: Based on combined run and dwell time.

R3 RapidBus: Lougheed Highway

The R3 RapidBus runs between Coquitlam Central SkyTrain Station and Haney Place via Lougheed Highway. The R3 largely runs alongside and complements local Route 701. It added bus priority lanes expanding on an existing HOV lane along with providing a more direct route compared to Route 701.

Map of R3 RapidBus Transit Priority



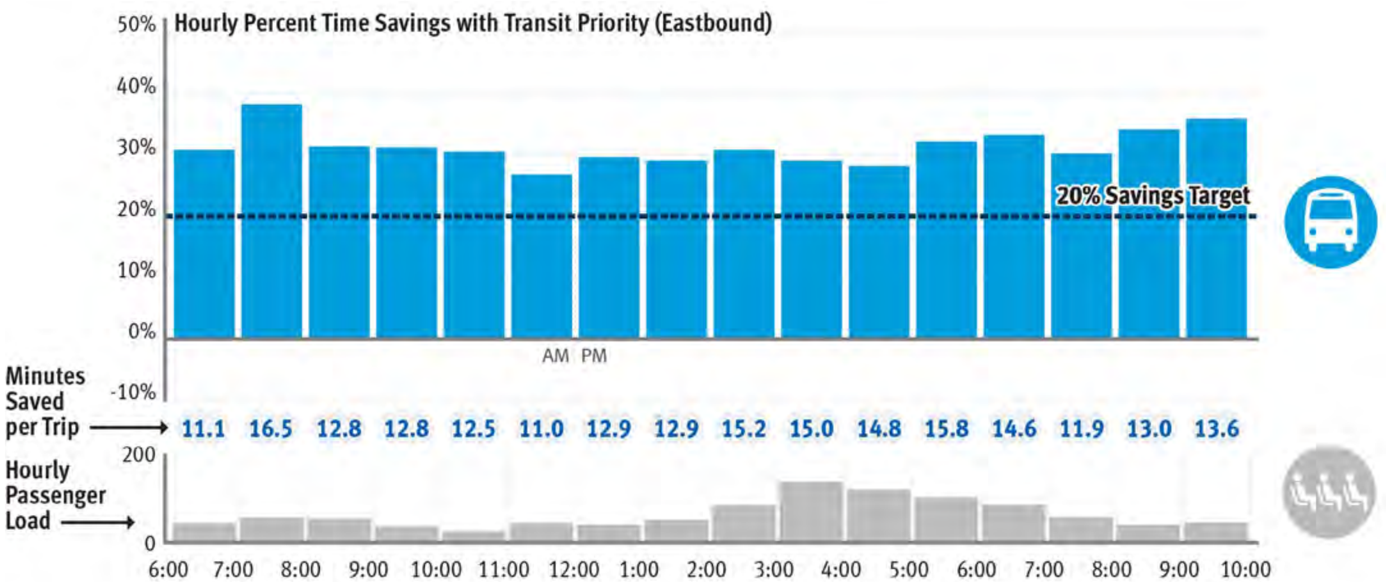
Overview of R3 RapidBus Performance

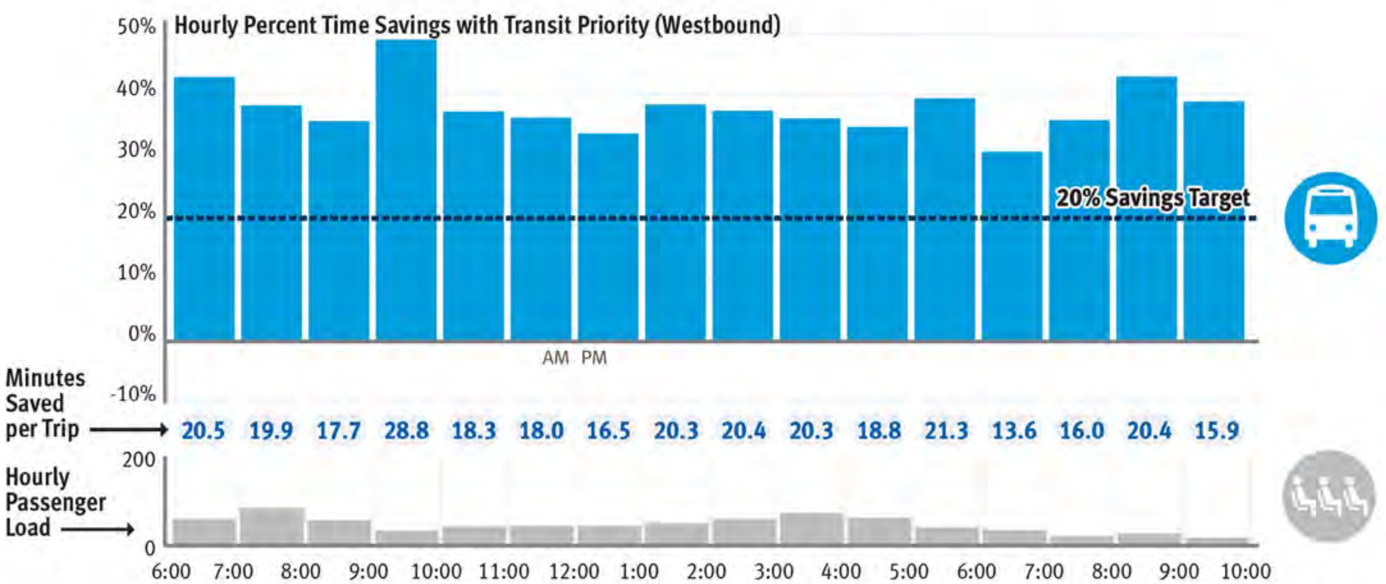
- Travelling both eastbound and westbound, the R3 provided consistent travel time savings at all times of the day, exceeding 30% at all times of the day traveling eastbound.
- This is a significant improvement, providing a much faster transit connection between Maple Ridge and the rest of the region, including a more direct connection to the Millennium Line SkyTrain.
- With average speed (36 km/hr) and stop-spacing (2.45 km) exceeding those of the Canada Line (32 km/hr and 1.22 km), **the new R3 has service attributes comparable to SkyTrain**. This is an example of what can be accomplished with at-grade bus service.
- Largely as a result of the introduction of the R3, ridership in the whole sub-region has been more robust since the COVID-19 pandemic. In fall 2022, Maple Ridge/Pitt Meadows led all sub-regions, with a ridership recovery of 98% since before the pandemic, compared to 79% system-wide.

R3 Implementation Challenges

- The Coquitlam River Bridge is a two-lane bottleneck that is due to be replaced. Implementation of bus priority measures in this area was not possible prior to the launch of R3.

R3 Travel Time Savings by Hour, Weekdays, R3 vs 701





For each direction, the blue vertical bars (top) show the percentage savings by hour of day, relative to RapidBus' target of 20% faster service compared to previous local buses; the labels below the bars show the average minutes saved per trip. The grey bars (bottom) show the passenger load (number of passengers on board) in each hour.

Note: Based on combined run and dwell time.

R4 RapidBus: 41st Ave

The R4 RapidBus runs between UBC to Joyce–Collingwood SkyTrain Station via 41st Ave. The R4 replaced Route 43, the previous weekday-only limited stop service. It also replaced the local Route 41 west of Marine Drive. The RapidBus route added transit priority measures including bus lanes and queue jumps along with turn restrictions and traffic signal changes. The RapidBus launch introduced all-door boarding and provided frequent limited stop service including on weekends.

Map of R4 RapidBus Transit Priority

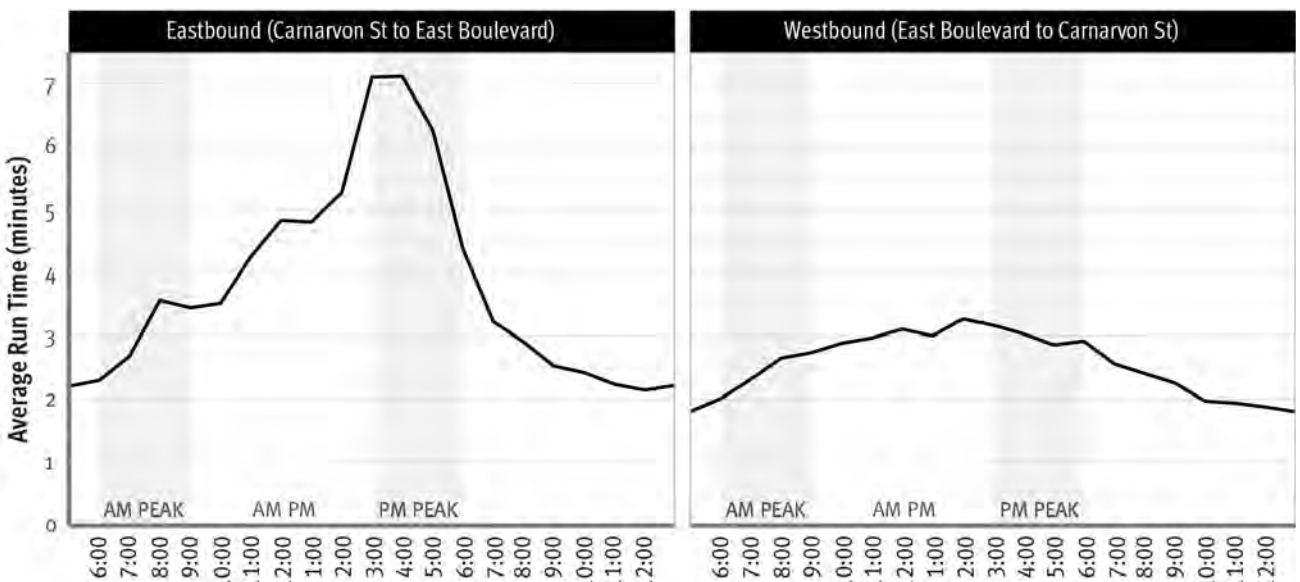
Overview of R4 RapidBus Performance

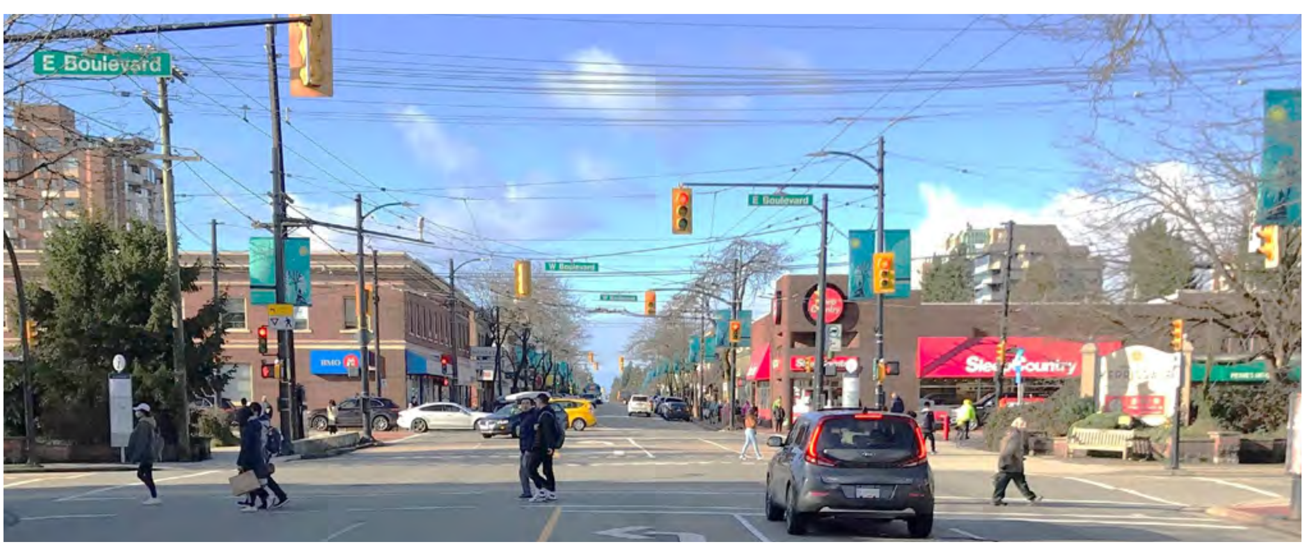
- Comparing the R4 RapidBus with the previous local Route 41, the R4 saw a 26% reduction in run and dwell time between Joyce–Collingwood Station and UBC, and a 29% reduction between Joyce–Collingwood Station and Dunbar St.
- Prior to the implementation of the R4, local Route 41 travelled between UBC and Joyce–Collingwood Station. RapidBus service provided travel time savings of over 20% throughout the day compared to the pre-existing local route, and over 30% at some times of the day.

R4 Implementation Challenges

- Travel lanes along 41st Ave vary between one and two so transit priority measures could not be applied continuously along 41st Ave.
- Along much of the corridor, bus lanes were created by removing on-street parking. This requires additional stakeholder engagement, but expands capacity for both buses and other vehicles.
- Kerrisdale is a retail area that remains a hotspot of congestion along the corridor with delays most evident in the eastbound direction in the afternoon (see charts below). Creative solutions will be required to alleviate this congestion given limited road space and many competing demands—including parking, pick-up/drop-off and pedestrian access.
- Ongoing construction of Oakridge Centre will continue to cause disruptions to bus service until its completion after 2025.

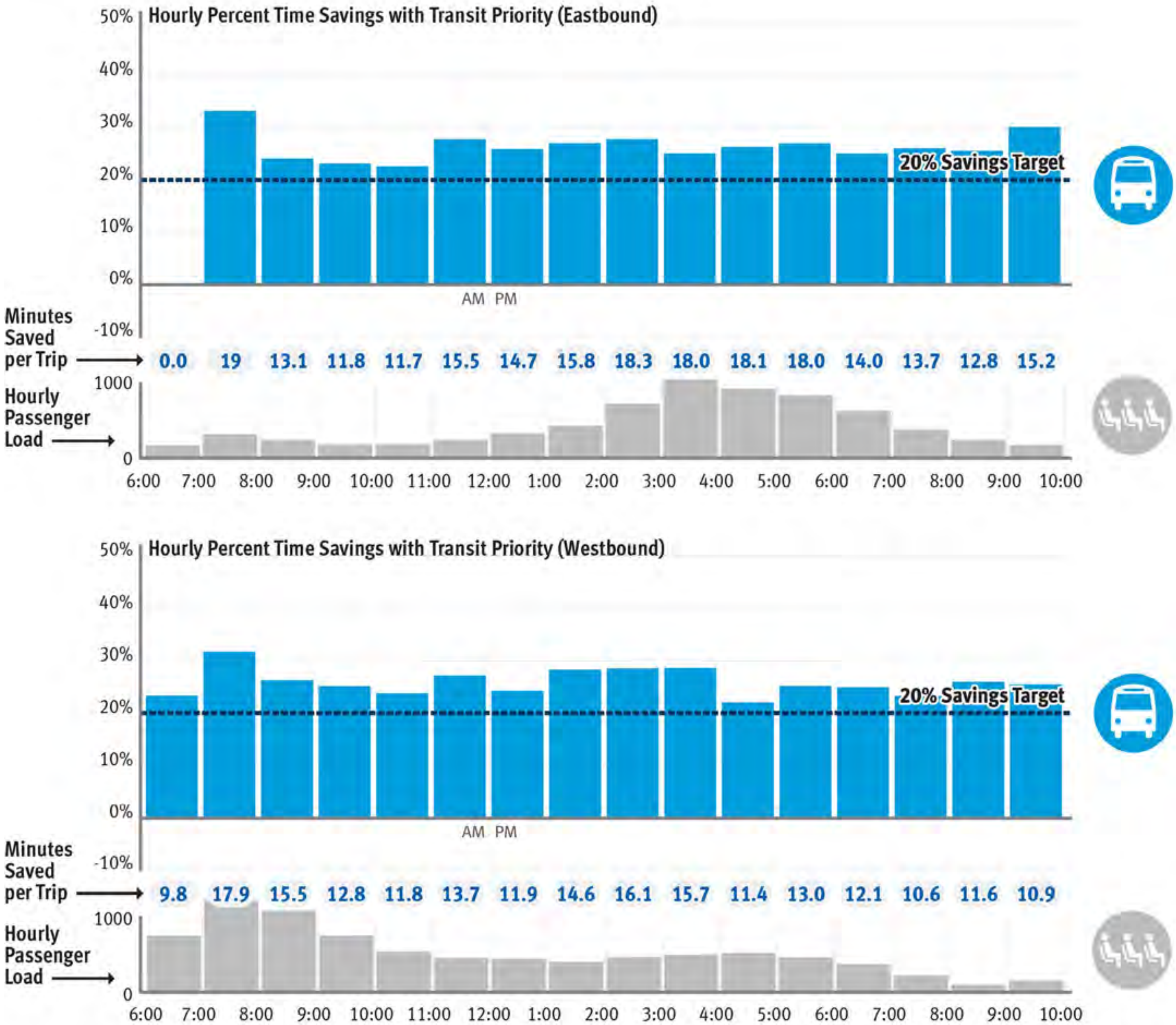
R4 Average Weekday Travel Time by Hour (Excluding Dwell Time) in Kerrisdale between Carnarvon St and East Blvd, Fall 2021





West 41st Ave at East Blvd, facing west.

R4 Travel Time Savings by Hour, Weekdays, R4 vs 41

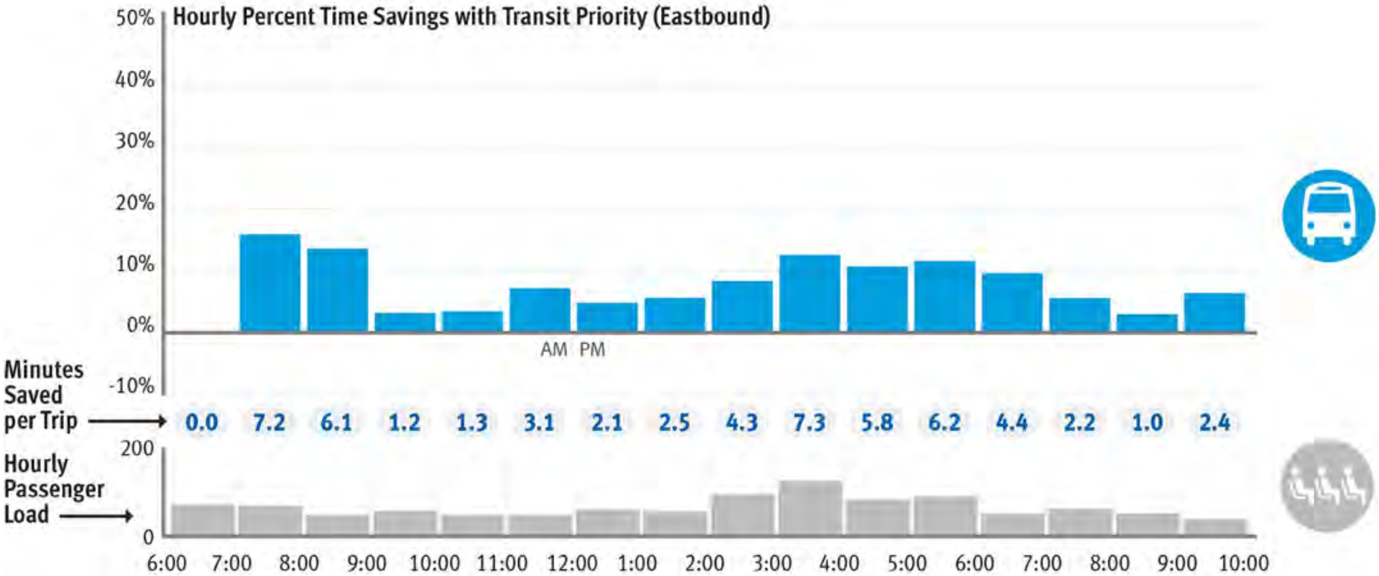


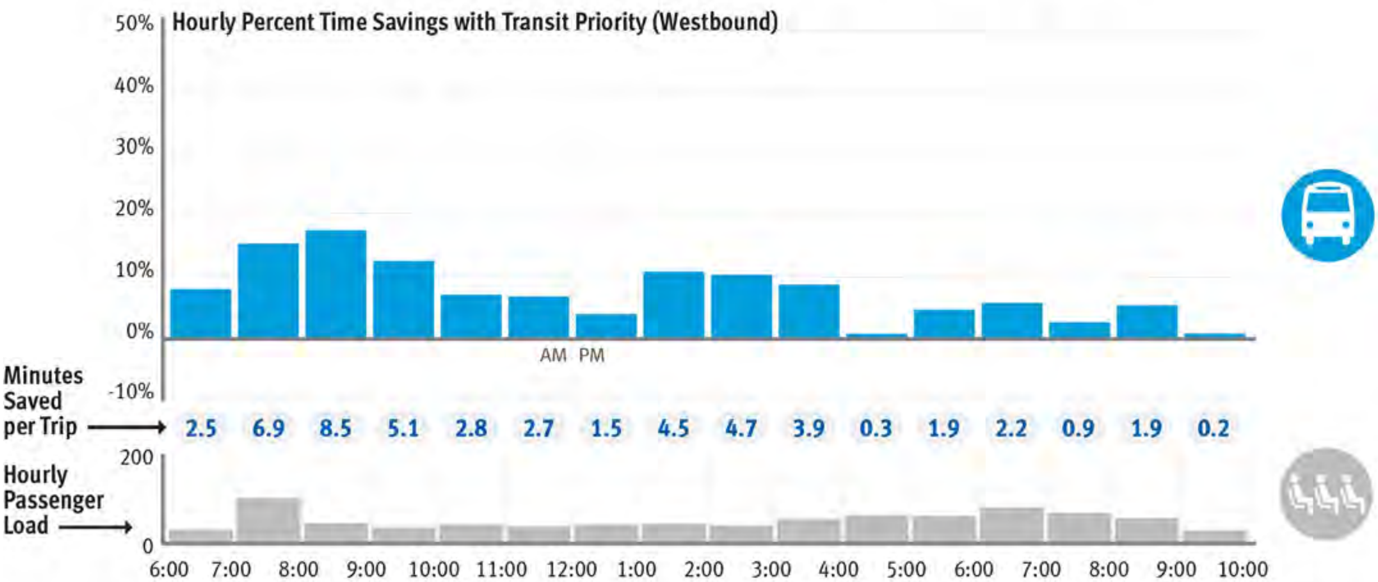
For each direction, the blue vertical bars (top) show the percentage savings by hour of day, relative to RapidBus' target of 20% faster service compared to previous local buses; the labels below the bars show the average minutes saved per trip. The grey bars (bottom) show the passenger load (number of passengers on board) in each hour.

Note: Based on combined run and dwell time.

The local service on Route 41 saw a 9% reduction in run and dwell time, demonstrating transit priority measures benefit all routes that travel on the corridor. Since implementation of the R4, local Route 41 now terminates at Crown Street. The graphic below shows the hourly travel time savings compared to the previous Route 41 between Dunbar Street and Joyce–Collingwood Station. Travel time was lower on Route 41 at all times of the day, exceeding 10% savings during some hours in the morning (both directions), late afternoon (eastbound), and mid-afternoon (westbound).

Local Bus Travel Time Savings by Hour, 41 Before and After, Joyce–Collingwood Station – Dunbar





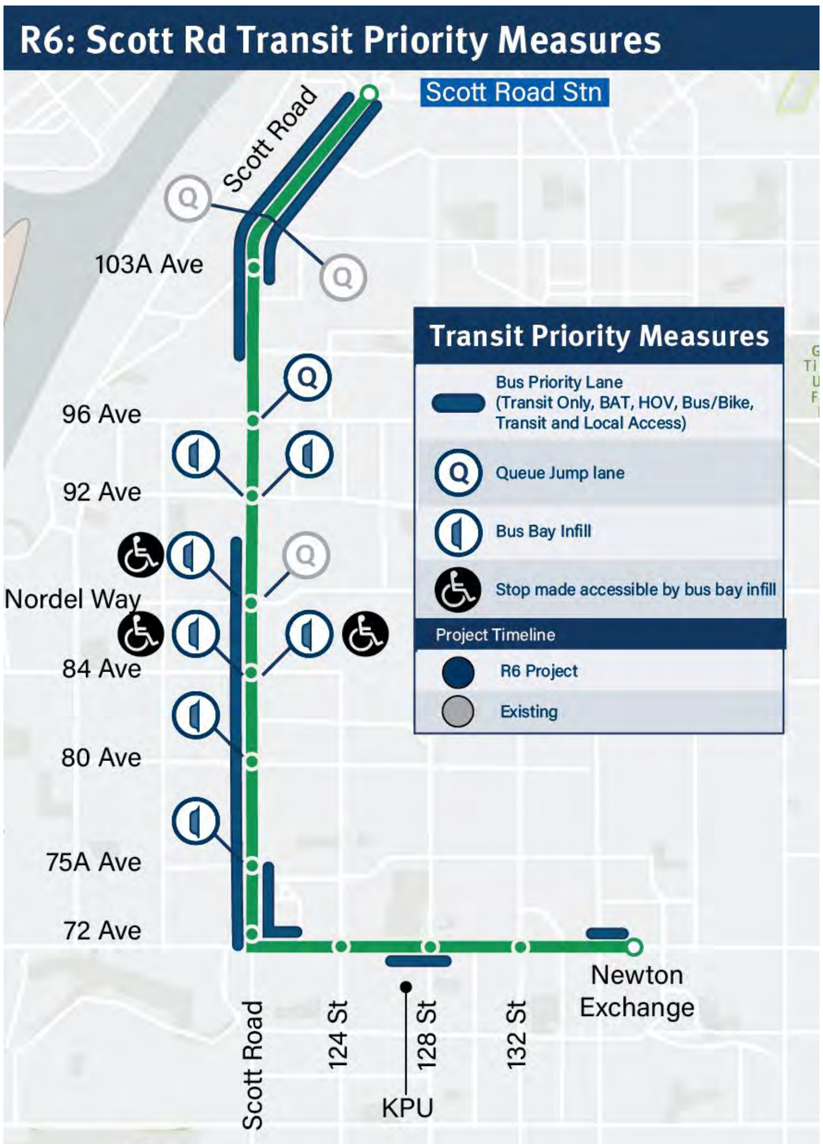
For each direction, the blue vertical bars (top) show the percentage savings by hour of day; the labels below the bars show the average minutes saved per trip. The grey bars (bottom) show the passenger load (number of passengers on board) in each hour.

Note: Based on combined run and dwell time.

R6 RapidBus: Scott Road

The R6 RapidBus connects Scott Road SkyTrain Station with Newton Exchange via Scott Rd and 72 Ave. The RapidBus route added transit priority measures including 8.8 km of bus priority lanes, four queue jumps, and optimized stop spacing with in-lane stops. Route 319 remains in operation at a reduced but still frequent all-day local service that benefits from the transit priority improvements completed for the R6.

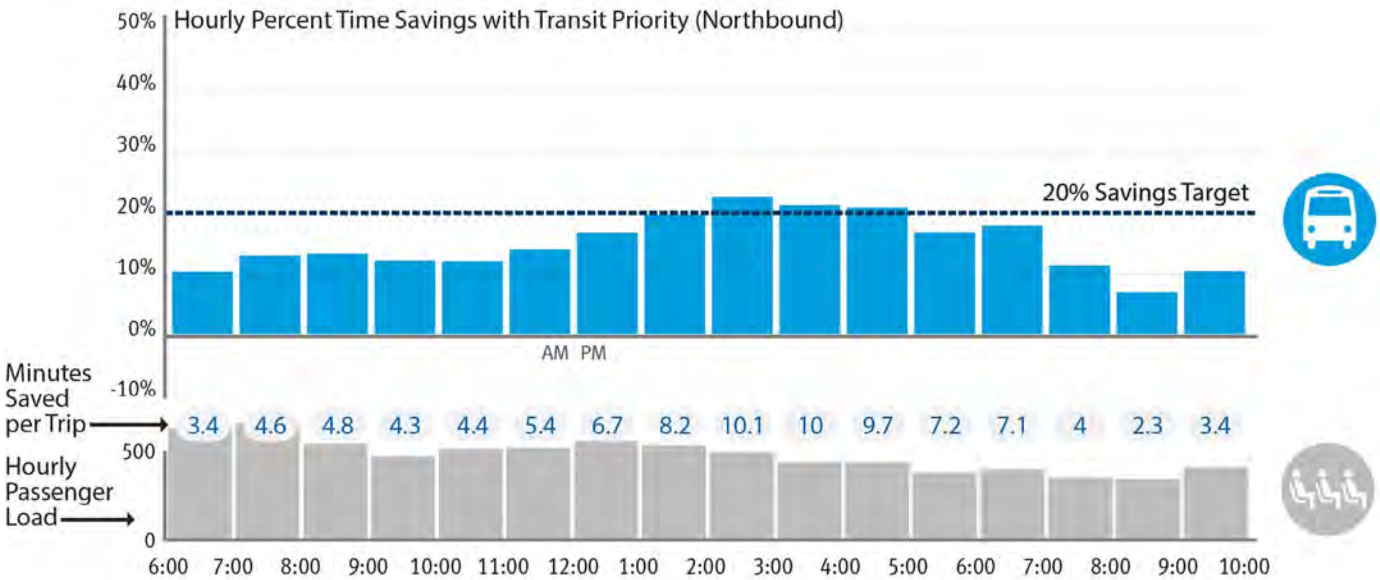
Map of R6 RapidBus Transit Priority

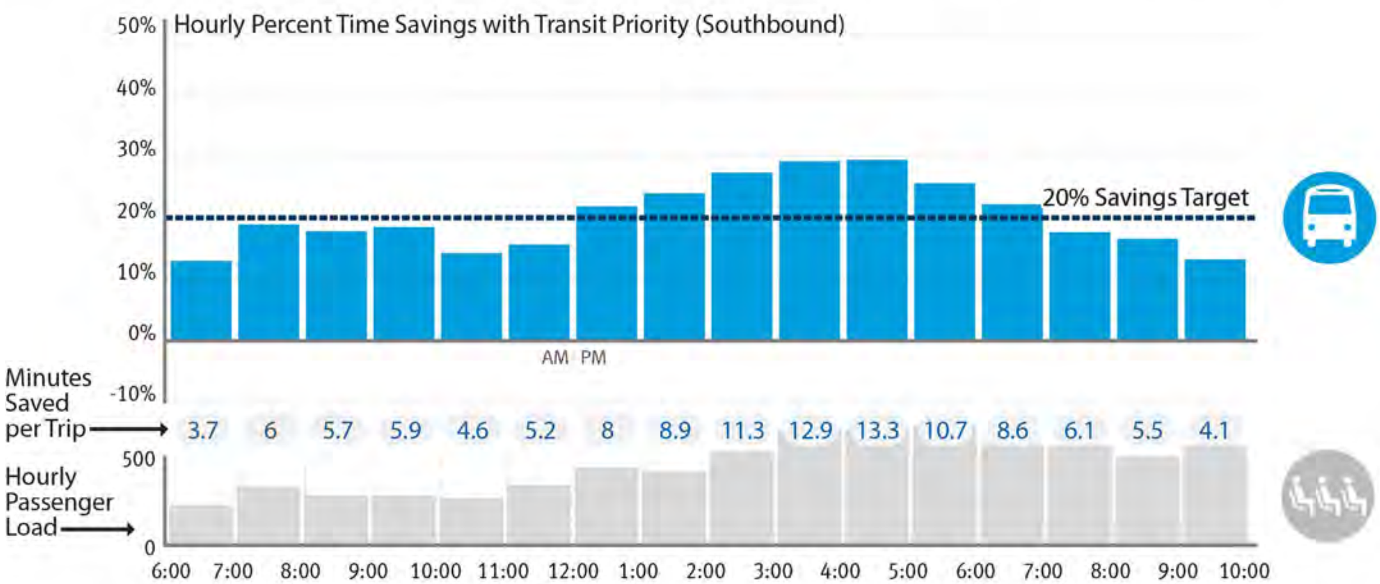


Overview of R6 RapidBus Performance

- Comparing the R6 RapidBus with the local Route 319 prior to the project, the R6 saw a reduction in run and dwell time by 18% overall, an average savings of over 6 minutes per trip, and 20% on average in the AM and PM peak periods. The greatest savings occurred in the PM peak—28% (12 minutes per trip) southbound and 20% (9 minutes per trip) northbound.
- The R6 line carried over 5.2 M people annually in 2024 while Line 319 had 3.0 M boardings (8.2 M total). Combined, R6 and Line 319 had over 1.4 M more boardings in 2024 than the 319 alone in 2023 (6.8 M).

R6 Travel Time Savings by Hour, Weekdays, R6 vs 319





For each direction, the blue vertical bars (top) show the percentage savings by hour of day; the labels below the bars show the average minutes saved per trip. The grey bars (bottom) show the passenger load (number of passengers on board) in each hour.

Note: Based on combined run and dwell time.

R6 Implementation Challenges

- Population in this area—along with traffic and bus ridership—has been growing very quickly.
- Some bus priority measures (e.g., Scott Rd pullout infills project) were implemented before the R6 launch, reducing some of the before/after benefits.
- The R6 required more civil works—including removing medians and moving curbs—to create new bus lanes.
- Construction costs were affected by pandemic inflation, including shortages of materials and labour.

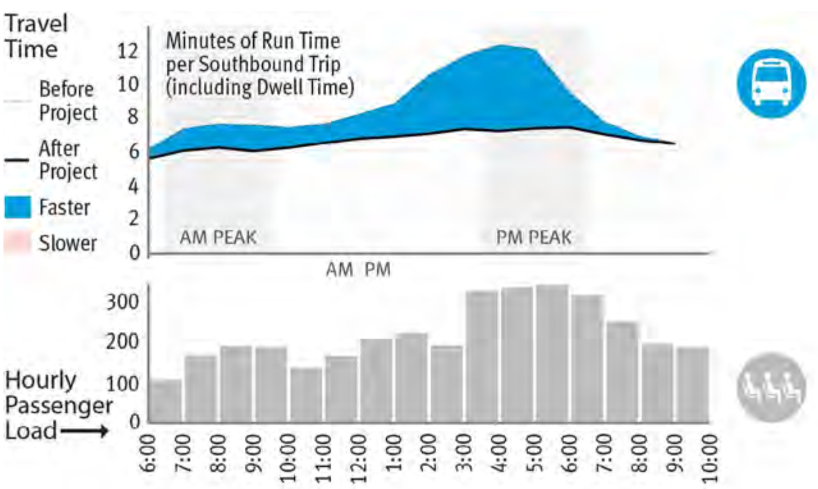
R6 Routing Adjustment between 75A Ave and 124 St

The R6 project adjusted the RapidBus route to run along 72nd Ave and Scott Rd near the Scottsdale Exchange. The map below (left) shows the previous routing, which Route 319 still follows through the Strawberry Hill Shopping Centre and stops at the Scottsdale Exchange. The map below (right) shows the R6 route. The RapidBus project constructed a median station and bus-only left-turn lane to help the southbound R6 turn efficiently onto 72 Ave. The resulting southbound R6 travel time is over 20% lower overall between 75A Ave and 124th St compared to the 319 before the project—nearly 16% lower in the AM peak and 40% lower in the PM peak; average savings of 1 minute to up to 5 minutes per trip (run and dwell time). However, the northbound R6 makes a right-turn onto Scott Road and was 10% slower in this area during the AM peak, but unchanged in the PM peak.

Previous and Existing Route 319 (Before)

R6 RapidBus Routing Adjustment (After)

R6 Travel Time by Hour between Scott Rd & 75A Ave and 72nd Ave & 124 St, Southbound, Weekdays, Fall 2024 vs 2023



This graphic illustrates bus travel time before implementation (dotted line) compared to after implementation (solid line), by hour. Blue shading highlights the run time improvement. The grey bars below the graph shows the hourly passenger load (number of passengers on-board buses). Note: Based on combined run and dwell time.

The RapidBus project constructed a new station and a bus-only adjacent to Strawberry Hill Shopping Centre. Southbound R6 buses use a new median station (above left) and depart the station using a bus-only left-turn lane to turn efficiently onto 72 Ave (above right). Northbound buses stop along the curb.

The R6 RapidBus project integrates vibrant cultural motifs into the design of everyday transit infrastructure. For example, Angela Aujla’s bus shelter glazing, Look Both Ways, at the eastbound stop at Kwantlen Polytechnic University (KPU), is inspired by Sikh iconography.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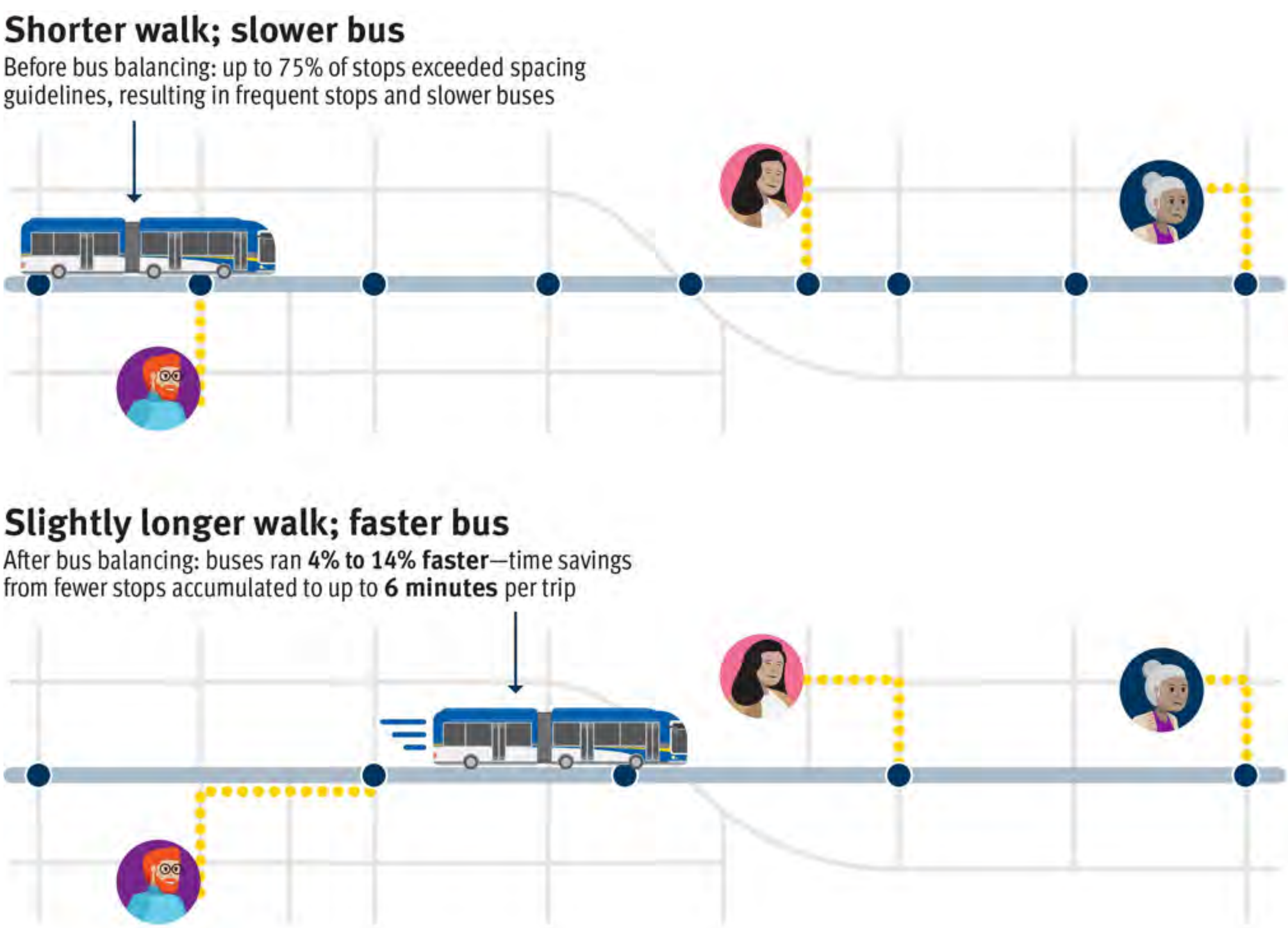
Project Highlights: Bus Stop Balancing and Optimization

Bus stop balancing projects yield savings at scale.

Bus stop balancing involves carefully consolidating or removing bus stops that are too close together, in order to improve travel times and reliability for bus customers. As the name suggests, it aims for a balance between convenient access and effective service. While bus customers must sometimes walk a little bit further to their stop, their trip on the bus will be much shorter.

Bus stop optimization projects address a single or limited number of stops but can still yield a high benefit for a low cost. They often involve shifting stops to the far-side of an intersection—avoiding traffic at an intersection—or to a location where the bus can stop in-lane—avoiding delays due to re-merging into the travel lane.

Bus Stop Spacing Before and After Balancing



Map of Bus Stop Balancing Projects (Routes 2, 4, 7, 17, and 25)

Between 2020 and 2022, TransLink and the City of Vancouver worked together on the Bus Stop Balancing project, which focused on five bus routes. Up to 80% of stops on these routes were closer than TransLink's service guidelines (300 m). After consolidating 86 bus stops, the vast majority of customers could still use their original stop, especially those with mobility limitations, and most customers affected were still within a 2- to 3-minute walk of their original stop. But all customers experienced a significant improvement in travel times. These project areas are illustrated in the map above, which shows only the portions of Routes 4 and 7 where stops were balanced; downtown Vancouver stops were not included in the projects.

Overview of Bus Stop Balancing and Optimization Performance

- On the five routes with rebalanced bus stops, travel time savings averaged approximately 4% to 14% (3 to 6 minutes) across the day.
- Reducing the number of stops most clearly improves dwell time, as buses are less often sitting still at a stop. But run-time is also reduced, as buses spend less time decelerating, accelerating, and merging back into traffic.
- Run time savings are most pronounced during weekday peak periods, when buses can experience more delay from accessing bus stops and re-entering traffic.

- Optimizing timing points—a set location along the route where bus operators wait if they are ahead of schedule—can have a major impact on improving speed and reliability. The removal of the timing point in the Route 2 Bus Stop Balancing project accounted for up to one-third of dwell time savings.
- Bus stop optimization projects have more modest benefits than route-wide rebalancing. They can complement other treatments, and be an important component of larger corridor-scale projects. However individual stop changes can be too small to quantify clearly, and their benefits can be undermined by coincident road changes. For example, the St. Johns & Moody stop relocation was primarily done to accommodate a new bike lane.

Bus Stop Balancing Project Statistics

Map	Route	Sub-Region	Closely Spaced Stops Before [1]	Closely Spaced Stops After [1]	Change in Travel Time Daily [2] 6am–10pm	Change in Travel Time [2] AM/PM Peak	Cost-Benefit Payback Period [3] Years
5	Route 2	Vancouver/UBC	81%	45%	**-11%**	**-14%**	**0.3**
6	Route 4	Vancouver/UBC & Burnaby/New Westminster	65%	48%	**-8%**	**-7%**	**-**
7	Route 7	Vancouver/UBC	77%	52%	**-7%**	**-4%**	**-**
8	Route 17	Vancouver/UBC	76%	56%	**-6%**	**-7%**	**0.6**
9	Route 25	Vancouver/UBC & Burnaby/New Westminster	52%	33%	**-6%**	**-6%**	**0.4**

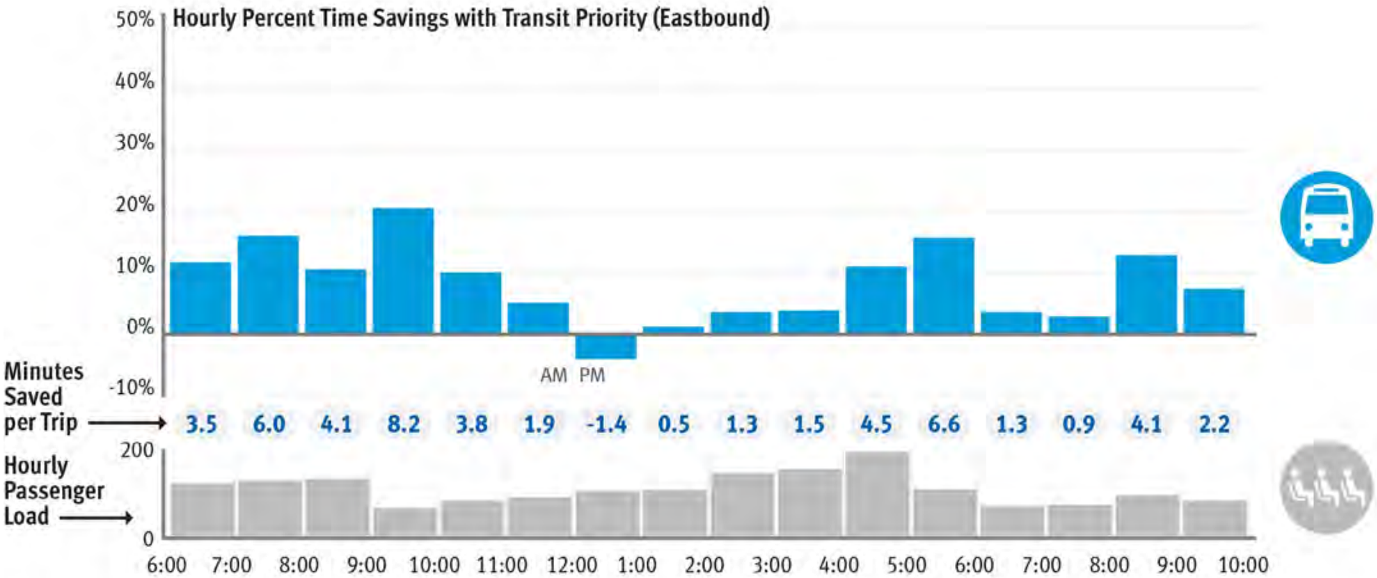
Notes: 1. Closer than the recommended 300m per TransLink's Service Guidelines before implementation. 2. Daily average change per trip, for trips between 6 am and 10 pm, including run time and dwell time. 3. Costs are based on values provided by municipalities in funding applications, funding reallocations, or submitted invoices (if received). Some projects lacked sufficient cost data to estimate a payback period. Benefit is based on travel time savings, the number of bus trips, and the monetized value of bus service hours. Both cost and benefit values reflect evaluation-year dollars and are not inflation-adjusted.

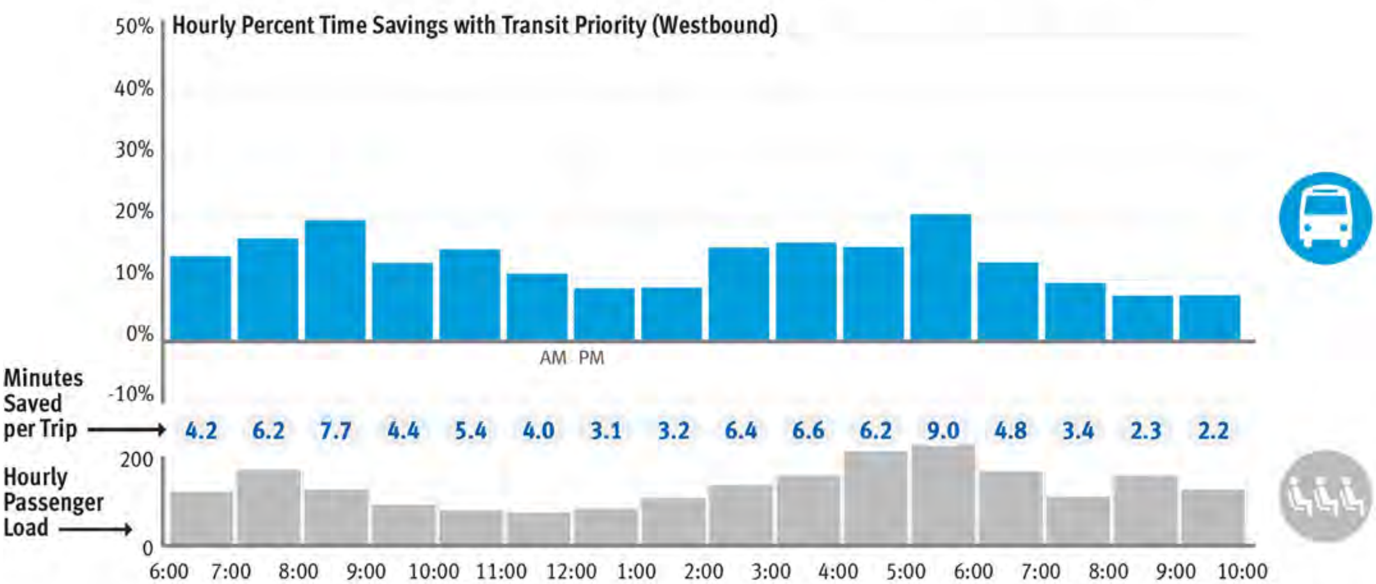
Bus Stop Optimization Project Statistics

Map	Project Name	Sub-Region	Year Evaluated	Change in Travel Time Daily [1] 6am–10pm	Change in Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	Cost-Benefit Payback Period [3] Years
10	Commercial Drive (2nd to 4th) - Bus Stop Optimization & Bus Bulbs	Vancouver/UBC	2025	**-4%**	**-3%**	-	**20**
11	St. Johns & Moody - Relocate EB Stop	Northeast	2025	**16%**	**14%**	> 5%	**-**

Notes: 1. Transit travel time change is a trip-weighted average calculated by hour from TransLink AVL data for the before and after time periods. 2. Background auto travel times are provided where relevant data was available and slowing due to traffic was significant. 3. Costs are based on values provided by municipalities in funding applications, funding reallocations, or submitted invoices (if received). Some projects lacked sufficient cost data to estimate a payback period. Benefit is based on travel time savings, the number of bus trips, and the monetized value of bus service hours. Both cost and benefit values reflect evaluation-year dollars and are not inflation-adjusted.

Bus Stop Balancing: Example of Travel Time Savings Achieved on Route 2

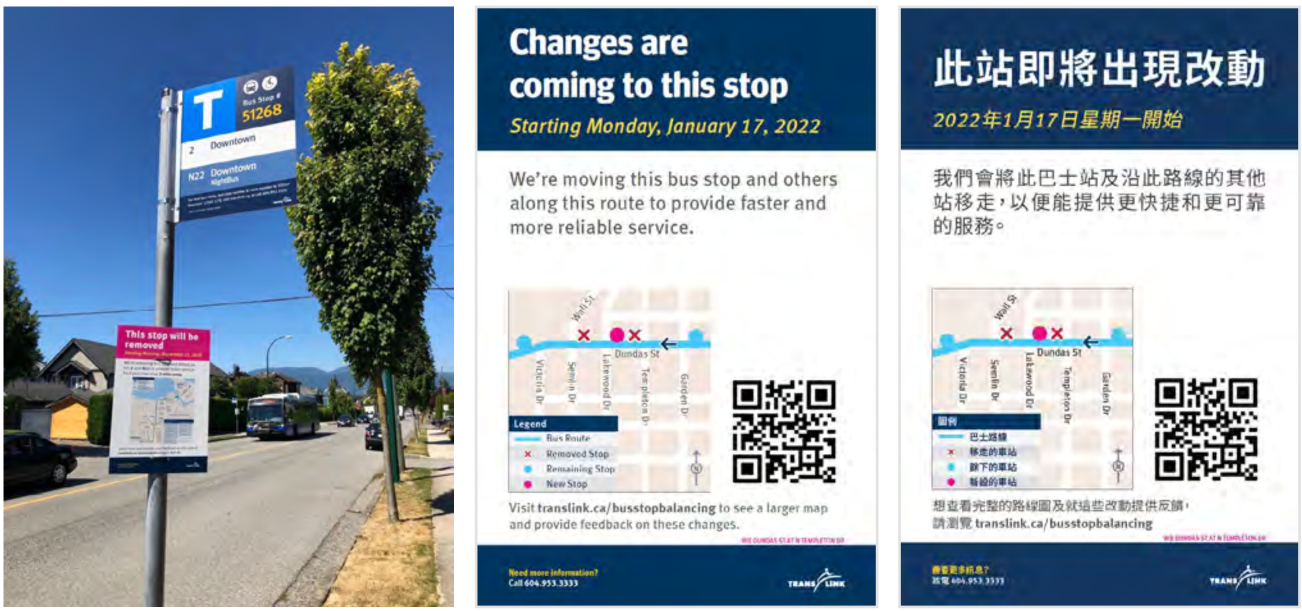




The blue vertical bars (top) show the percentage savings by hour of day; the labels below the bars show the average minutes saved per trip. The grey bars (bottom) show the passenger load (number of passengers on board) in each hour. After bus stop balancing, eastbound travel on Route 2 saw mostly decreases in travel time, with travel time savings of up to 20% in some hours of the day.

Considerations for Future Projects

- Corridors with very close and busy stops benefit the most. These are often concentrated in downtown areas.
- Bus stop relocations should be carefully evaluated to avoid unanticipated new sources of delay, including merging challenges and the impacts of other roadway changes, such as new bike lanes or traffic signal phases.
- It is important to avoid increasing walking or rolling distances to bus stops for people with accessibility needs, especially if their new route would involve a steep slope.
- Financial payback is typically very high, but public outreach requirements are also high. Staff have a limited amount of time, which constrains the number of corridors that can be implemented at the same time. Additional effort is also required to decommission bus stops after route adjustments have been made.



Bus stop balancing projects require thoughtful public outreach to minimize disruption to customers, including multilingual announcements at stops.

Project Highlights: Bus/BAT Lanes

Bus and BAT lane projects reduced travel times by up to approximately 15%, with payback in less than 10 years.

Lanes reserved for buses protect them from congestion. They may operate all-day or only during certain parts of the day, such as peak-only lanes that primarily benefit commuters. Bus lanes can also be bus-only, or they may be shared with “business access” traffic that turns across bus lanes (BAT lanes) or “high-occupancy" vehicles (HOV lanes). Bus/bike lanes are shared with cyclists. Bus lanes are typically demarcated by diamond-shapes or red paint on the road, along with curb-side or overhead signage.

There are two primary types of bus lanes in Metro Vancouver.

Curb-side bus lanes are cost-effective and quick to implement, often with limited impact to traffic if repurposing parking. Tradeoffs include conflicts with right turning motor vehicle traffic. They also require enforcement and curb management to deter prohibited uses such as parking or loading in the bus lane.

Offset bus lanes run between an on-street parking lane and a through-traffic lane and reduce competition with right-turning vehicles as well as delivery and loading vehicles. Offset bus lanes preserve parking and loading along the curb. Tradeoffs include friction between buses and vehicles that are parking or double-parked. Because passengers cannot board directly from the curb, bus bulbs can be provided additional space for passengers at bus stops and improve pedestrian safety (e.g., shorter crossing distances).

Overview of Bus and BAT Lane Project Performance

- Both peak hour and all-day bus lanes were effective at decreasing travel time. These were evaluated only during the hours the lanes were in operation.
- In general, clearly marked, red, bus-only lanes perform the best. These included the two most effective projects—Wesbrook Mall bus lane (a curb-side lane) and West Keith Rd transit project (an offset lane).
- Bus lanes that are shared with business access traffic did not perform as well, especially in areas where buses encounter frequent intersections or queues of right-turning vehicles. This includes the least effective project—the W Georgia St bus lanes. Notably this project also showed a slight worsening at the peak periods. This is due to increased road delay at the PM peak, during which there had previously been a peak-only business-access bus lane.
- However, BAT lanes with limited or no friction with right-turning vehicles can perform very well —notably on 152 St from 96 to 98 Ave, which is effectively a bus-only lane, and the Highway 99 Bus-on-Shoulder Transit Lanes, a MOTT-funded project that allows buses to use the shoulder lane during periods of congestion. Both projects reduced bus travel times 15-20%, and the bus-on-shoulder project saved up to 2 to 3 minutes per trip in the PM peak.
- The most cost-effective project achieved savings at scale, using low-cost interventions. Although the 49th Ave transit project did not have the highest percentage improvement in travel time, by changing lane markings across a more than 5 km corridor, it achieved greater absolute savings (more than 75 seconds at the AM peak). And, relying primarily on street signage and roadway paint—which are relatively cheap—it achieved a payback period of less than 6 months.

Bus and BAT Lane Project Statistics

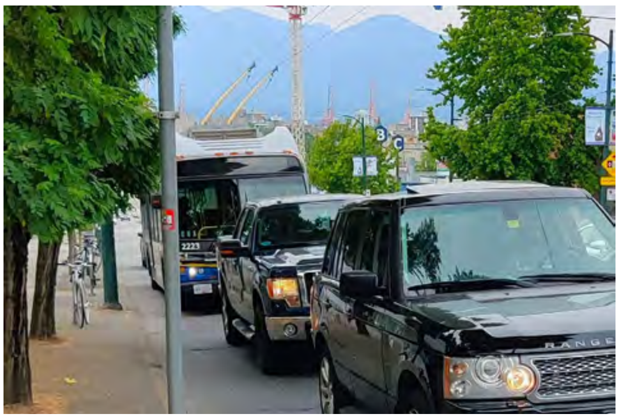
Map	Project Name	Sub-Region	Year Evaluated	Time Restrictions	Change in Travel Time Daily [1] 6am–10pm	Change in Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	Cost-Benefit Payback Period [3] Years
62	Bridgeport Road - Bus Connection [5]	Southwest	2025	-	-26%	-22%	-	-
24	152 St from 96 to 98 Ave - BAT Lane	Southeast	2025	-	-20%	-19%	-	>20
26	Highway 99 - Bus-on-Shoulder Transit Lanes [5]	Southwest	2025	-	-17%	-18%	-	-
18	Wesbrook Mall - Bus Lane	Vancouver/ UBC	2023	-	-15%	-13%	-	5.7
13	West Keith Road - Transit Project	North Shore	2023	-	-9%	-9%	-	9.9
14	Kennard Intersection Transit Improvements (KITI)	North Shore	2025	-	-7%	-12%	-	> 20
15	Granville St - Bus Lanes	Vancouver/ UBC	2023	SB: 3–6pm, NB: 7–10 am	-6%	-7%	-	4.8
21	Lougheed Hwy - Bus Lanes [4]	Northeast	2023	-	-5%	-11%	-	[4]
16	49th Ave - Transit Project	Vancouver/ UBC	2023	Various time-restricted segments	-4%	-5%	-	0.4
12	East 3rd St - Bus Lanes [4]	North Shore	2023	-	-4%	-4%	-	[4]
17	Main St and Kingsway - Bus Lanes	Vancouver/ UBC	2023	SB: 3–6pm, NB: 7–10 am; portion 7am–7pm, 7 days	-4%	-4%	-	8.3
22	Langley City - Bus Lanes	Southeast	2023	-	-3%	-3%	-	7.7
19	W Georgia St - Bus Lanes	Vancouver/ UBC	2023	Extended peak-only lane to 7am–7pm	-3%	5%	-	1.5
20	Burrard - Extension of NB/ SB Bus Lane Hours	Vancouver/ UBC	2025	Extended to 7–10am NB, 3–7pm SB, M–F	-	-3%	-	-
23	KGB between 72 Ave and 74 Ave - NB Bus Lanes	Southeast	2025	-	-0.3%	-3%	> 35%	-
25	Scott Rd / 120 St from 75A Ave to 72 Ave - BAT Lanes	Southwest & Southeast	2023	-	4%	3%	> 5%	-

Notes: 1. Transit travel time change is a trip-weighted average calculated by hour from TransLink AVL data for the before and after time periods. 2. Background auto travel times are provided where relevant data was available and slowing due to traffic was significant. 3. Costs are based on values provided by municipalities in funding applications, funding reallocations, or submitted invoices (if received). Some projects lacked sufficient cost data to estimate a payback period. Some of the projects listed were constructed using temporary/interim measures, while others may be more permanent and have different associated costs. Benefit is based on travel time savings, the number of bus trips, and the monetized value of bus service hours. Both cost and benefit values reflect evaluation-year dollars and are not inflation-adjusted. 4. Subset of a project constructed as part of RapidBus implementation. 5. Where stop-to-stop distances are long, segment travel times are derived from GPS ping data rather than stop events, which reduces sample size.

Considerations for Future Projects

Bus lanes are complementary with other transit priority treatments.

- *Turn restrictions* can be used to prevent cars from queuing to turn at intersections, such as where right-turns may block bus lanes. Limiting turn movements at intersections can also prevent traffic from backing up.

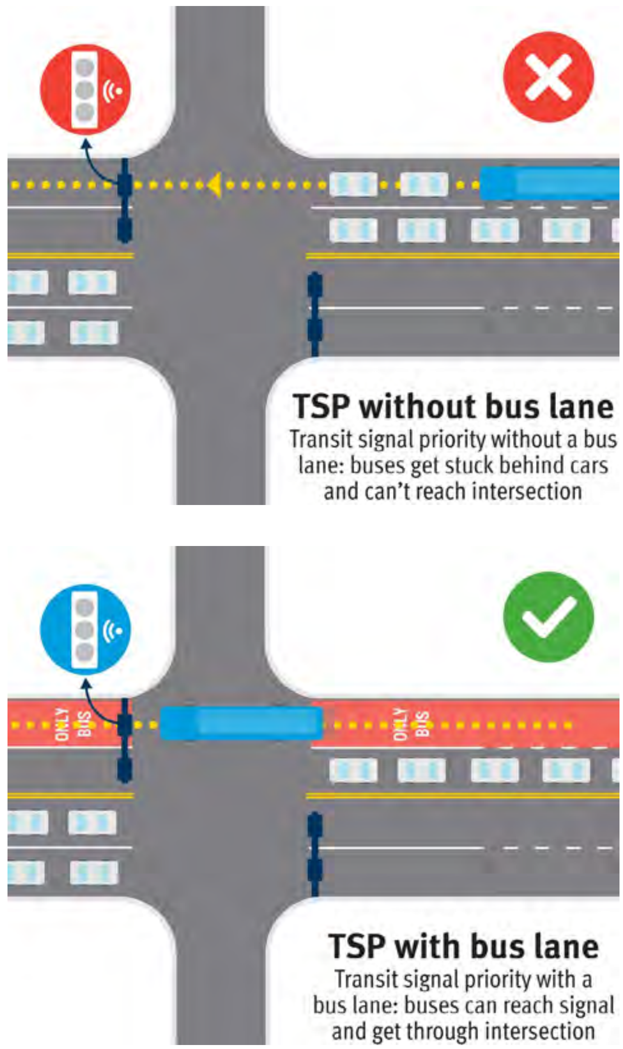


Cars blocking the 7am-7pm bus-only lane on Main St at 5th Ave.

- *Right-turn pockets and advanced right-turn signals or phases* can separate buses from queued vehicles where there are many right turn movements and pedestrian crossings.

Right: The curb lane on 152 St from 96 to 98 Ave in Surrey functions like a bus-only lane because there are very few right-turning vehicles.

- *Transit signal priority (TSP)* benefits from bus lanes. TSP may not function effectively if a bus is stuck in traffic and is unable to activate signal priority (top right panel). Bus lanes make transit signal priority systems more effective by allowing buses to be detected reliably and far in advance of the intersection (bottom right panel).



Clearly marked and well-enforced bus lanes work better. Confusing signage and inadequate enforcement of drivers blocking the bus lane reduce their effectiveness. Strategies that other regions have used to keep buses moving smoothly through bus lanes include:

- ***Follow-up on quick build projects with permanent improvements.*** Many bus lane projects implemented in 2020 were installed using side-mounted signage for quicker project delivery. Once improvements are demonstrated to be effective, it is also important to construct permanent and more visible bus lane markings and signage.
- ***Make lanes visible.*** Many cities and transit agencies are using red-coloured pavement treatment to discourage unauthorized vehicles from using transit lanes. A study of red bus lanes in San Francisco found they reduced the number of drivers violating the lanes by approximately 50%.
- ***Increase awareness of bus lane policies and hours*** by ensuring clear and consistent signage. A variety of signs are used in bus and HOV (High-Occupancy Vehicle) lanes in Metro Vancouver.[30] Drivers may not understand that a diamond lane is a bus-only lane. Many people interpret it as an HOV lane (and drivers of electric vehicles interpret it as "EV OK"). Improved overhead signage can communicate when bus lanes can be shared with HOVs or bicycles, and when they are reserved exclusively for bus travel.

The Kennard Intersection Transit Improvements on the North Shore benefited from the combination of bus lanes and signal priority.

The red bus lanes along Wesbrook Mall are clearly demarcated.

The bus lane along Keith Rd is supported by red paint, a right-turn pocket, and a left-turn restriction at the intersection with Bewicke Ave.

Provide consistent reinforcement to deter drivers from stopping in the bus lanes and establish a culture of keeping bus lanes clear. Active enforcement of cars in the bus lane (pick-ups/drop-offs, deliveries, double parking) keeps the bus lane clear and reminds drivers not to stop in the bus lane. See the "Automated Bus Lane Enforcement" section on page 95 for additional details, case studies, and implementation considerations.

Bus lanes benefits are most durable when they are reserved for buses only. As described elsewhere in this report (see “Existing Bus Priority in Metro Vancouver”), much of our existing bus priority lane infrastructure allows high-occupancy vehicles. Benefits from HOV lanes may decline in the future as more vehicles are allowed to use those lanes (see “HOV Lanes and Electric Vehicles” below).

HOV Lanes and Electric Vehicles

High-occupancy vehicle (HOV) lanes are reserved for vehicles carrying multiple occupants, typically two or more people—to support more efficient use of limited road space. They comprise about half the Vancouver region’s bus-priority infrastructure. (By contrast, only buses can use “bus-only” lanes.)

In British Columbia, electric vehicles (EVs) are also permitted to use HOV lanes—regardless of the number of passengers—where allowed by roadside signage. This access was introduced as an incentive to support early adoption of zero-emission vehicles. As EVs become more common on our roads, however, this policy can create tension with the original purpose of HOV lanes: moving the greatest number of people efficiently.

The number of EVs on the roads in British Columbia has increased rapidly. In 2024, zero-emission vehicles accounted for approximately 22% of new light-duty vehicle sales and the CleanBC Roadmap and the Zero-Emission Vehicles Act includes a requirement that 26% of new light-duty vehicle sales be zero-emission vehicles by 2026 and 100% by 2035 [1].

While EVs help reduce emissions, they do not reduce congestion—and in large numbers they will slow down buses in HOV lanes. Provincial analysis has projected that increasing EV use could begin to diminish the congestion-reduction benefits of HOV lanes by 2027 [2]. Policy changes since that analysis—including removal of the EV “OK” decal requirement in 2025, allowing EV access everywhere permitted by signage—may accelerate the timeline at which EV volumes begin to affect HOV lane performance.

Other jurisdictions have addressed this tension by limiting or phasing out EV access to HOV lanes, returning these lanes to their original function of prioritizing vehicles carrying multiple occupants, such as buses. As EV adoption continues to increase, monitoring bus performance in HOV lanes can help inform future policy decisions.

Sources:

1. Ministry of Energy and Climate Solutions, Zero-Emission Vehicle Update 2024, April 2025.

2. Ministry of Transportation and Transit, EV HOV Lane Capacity and Utilization, March 2022.

New Technologies: Automated Bus Lane Enforcement

Why It Matters

Illegal intrusions into bus lanes and bus stops cause safety issues and persistent frustration for customers and bus operators alike. These blockages prevent buses from pulling fully to the curb, or deploying the front-door assistance ramp —forcing passengers to alight into traffic or onto muddy surfaces. This disproportionately affects people with disabilities, wheelchair users, and caregivers with strollers.

The current enforcement method of hotspot policing is resource-intensive and limited to locations where officers can safely observe and stop violators – making broad, consistent enforcement difficult. It is recognized as ineffective as a long-term deterrent. Violations can compound as drivers observe others getting away with them, normalizing the behavior. As regions invest in bus priority measures and BRT systems, there is a need to ensure the safe and efficient movement of people along these routes; automated systems with always-on, efficient, and scalable enforcement are one proven tool to protect investments made in bus priority infrastructure and ensure the safety of bus riders at stops.

What's New

Modern automated bus lane enforcement uses cameras near the windshield of the bus to detect violations as they occur in front of the vehicle. Like existing red light and speeding automated enforcement programs, human reviewers generally confirm any violation recorded by the system, before notices or penalties are issued.

Automated bus lane enforcement programs levy fines on offending drivers which in many cases are reinvested into transportation safety, bus speed and reliability projects, or increased service frequency—amplifying the benefits beyond the immediate public safety and transit operation improvements.

Example: ACE Program
MTA, New York City, NY

New York City's Metropolitan Transportation Authority launched its Automated Camera Enforcement (ACE) program in October 2019, establishing the longest-running and most thoroughly documented bus lane enforcement program in North America. Operating across 1,400 buses on 54 routes serving approximately 980,000 weekday riders, the program has achieved significant safety and operational efficiency outcomes:

- Enforced routes have seen an average 20% reduction in collisions, with the highest-performing corridor—the M14 Select Bus Service—recording a 40% drop in crashes.
- Bus speeds on enforced routes have improved an average of 5%, with select corridors achieving gains as high as 30%.
- Approximately 91% of cited drivers do not reoffend, indicating durable changes in driver behaviour.

Source: Metropolitan Transportation Authority, MTA Announces Bus Lane Camera Enforcement Expanded to Include New Violations, June 2024

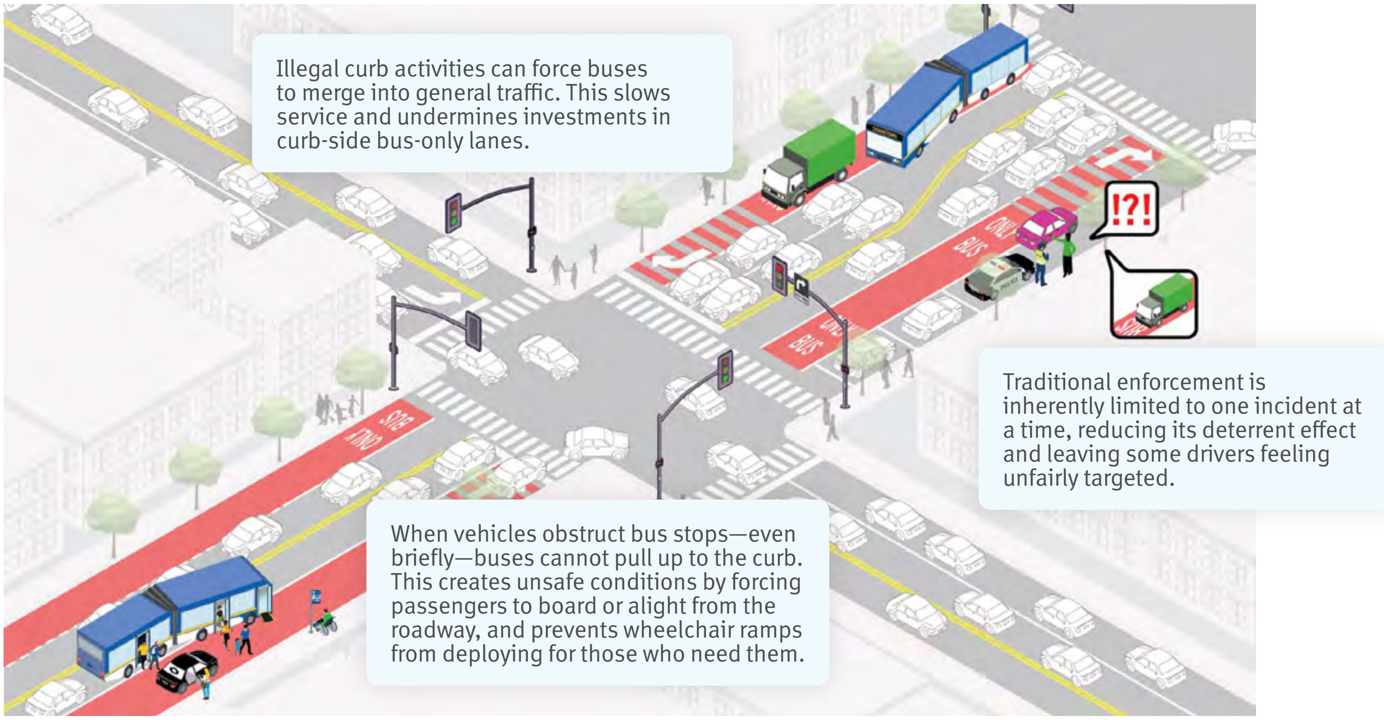
Example: Clear Lanes Program
WMATA, Washington D.C.

WMATA's Clear Lanes program, launched in partnership with the DC Department of Transportation (DDOT) in January 2024, covers all 21 kilometres of D.C.'s dedicated bus lanes and 1,400 bus stops across 31 routes. The program's primary mandate is safety: illegal bus lane and bus stop occupancy creates conflict points between vehicles, buses, cyclists, and pedestrians, and DDOT has since endorsed automated enforcement as a recommended best practice for bus corridor safety management. Within its first year, the program achieved measurable safety and operational outcomes:

- Bus lane violations fell 41% and bus stop violations fell 27%, directly reducing hazardous interactions at stops and along corridors.
- While citywide Metrobus speeds declined 11% between 2019 and 2025, speeds on enforced lanes rose 14% over the same period—a 25-percentage point spread that isolates the operational impact of enforcement.
- Approximately 80% of cited drivers do not reoffend, a figure that is expected to improve as enforcement applicability is expanded to surroundings States, as out-of-state drivers do not receive tickets.

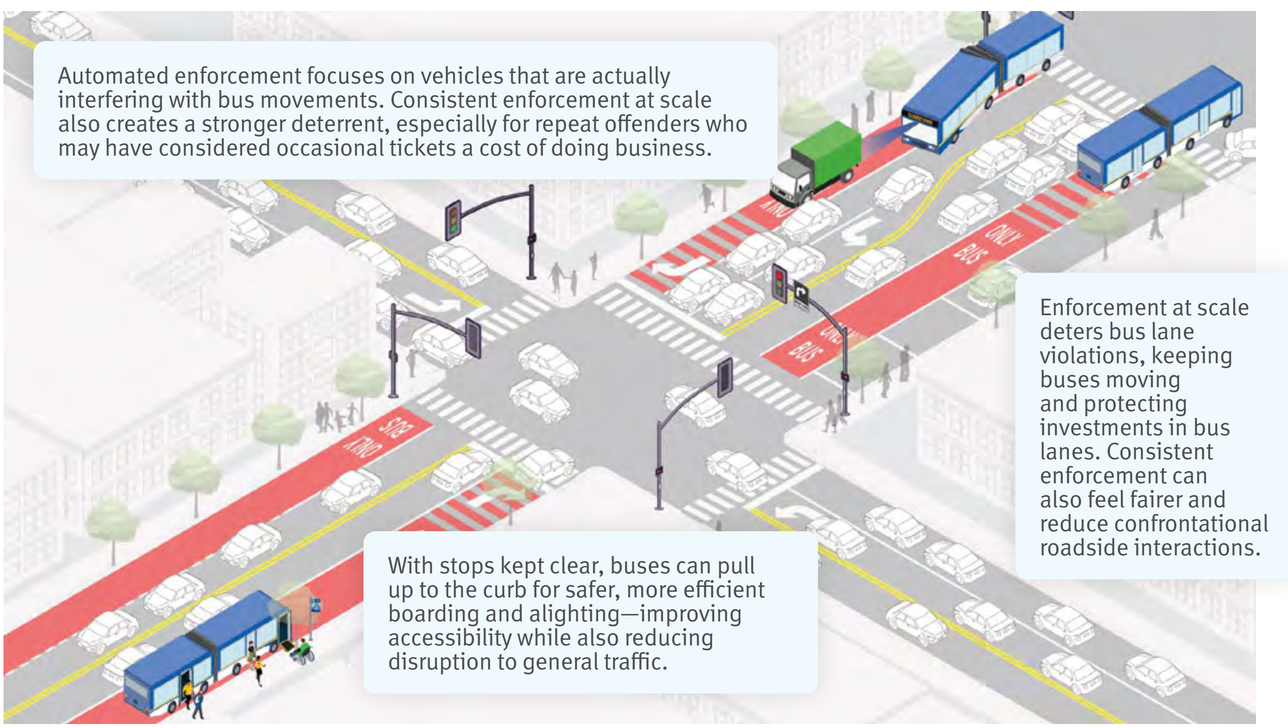
Sources: Washington Metropolitan Area Transit Authority, FY24 Annual Service Excellence Report, September 2024. Washington Metropolitan Area Transit Authority, Authorization of MOU for Reimbursable Agreement to Expand Clear Lanes to Montgomery County, November 2025.

Without Automated Bus Lane Enforcement (ABLE)



When curb-side bus lanes are blocked, buses need to detour around delivery and ride-hailing vehicles, which causes delay and disrupts traffic flow. Buses may not be able to access bus stops to let passengers on and off, or to deploy the front-door assistance ramp for mobility devices and strollers. Consistent enforcement is challenging and doesn't have durable results.

With Automated Bus Lane Enforcement



Automated enforcement helps keep the bus lane clear of pick-ups/drop-offs, deliveries, and double parking. Case studies elsewhere in Canada and North America have demonstrated that new enforcement technologies are effective and have durable results.

Project Highlights: Queue Jumps and Transit Approach Lanes

Queue jumps and transit approach lanes improved travel times by up to 35%, with payback often less than five years.

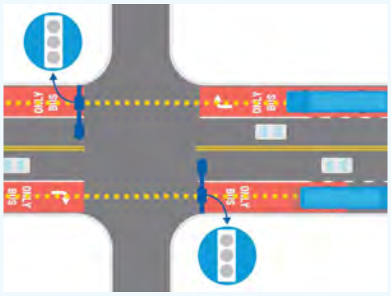
Queue jumps and transit approach lanes allow buses to bypass general traffic at congested intersections, reducing delay at traffic signals.

Transit approach lanes are a dedicated bus lane running through an intersection, allowing a bus to bypass congestion at the intersection.

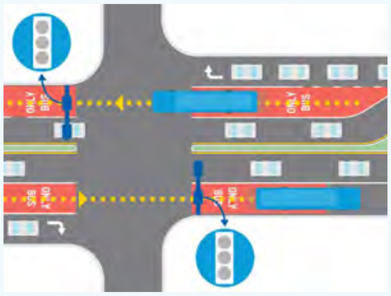
Queue jumps are typically approach lanes that are combined with a specialized transit signal that enables buses to get a head start at the beginning of a new signal cycle. This design is particularly important when there is no receiving bus lane on the far side of the intersection, allowing buses to merge ahead of the traffic. Queue jumps can also be an approach lane with a sensor that recognizes when a bus is at or approaching the intersection, prompting the signal to stay or turn green.

How do queue jumps and approach lanes work?

Queue jump in right-turn lane or BAT lane without a receiving lane. A specialized transit signal and/or phase is required to help the bus transition back into traffic.



Queue jump in right-turn lane or BAT lane. Signal priority is not required but may be complementary.



Dedicated transit approach lane. Signal priority is not required but may be complementary.

Overview of Queue Jump and Approach Lane Project Performance

- Transit approach lanes complemented by a right-turn pocket are most effective—such as those implemented along Joyce Street as part of the R4 RapidBus project. These reduced weekday bus run time by 34% all-day and up to 40% during the PM peak—more than a minute per trip. Likewise, queue jumps on Broadway at Gaglardi Way—supported by a right-turn lane—reduced bus run times by 15% all-day (15 to 65 seconds) and by 13% to 25% during peak periods.
- Queue jumps on Fraser Hwy—which were accompanied by a road widening and right turn restrictions—reduced bus run times by more than 20% at peak times, saving approximately one minute.
- The Edmonds Street approach lanes saw more modest benefits (e.g., 6% savings in the PM peak at Canada Way and 8% savings in the AM peak at Kingsway, but were not effective during some hours of the day. This may be due to high right-turn and/or overall traffic volumes preventing buses from reaching the approach

lanes. Challenges like these may be addressed via adjustments to lane configuration, on-street parking, and/or stop placement.

- Transit priority focused on already-busy intersections can be tricky to evaluate. In locations where overall traffic is increasing, projects can protect buses from slowing down as much as other vehicles. This is likely what happened at KGB & 72 Ave, Kingsway & Willingdon, and Lougheed & Boundary.
- Projects can also be undermined by other changes in context. New residential and commercial developments around Lougheed & Willingdon have increased pedestrian crossings and right-turning vehicles, which obstruct the curb-side BAT lane. And additional signal time was allocated for left-turning vehicles at 96 Ave & 128 St, undermining the benefit of the new queue jump.

Transit Approach Lane Project Statistics

Map	Project Name	Sub-Region	Year Evaluated	Change in Transit Travel Time Daily [1] 6am–10pm	Change in Transit Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	Cost-Benefit Payback Period [3] Years
27	Joyce Street - Approach Lanes (Part of R4 RapidBus) [4]	Vancouver/ UBC	2023	**-34%**	**-33%**	-	**[4]**
32	Highway 99 and 17A - Off-Ramp Widening [5]	Southwest	2025	**-28%**	**-32%**	-	**-**
29	Edmonds St & Kingsway - Approach Lanes	Burnaby/New Westminster	2023	**-2%**	**-2%**	-	**> 20**
28	Edmonds St at Canada Way - Approach Lanes	Burnaby/New Westminster	2023	**0%**	**-3%**	-	**> 20**
31	KGB & 72 Ave - SB Approach Lane	Southeast	2025	**9%**	**9%**	> 40%	**-**
30	Lougheed & Willingdon - Approach Lane	Burnaby/New Westminster	2025	**19%**	**22%**	> 5%	**-**

Queue Jump Project Statistics

Map	Project Name	Sub-Region	Year Evaluated	Change in Transit Travel Time Daily [1] 6am–10pm	Change in Transit Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	Cost-Benefit Payback Period [3] Years
37	Fraser Highway - Queue Jumps	Southeast	2023	**-15%**	**-21%**	-	**3.3**
33	Broadway and Gaglardi Way - Queue Jumps	Burnaby/New Westminster	2023	**-15%**	**-15%**	-	**4.1**
34	Edmonds & Griffiths - Queue Jump	Burnaby/New Westminster	2025	**-1%**	**0%**	-	**-**
35	Kingsway & Willingdon - Approach Lane with Signal	Burnaby/New Westminster	2025	**1%**	**-1%**	> 30%	**-**
36	Lougheed & Boundary - Conversion to Shared RT Lane	Burnaby/New Westminster	2025	**4%**	**2%**	> 10%	**-**
38	96 Ave & 128 St - Queue Jump	Southeast	2025	**16%**	**15%**	-	**-**

Notes (both tables): 1. Transit travel time change is a trip-weighted average calculated by hour from TransLink AVL data for the before and after time periods. 2. Background auto travel times are provided where relevant data was available and slowing due to traffic was significant. 3. Costs are based on values provided by municipalities in funding applications, funding reallocations, or submitted invoices (if received). Some projects lacked sufficient cost data to estimate a payback period. Benefit is based on travel time savings, the number of bus trips, and the monetized value of bus service hours. Both cost and benefit values reflect evaluation-year dollars and are not inflation-adjusted. 4. Subset of a project constructed as part of RapidBus implementation. 5. Where stop-to-stop distances are long, segment travel times are derived from GPS ping data rather than stop events, which reduces sample size.

Project Highlight: Queue Jumps on Fraser Hwy at 96 Ave and 140 St

After implementation, buses on Fraser Hwy saw decreased run times of 15% across the day and up to 25% during peak periods at these locations.

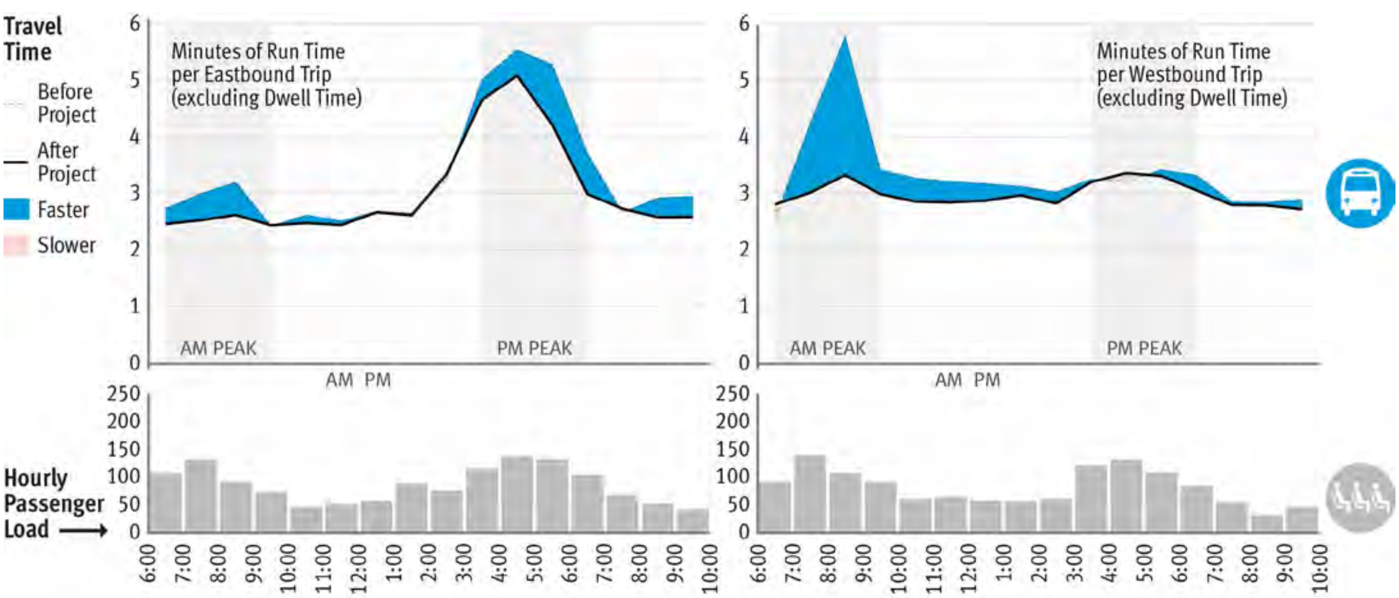
Before:

After:

Travel lanes and wide shoulders were narrowed on Fraser Highway at 96 Ave to create receiving lanes on the far side of the intersections, allowing buses to use right-turn lanes to bypass congestion, before and after. The project also prohibited right turns, which would cross a newly repaved bike lane—benefitting both bus passengers and cyclists (Google Street View). Notes: Photo showing eastbound direction. The queue jumps were removed when Fraser Hwy was widened in June 2022.

The graphs below show that the project created the greatest benefit when bus ridership was highest, particularly westbound in the morning, during which delay was almost eliminated—declining by about two minutes. It reduced but did not eliminate eastbound delay in the afternoon.

Illustration of Travel Time Savings from Fraser Hwy Queue Jumps, Weekdays, Fall 2021 vs Fall 2019



This graphic illustrates bus run time before implementation (dotted line) compared to after implementation (solid line), by hour. Blue shading highlights the run time improvement. The grey bars below the graphs show the hourly passenger load (number of passengers on-board buses).

Project Highlight: Queue Jumps on Broadway & Gaglardi Way

Implementation of a queue jump with transit signal priority enabled buses to bypass vehicles queued at the signal and get a head start when the light turns green. Along this segment of Route 145 to Simon Fraser University, the improvement saved buses 15% of run time.

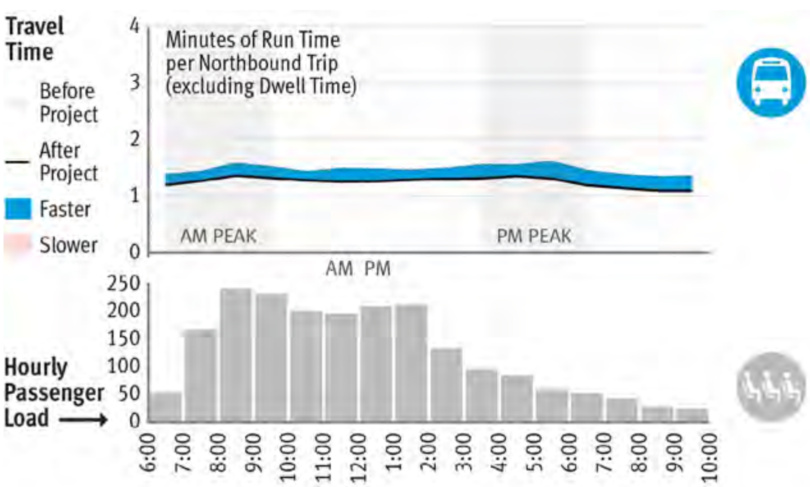
Before:

After:

Before (left) and after (right) showing a bus queue jump lane with transit signal priority that was installed at the intersection of Broadway and Gaglardi Way in late 2020 (Google Street View).

The graph below shows buses consistently saved time throughout the day.

Illustration of Travel Time Savings from Broadway & Gaglardi Way Queue Jump, Weekdays, Fall 2021 vs Fall 2019



This graphic illustrates bus run time before implementation (dotted line) compared to after implementation (solid line), by hour. Blue shading highlights the run time improvement. The grey bars below the graph shows the hourly passenger load (number of passengers on-board buses).

Project Highlight: Edmonds St Approach Lanes at Canada Way and Kingsway

Southbound transit approach lanes were implemented along Edmonds St at Kingsway and at Canada Way in late 2020. Northbound right-turn except bus lanes were also implemented. Approach lanes are used to allow buses to bypass vehicles that are queued to make right-turns, where right-turn volumes are high.

For Route 106, connecting Edmonds and New Westminster Stations, the improvements saved buses up to nearly 6% of runtime at Canada Way in the PM peak and up to nearly 8% of run time at Kingsway in the AM peak, but did not perform consistently across the day, as described in more detail below.

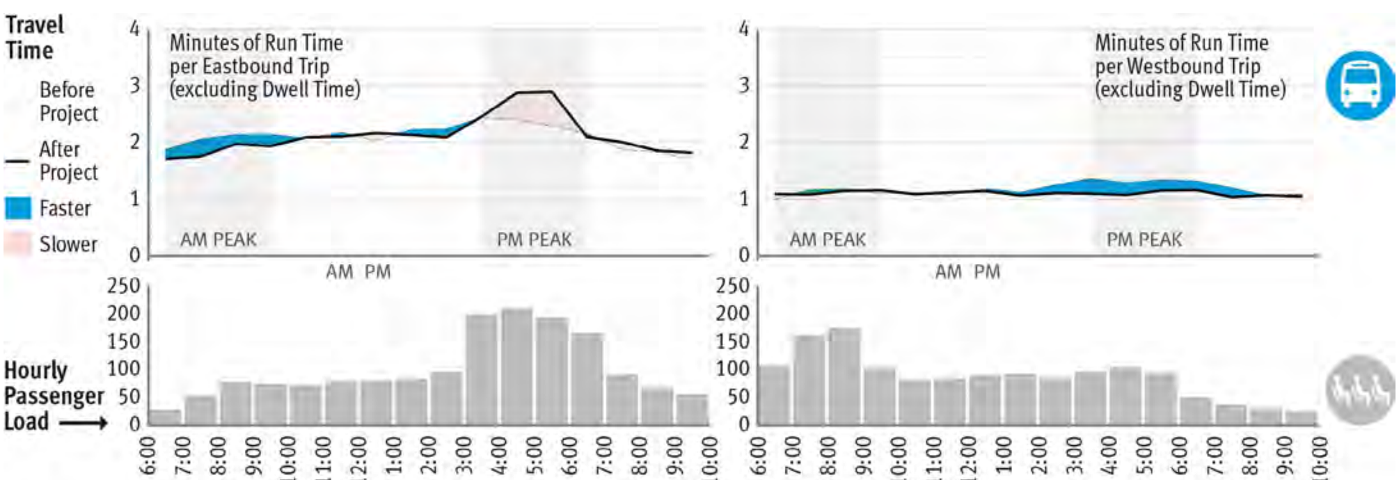
Before:

After:

Before (left) and after (right) showing the eastbound right-turn except bus lane that was installed at the intersection of Edmonds St and Kingsway in late 2020 (Google Street View).

The graphs below show that at Kingsway, the eastbound right-turn except bus lane pictured above improved bus run time in the morning, but there was an increase in run time in the afternoon, which can be attributed to high right-turn volumes in the shared lane (see left panel below).[31] The westbound transit approach lane improved travel time for buses in the afternoon (see right panel below).

Illustration of Travel Time Change at Eastbound Right-Turn Except Bus Lane and Westbound Transit Approach Lane on Edmonds St at Kingsway, Weekdays, Fall 2021 vs Fall 2019

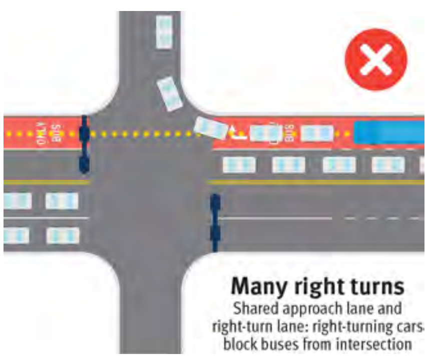


This graphic illustrates bus run times before implementation (dotted lines) compared to after implementation (solid lines), by hour. Blue shading highlights the run time improvement, while red shading indicates an increase. The grey bars below the graphs show the hourly passenger load (number of passengers on-board buses).

The westbound approach lane on Edmonds St at Kingsway is supported by a right-turn pocket, allowing buses to bypass queues and get through the intersection quickly.

The approach lane on Joyce St at Kingsway is supported by a right-turn pocket. Parking was removed to lengthen this pocket and minimize friction with buses. The project reduced average travel times by more than 30% all day.

Considerations for Future Projects



Both approach lanes and queue jumps must be long enough for buses to reach them before encountering congestion.

Particularly where there are many right-turning vehicles or pedestrians crossing the street, right-turn lanes can back up and prevent buses from getting to the front of the queue.

Project Highlights: In-Lane Bus Stops

In-lane bus stops improve travel times by up to approximately 15% and can pay back investments quickly.

In-lane stops allow buses to serve customers from the travel lane. They improve travel time and reliability by eliminating delays caused by merging into and out of the travel lane at bus stops. Bus bulbs extend the sidewalk areas out to the travel lane in locations with on-street parking. Travel time reduction may be appear as a reduction in run time or dwell time (waiting time at a stop) depending on bus operator behaviour and whether a bus is registered as at, or nearby, a stop.

Creating bus bulbs or filling in bus pullouts areas can provide more space for passengers waiting for the bus and make stops more accessible, safe, and visible for passengers. For example, along the R6 RapidBus corridor, infilling several bus pullout areas to make in-lane stops was necessary to accommodate a ramp for mobility devices.

Overview of In-Lane Bus Stops Project Performance

Overall, in-lane bus stops and bus bulbs contributed to reduced run time and dwell time along the routes they serve, as shown in the table below. The projects evaluated saved between 5–40 seconds (up to 16%) at different times of day. This is consistent with TransLink's Transit Priority Toolkit, which suggests peak savings of 15-30 seconds as a general rule-of-thumb.

Payback periods were as short as a few months. In general bus bulb cost-effectiveness will vary based on how permanent the construction materials are, and how many buses benefits from the improvement.

In-Lane Bus Stop Project Statistics

Map	Project Name	Sub-Region	Year Evaluated	Change in Transit Travel Time Daily [1] 6am–10pm	Change in Transit Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	Cost-Benefit Payback Period [3] Years
42	West 4th Ave - Bus Bulbs	Vancouver/ UBC	2023	**-14%**	**-16%**	-	**0.3**
41	Robson St - Transit Project	Vancouver/ UBC	2023	**-8%**	**-8%**	-	**1.8**
39	Lonsdale Ave, 4th St & 5th St - Bus Bulbs	North Shore	2023	**-5%**	**-3%**	-	**> 20**
40	Lonsdale Ave, 15th St - Bus Bulbs	North Shore	2023	**-5%**	**0%**	-	**7.5**
10	Commercial Drive (2nd to 4th) - Bus Stop Optimization & Bus Bulbs	Vancouver/ UBC	2025	**-4%**	**-3%**	-	**20**
43	Scott Rd / 120 St - Bus Pullout Infills	Southwest & Southeast	2023	**0%**	**-4%**	-	**19.3**

Notes: 1. Transit travel time change is a trip-weighted average calculated by hour from TransLink AVL data for the before and after time periods. 2. Background auto travel times are provided where relevant data was available and slowing due to traffic was significant. 3. Costs are based on values provided by municipalities in funding applications, funding reallocations, or submitted invoices (if received). Some projects lacked sufficient cost data to estimate a payback period. Benefit is based on travel time savings, the number of bus trips, and the monetized value of bus service hours. Both cost and benefit values reflect evaluation-year dollars and are not inflation-adjusted. Some of the projects listed were constructed using temporary/interim measures, while others may be more permanent and have different associated costs.

Project Highlight: West 4th Ave bus bulbs

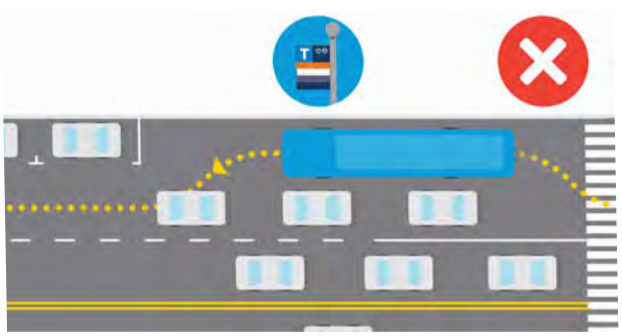
In 2022, TransLink partnered with the City of Vancouver to construct bus bulbs along West 4th Avenue. They reduced total dwell time at stops by 30% and total travel time by 10% to 20%—including both dwell time and run time—saving more than a minute at the weekday PM peak. Extending bus zones to accommodate more than one bus may also have contributed to reduced dwell times.

Considerations for Future Projects

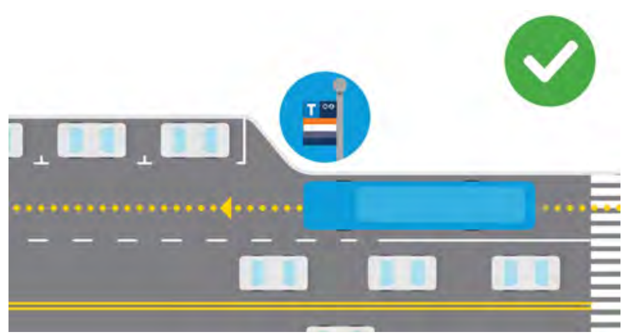
- Stops should be fully in-lane to eliminate time lost to bus merging in/out of traffic at stops.
- Bus bulbs preclude peak-hour bus lanes from operating in the parking lane.
- Savings at timing point stops—where bus operators may wait to get back on schedule—may be hard to measure and will rely on schedule tightening.
- Bus priority measures can have "co-benefits" beyond making buses faster and more reliable (see graphic below).
  - Bus bulbs improve safety by shortening pedestrian crossing distances and calming traffic. These should extend fully to the pedestrian crosswalk in order to "neck-down" the intersection.
  - They also support retail areas by expanding room for pedestrian activity, parking, loading and unloading, and landscaping, while acting as a complement to street patios.

Bus bulbs along West 4th Ave.

Bus bulb projects reduce the time buses spend merging into and out of traffic while also providing more room for people on the sidewalk, such as at Lonsdale Ave between 4th and 5th Streets.



Buses can be delayed when they need to pull to the curb to pick up passengers and then find a gap to re-enter traffic.



Bus bulbs not only enable buses to stop in-lane, they can enable other benefits such as improved amenities and safety.

Project Highlights: Signal Upgrades

Signal upgrade projects reduce travel time by up to 20% and typically pay back the investment in less than 5 years.

Upgrading traffic intersections can reduce wait times for buses at what are often hotspots for congestion. Interventions often take the form of left-turn or right-turn pockets that separate through-traffic and turning vehicles. These turn lanes can also be supported by distinct signal phases to clear queues of turning vehicles.

Signal upgrades that support overall flow of traffic, including buses that are turning alongside other vehicles, can improve bus performance. Turn pockets and signal phases can also be bus-only. In “active” transit signal priority projects, the signal recognizes the presence of a bus, and either extends a green phase or shortens a red phase to support bus movement. In “passive” transit signal priority, multiple intersections along a corridor are timed to turn green at the speed of a typical bus, which also reduces bus wait times at red lights.

Overview of Signal Upgrade Project Performance

Signal upgrade projects decreased run time by up to 20%. Bus-only signal upgrade projects were among the most effective with a payback period within 1–2 years:

- Dedicated bus-only signals at bus exchanges can benefit many bus trips and be particularly cost-effective. The projects at Metrotown, 18th Ave at Griffiths Dr (Edmonds Station), and Coquitlam Central Station each had a theoretical payback period of less than 2 years. See the project highlights for Metrotown below, and Coquitlam Central in the Routing Adjustments section (page 102).
- Signal priority can buffer buses from increases in background traffic. Even though buses got slower at Marine Dr at Fell Ave, Columbia & 10th St, and Great Canadian Way, they were less affected by traffic than other vehicles.
- The benefits of bus priority signals are limited by the conditions required to activate them. Often, buses must be at a specific location (e.g., at the front of the queue) at the start of a signal cycle for the bus-only phase to be triggered. Other conditions may include time of day or the presence of other vehicles. This conditionality likely reduced the benefits of most projects in this category, including the WBLT and NBRT Signal Phase Overlap at Granville & Hastings. This project was also undermined by pedestrians crossing in front of right-turning buses.

Pedestrians crossing in front of a right-turning bus at Granville and Hastings.

- A new traffic signal may not speed up buses but can have important safety benefits. The signal at Chesterfield at 1st St actually slowed buses down but improved pedestrians safety at a location with steep grades and poor sightlines.

Signal Upgrade Project Statistics

Map	Project Name	Sub-Region	Year Evaluated	Change in Transit Travel Time Daily [1] 6am–10pm	Change in Transit Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	Cost-Benefit Payback Period [3] Years
54	Coquitlam Central - Midblock Signal	Northeast	2025	-19%	-22%	-	0.3
51	Metrotown Bus Loop - Signal Upgrade	Burnaby/New Westminster	2023	-18%	-19%	-	1.8
55	NB Scott Rd at 84 Ave - Signal Upgrade	Southeast	2023	-15%	-7%	-	16.8
52	18th Ave at Griffiths Dr - Signal Upgrade	Burnaby/New Westminster	2023	-11%	-13%	-	0.2
45	Marine Dr at Keith Rd and Bewicke Ave - Signal Upgrade	North Shore	2023	-9%	-9%	-	0.4
14	Kennard Intersection Transit Improvements (KITI)	North Shore	2025	-7%	-12%	-	> 20
44	Lonsdale Avenue at East Esplanade - Signal Upgrade	North Shore	2023	-3%	-6%	-	1.8
48	Transit Detection Signals on 15th Street (2021 CNV)	North Shore	2023	-2%	-2%	-	9.8
49	Granville & Hastings - WBLT and NBRT Signal Phase Overlap	Vancouver/UBC	2025	-1%	-1%	-	>20
46	Marine Dr at Fell Ave - Transit Signal	North Shore	2025	0.2%	0%	> 25%	-
50	Various Locations - Minor Signal Timing Modifications	Vancouver/UBC	2025	2%	3%	-	-
53	Columbia & 10th St - Transit Signal	Burnaby/New Westminster	2025	5%	14%	> 20%	-
56	Great Canadian Way - Signal Coordination	Southwest	2025	7%	10%	> 10%	-
47	Chesterfield at 1st St - New Traffic Signal	North Shore	2025	25%	30%	-	-

Notes: 1. Transit travel time change is a trip-weighted average calculated by hour from TransLink AVL data for the before and after time periods. 2. Background auto travel times are provided where relevant data was available and slowing due to traffic was significant. 3. Costs are based on values provided by municipalities in funding applications, funding reallocations, or submitted invoices (if received). Some projects lacked sufficient cost data to estimate a payback period. Benefit is based on travel time savings, the number of bus trips, and the monetized value of bus service hours. Both cost and benefit values reflect evaluation-year dollars and are not inflation-adjusted.

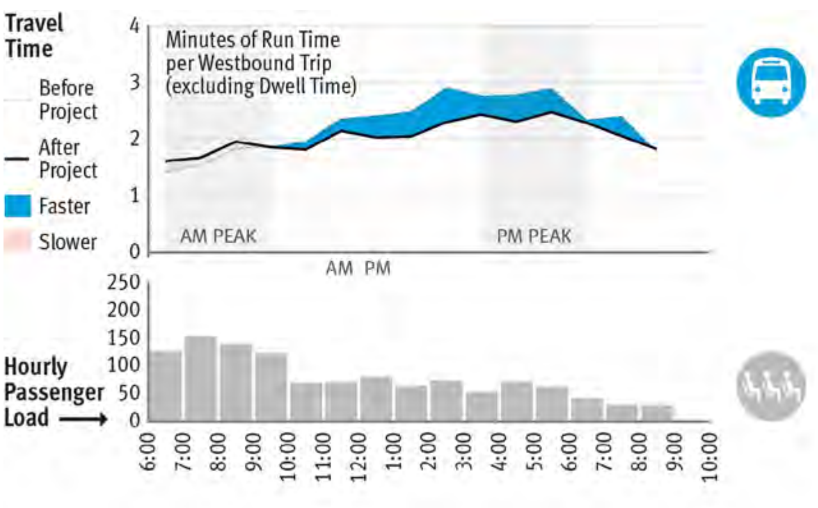
Project Highlight: Signal upgrade on NB Scott Rd at 84 Ave

Upgrading the traffic signal on Scott Road at 84th Ave to provide a northbound left-turn signal saves an average of 25 seconds per trip for Route 301, or 15% of average run time. This route connects Richmond and Surrey, including Kwantlen Polytechnic University.

When the City of Delta first installed the left turn signal in June 2019, transit buses were experiencing waits of up to 4 minutes to make the single left turn. Immediately after the change in signal operation, buses saved almost 2 minutes in travel time.

Although the project has continued to be effective overall, its benefits appear to have diminished by 2021. This may be due to additional vehicles on the road, including more vehicles taking advantage of the new signal—as travel times for general purpose vehicles along Scott Road increased by over 20% throughout the day. Nonetheless, the graphic below shows that bus run time improved for much of the day, especially in the afternoon and evening.

Travel Time Savings from NB Scott Rd & 84 Ave Signal Upgrade, Weekdays, Fall 2021 vs Fall 2019



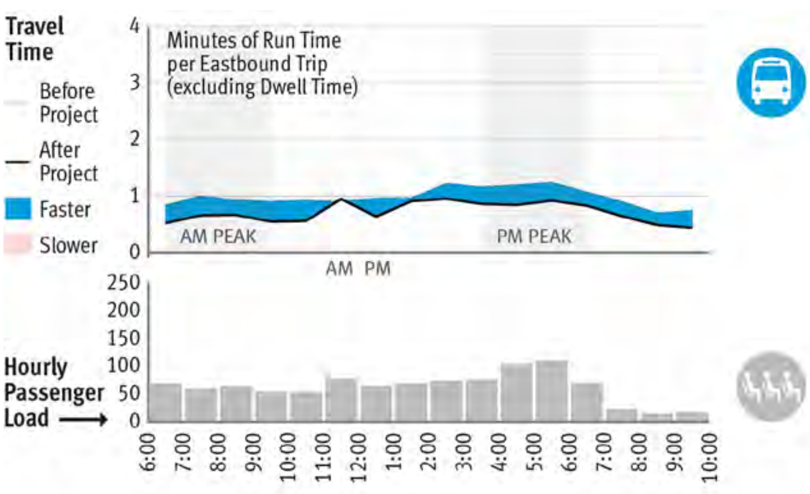
This graphic illustrates bus run times before implementation (dotted lines) compared to after implementation (solid lines), by hour. Blue shading highlights the run time improvement, while red shading indicates an increase. The grey bars below the graph show the hourly passenger load (number of passengers on-board buses).

Project Highlight: Signal upgrade at the Metrotown Bus Loop

A bus-only left-turn signal reduced run time by approximately 15% for eastbound buses turning left from Central Boulevard into the Metrotown bus loop, providing a consistent benefit averaging more than 10 seconds for approximately 2,000 bus trips every week. The City of Burnaby installed the signal and has periodically adjusted it to fine-tune the detection of buses, contributing to slightly improved performance over time. The signal also improved travel time for all vehicles by approximately the same amount, since left-turning buses no longer had to wait until the end of the green light to make the turn.

Bus-only left-turn signal into Metrotown bus loop.

Travel Time Savings from Bus-Only Left-Turn Signal at Metrotown Bus Loop, Weekdays, Fall 2021 vs Fall 2019



This graphic illustrates bus run time before implementation (dotted line) compared to after implementation (solid line), by hour. Blue shading highlights the run time improvement. The grey bars below the graph show the hourly passenger load (number of passengers on-board buses).

Considerations for Future Projects

- Bus-only upgrades that target frequent bus corridors will pay back faster.
- Buses do benefit from intersection improvements that benefit all traffic, but transit-priority signals are more likely to have lasting benefits.
- Left-turn pockets can also improve intersection throughput, reducing delay for buses and other motorists.

New Technologies: Advanced Transit Signal Priority (TSP)

Why It Matters

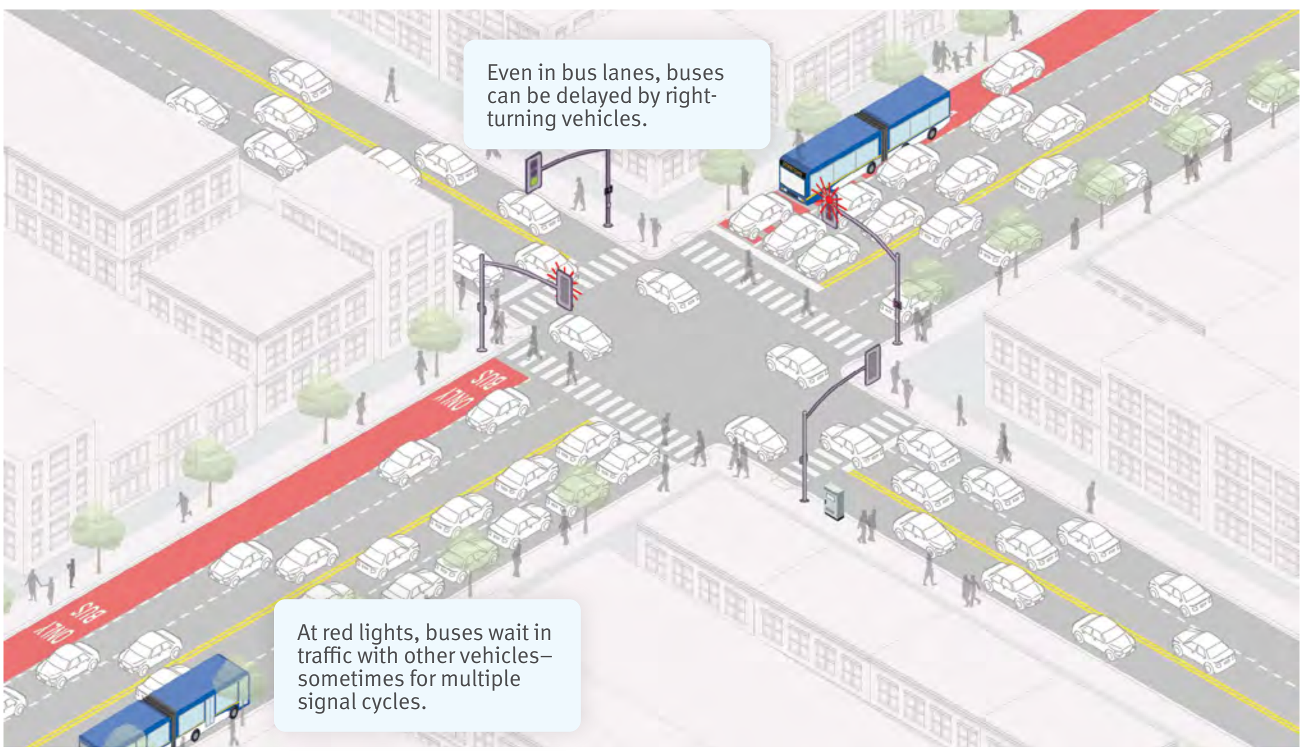
Even buses in bus-only lanes must stop at red lights, where they can sit from 30 seconds to more than 90 seconds at a single intersection. These delays can add up to many minutes for each bus rider's trip. Transit Signal Priority (TSP) can keep buses moving by detecting a bus that is approaching a traffic signal and holding a green light a little longer or turning a red light to green earlier. The result is faster, more reliable service for bus riders and, when done well, minimal disruption to pedestrians, cyclists, and other motorists.

What's New

Legacy TSP systems use pavement loops or line-of-sight sensors which require costly hardware and ongoing maintenance. Performance can be uneven, especially if buses are only detected when they are a few meters from the intersection. Sometimes buses may not be detected at all.

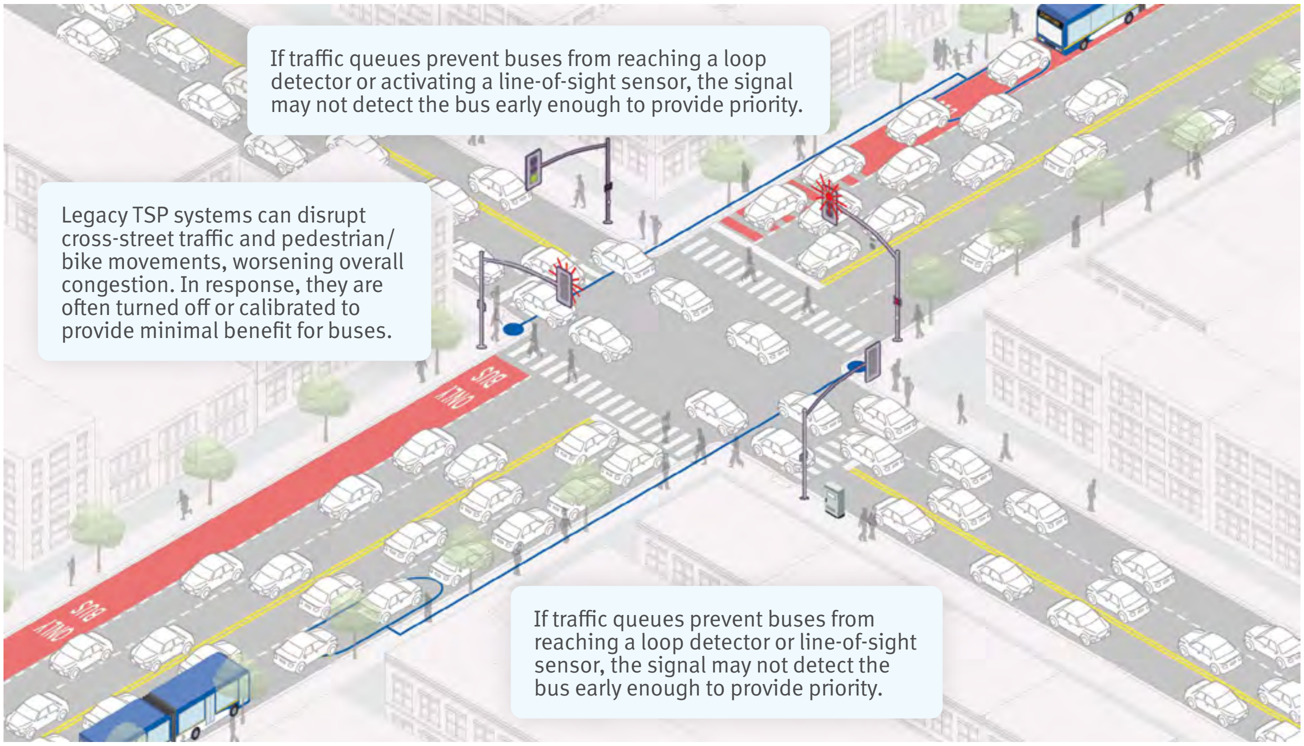
Modern "advanced" TSP systems are cloud-based and use a bus's GPS location data to predict when it will arrive at an upcoming intersection—often a minute or more ahead. That lead time allows the traffic system to make more nuanced changes—not just at one intersection, but across multiple traffic signals—ensuring benefits to bus movements while minimizing impacts to other road users. These TSP systems can be deployed without new hardware at the roadside or on the bus, and they can learn and improve with every trip.

Bus Operations on Roadway without TSP



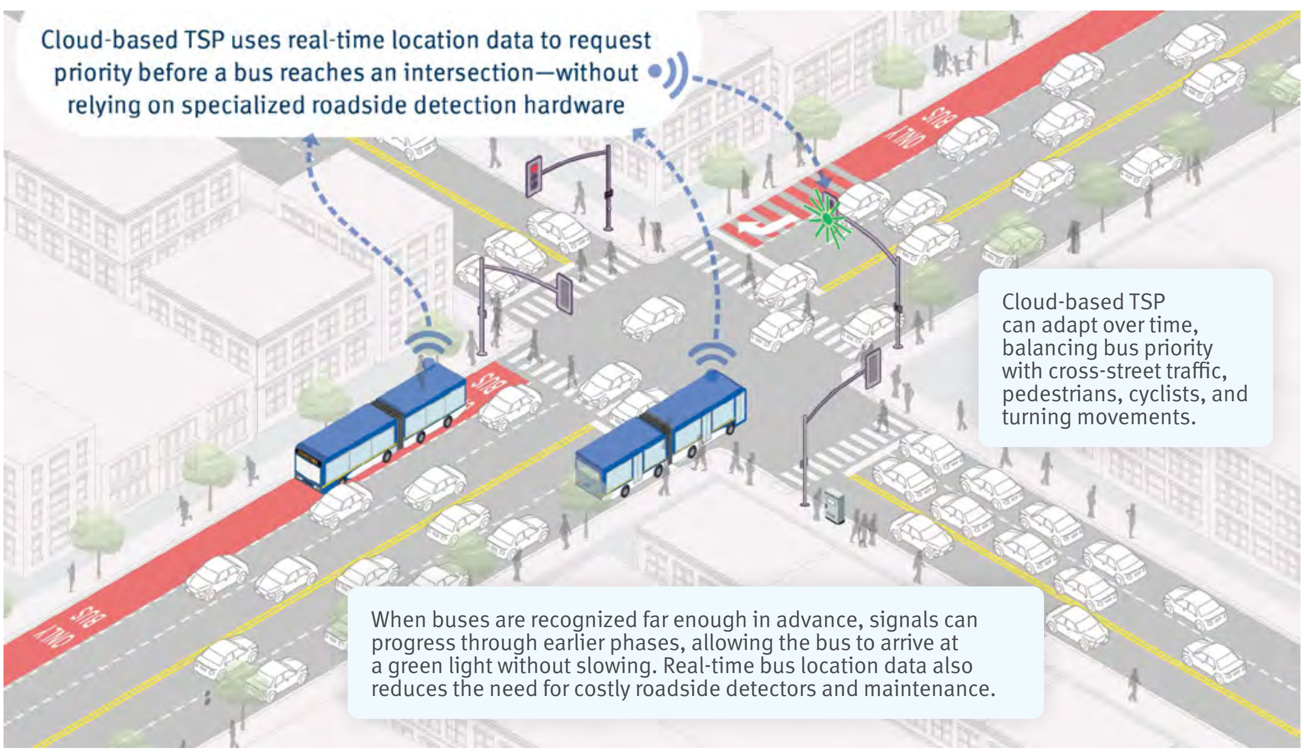
Without TSP, buses are delayed at intersections, even where there are bus lanes.

Bus Operations on Roadway with Legacy TSP



Legacy TSP works best at simpler intersections where buses can be detected reliably. At complex intersections, cross-street traffic and multimodal trade-offs can limit benefits.

Bus Operations with a Cloud-Based Advanced TSP System



Cloud-based TSP can provide more effective, coordinated, and adaptable priority, helping buses move through congested corridors with fewer trade-offs.

Impact and Examples

Cities that have deployed advanced TSP are seeing meaningful results for riders.

TriMet – Portland, Oregon

TriMet introduced modern TSP on its FX2-Division rapid bus line in 2022, with very positive results:

- Total intersection delay along the corridor dropped from 19 minutes to 10 minutes (45%).
- Improvements were most pronounced at the 10 worst intersections on the route, where delay had been highest

City of San José & Santa Clara VTA – California

San José piloted the technology on just two VTA bus routes in 2023, then expanded it across the network based on early results. As of early 2026, advanced TSP is active on 24 routes across the city across hundreds of intersections and growing. Results include:

- Bus speeds improved by 20% across all 24 routes
- Red-light wait times for buses were cut by 50% during the initial pilot
- More buses are arriving on time, with fewer delays accumulating across a trip
- The program was so effective that the biggest operational challenge became buses running ahead of schedule

Other agencies—including King County Metro (Seattle) and the San Francisco Municipal Transportation Agency—have also deployed cloud-based TSP systems.

Considerations for Deployment

- **Traffic management systems**: Most jurisdictions will need to confirm their traffic signals can receive and act on real-time priority requests. Some may require software upgrades; major infrastructure changes are generally not needed.
- **Inter-agency coordination**: TSP sits at the boundary between transit operations and municipal traffic engineering. Sustained coordination between transit agencies and city traffic departments is essential. It is a partnership, not a one-time installation.
- **Data and integration**: Buses must share real-time location data with the signal system. Establishing secure, reliable data connections between agencies requires planning and clear agreements on roles and responsibilities.
- **Ongoing performance monitoring**: The system's effectiveness depends on tuning and measurement over time. Agencies that commit to regular performance reviews see the greatest gains.

Despite these coordination requirements, advanced TSP stands out as one of the most cost-effective tools available to improve bus speed and reliability—with no new roadside hardware, no changes to bus fleets, and demonstrated benefits that extend to all road users.

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Project Highlights: Turn and Parking Restrictions

Turn restrictions can improve bus travel times >5% at a low cost.

Turn restrictions, similar to turn pockets, address locations where vehicles obstruct buses' movements, forcing them to wait or merge. Left-turn restrictions have the most significant benefit for buses when there is a single through lane, where one left-turning vehicle can keep all vehicles waiting for an entire signal phase. Right-turn restrictions can support buses when they are travelling in the curb-side lane, especially at locations with heavy pedestrian volumes. Parking restrictions limit where vehicles may park, which can keep travel lanes clear for buses (and all vehicles), or can help provide buses with space to make difficult turns.

The prohibition sign at right more effectively deters vehicles from turning into a bus-only zone.

Overview of Turn and Parking Restriction Project Performance

- Left-turn restrictions on Robson Street—a narrow street where buses themselves are turning left—contributed to a decrease in run time of nearly 10%, saving up to 16 seconds per trip. The change was implemented at the same time as bus bulbs on the same corridor.
- The benefit of closing a mid-block left turn at 64 Ave & 200th street was less clear. This is a location where buses run in the curb-side lane, which is less affected by left turns, and improvements were undermined by an overall increase in traffic.
- The Minor Signage Modifications project included small signage adjustments at a dozen locations across Vancouver. While the benefits are relatively modest, these projects are still worthwhile: signage costs are low, and benefits accumulate through incremental improvements across many bus trips.

Turn and Parking Restriction Project Statistics

Map	Project Name	Sub-Region	Year Evaluated	Change in Travel Time Daily [1] 6am–10pm	Change in Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	Cost-Benefit Payback Period [3] Years
57	Robson St - Turn Restriction [4]	Vancouver/ UBC	2023	**-9%**	**-6%**	-	**[4]**
59	Various Locations - Minor Signage Modifications	Vancouver/ UBC	2025	**-0.3%**	**0%**	-	**>20**
58	64 Ave & 200 St - Extend WBLT lane	Southeast	2025	**4%**	**6%**	> 5%	**-**

Notes: 1. Transit travel time change is a trip-weighted average calculated by hour from TransLink AVL data for the before and after time periods. 2. Background auto travel times are provided where relevant data was available and slowing due to traffic was significant. 3. Costs are based on values provided by municipalities in funding applications, funding reallocations, or submitted invoices (if received). Some projects lacked sufficient cost data to estimate a payback period. Benefit is based on travel time savings, the number of bus trips, and the monetized value of bus service hours. Both cost and benefit values reflect evaluation-year dollars and are not inflation-adjusted. 4. Robson Street turn restrictions project may include some run-time benefits from stop consolidation, implemented concurrently, which could not be isolated as a separate project.

Considerations for Future Projects

- Turn restrictions can bring low-cost benefits to both buses and general purpose traffic and complement other transit priority measures along a corridor.
- Each restriction may lead to higher traffic volumes elsewhere. They are best implemented with a corridor perspective, including in tandem with left-turn pockets at nearby intersections.
- Right-turn restrictions are rare but can benefit pedestrian and cyclist safety along a roadway, and should be considered at high volume intersections.
- All modes of transportation should be considered to identify conflicts.

Project Highlights: Routing Adjustments

Routing adjustments reduce travel time and can make buses more reliable and more direct.

Routing adjustments change the alignment of a bus route to bypass high delay locations such as around busy intersections, to reduce the number of turns, or travel on roadways where buses are able to move more efficiently.

Overview of Routing Adjustment Project Performance

Routing adjustment projects throughout Metro Vancouver contributed to a decrease in run time of between 6% and 67%. The projects highlighted at Bridgeport Rd and at Coquitlam Central saved 1 to 1.5 minutes in run time during the PM peak periods, and also reduced variability. A more signicant routing adjustment implemented as part of the R3 RapidBus saved over 12 minutes in combined run and dwell time. (Highlights for these projects are provided below; the R6 routing adjustment is highlighted in the RapidBus section; see page 82.)

Routing Adjustment Project Statistics

Map	Project Name	Sub-Region	Year Evaluated	Change in Travel Time Daily [1] 6am–10pm	Change in Travel Time [1] AM/PM Peak	Auto Traffic Increase [2] Average All Day	Cost-Benefit Payback Period [3] Years
60	R3 Routing Adjustment in vicinity of Pitt Meadows (Harris Rd - 203 St) [4]	Northeast & Maple Ridge/Pitt Meadows	2025	**-67%**	**-67%**	-	**[4]**
62	Bridgeport Road - Bus Connection [5]	Southwest	2025	**-26%**	**-22%**	-	**-**
53	Coquitlam Central - Midblock Signal	Northeast	2025	**-19%**	**-22%**	-	**0.3**
61	R6 Routing Adjustment between Scott Rd/75A Ave and 72Ave/124 St [4]	Southwest & Southeast	2025	**-11%**	**-16%**	-	**[4]**

Notes: 1. Transit travel time change is a trip-weighted average calculated by hour from TransLink AVL data for the before and after time periods. 2. Background auto travel times are provided where relevant data was available and slowing due to traffic was significant. 3. Costs are based on values provided by municipalities in funding applications, funding reallocations, or submitted invoices (if received). Some projects lacked sufficient cost data to estimate a payback period. Benefit is based on travel time savings, the number of bus trips, and the monetized value of bus service hours. Both cost and benefit values reflect evaluation-year dollars and are not inflation-adjusted. 4. Subset of a project constructed as part of RapidBus implementation. Routing adjustments completed as part of RapidBus projects are evaluated based on run time and dwell time. 5. Where stop-to-stop distances are long, segment travel times are derived from GPS ping data rather than stop events, which reduces sample size.

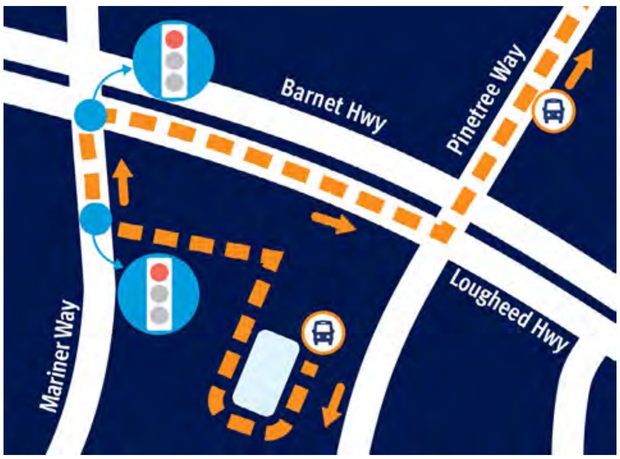
Considerations for Future Projects

- Opportunities for future routing adjustments may not be evident from maps of existing delay, especially when bused are slowed all day. Opportunities worth investigating include bus exchanges and highway intersections. Bus operators often take alternative routes and can suggest future opportuntities.
- Routing adjustments can be enabled by a small infrastructure investment—such as a new signal, a short "bus-only" bypass, or road widening.
- Bus stop balancing or optimization can also create opportunities for re-routing, when buses no longer are no longer constrained by the need to serve specific stops.

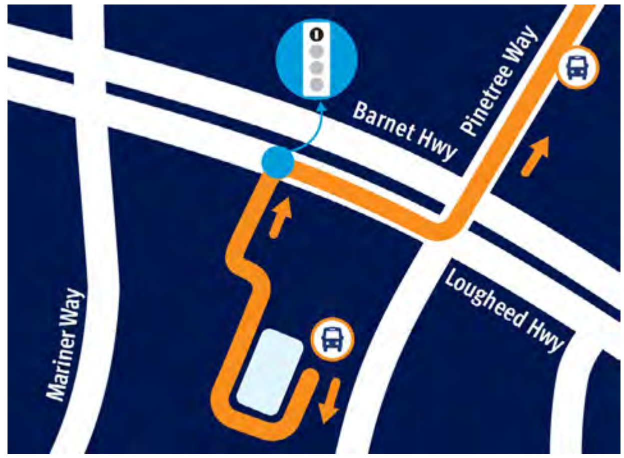
Project Highlight: Coquitlam Central - Mid-block Signal

A mid-block signal was constructed to allow all buses to exit Coquitlam Central Station via a driveway created for the R3 RapidBus project. With the project up to 17 buses per hour are able to exit the station more efficiently (see maps below). Buses save time throughout the day with a run time reduction of 19% overall and 22% during the AM and PM peak periods. This saves nearly 1.5 minutes per bus in the PM peak and reduces variability by over 25%.

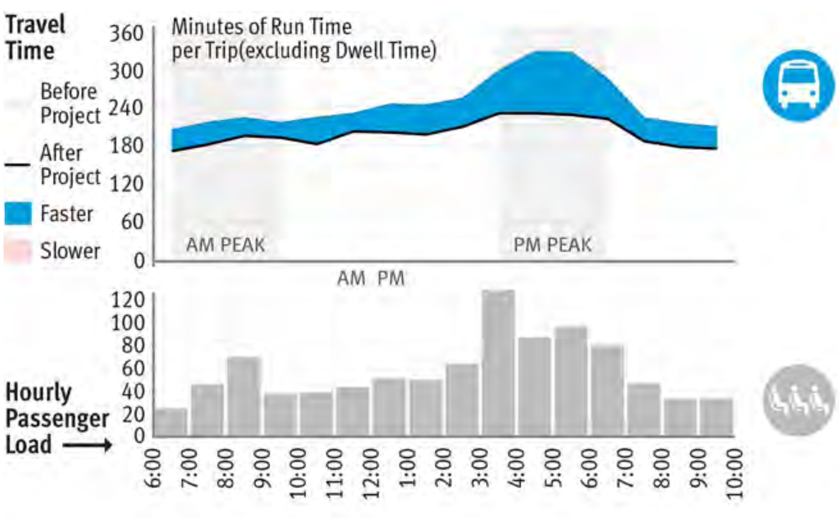
Routing Before Signal Project



Routing Adjustment with Signal Project



Travel Time Savings from Mid-Block Signal and Routing Adjustment at Coquitlam Central, Weekdays, Fall 2023 vs Fall 2022

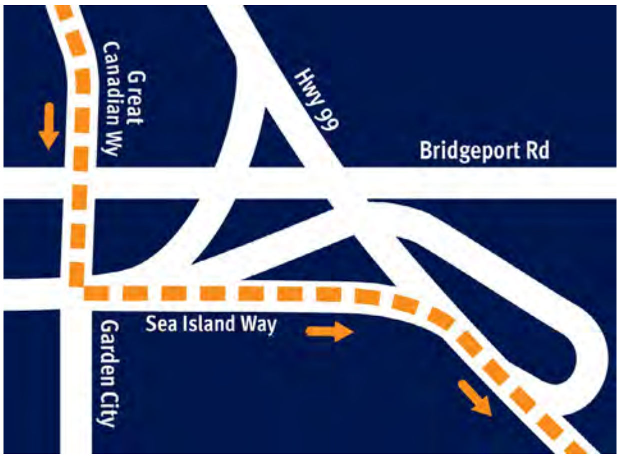


This graphic illustrates bus run time before implementation (dotted line) compared to after implementation (solid line), by hour. Blue shading highlights the run time improvement. The grey bars below the graph show the hourly passenger load (number of passengers on-board buses).

Project Highlight: Bridgeport Road Bus Connection

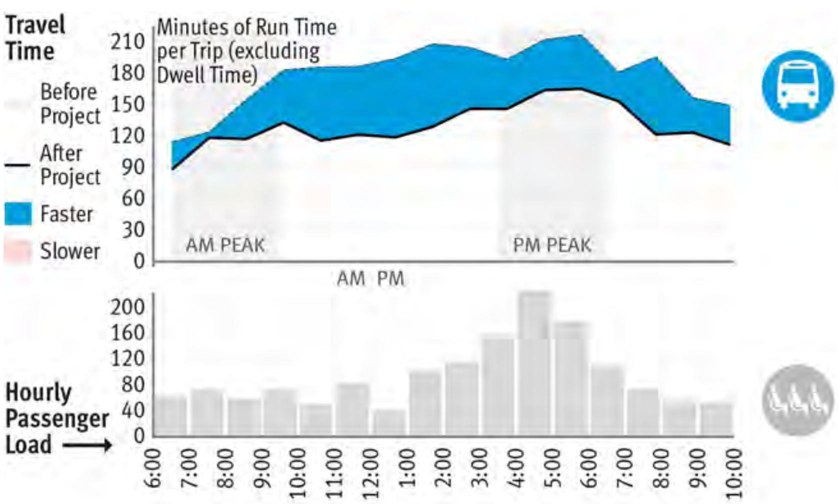
A new bus-only connection to the Hwy 99 southbound on-ramp was constructed south of Bridgeport Road (see maps below). This MOTT-funded project paved a bus-only shortcut that buses can use to merge onto Hwy 99—which both shortened the route and provided a queue jump at a congested onramp. Nine southbound bus routes use this connection, resulting in 26% lower run times across the day (see chart below). This saves an average of over 40 seconds per trip.

Before Bridgeport Road Bus Connection Project



With Re-routing to New Bridgeport Road Bus Connection

Travel Time Savings from Re-Routing to New Bridgeport Road Bus Connection, Weekdays, January 2023 vs January 2022



This graphic illustrates bus run time before implementation (dotted line) compared to after implementation (solid line), by hour. Blue shading highlights the run time improvement. The grey bars below the graph show the hourly passenger load (number of passengers on-board buses).

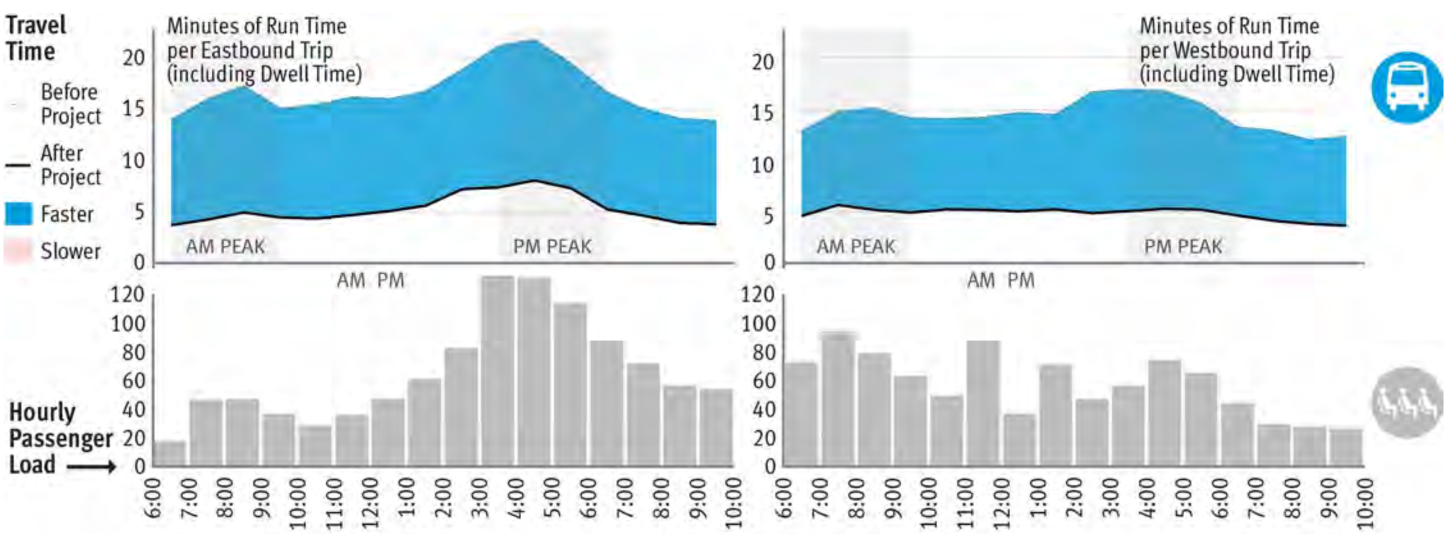
Project Highlight: R3 RapidBus Routing Adjustment

The R3 RapidBus project re-routed the R3 route to Lougheed Hwy north of Pitt Meadows, which is still served by local route 701. The maps below show Route 701 routing through Pitt Meadows (left) and R3 routing along Lougheed Hwy (right). The charts below compare R3 travel time to Route 701. The routing adjustment saves R3 up to 12 minutes including dwell time (of which 9 minutes is lower run time) in this portion of the route— the R3 takes approximatley 65% less time to travel through this area than Route 701.

Local Route 701 Routing through Pitt Meadows

R3 RapidBus Routing Along Lougheed Hwy

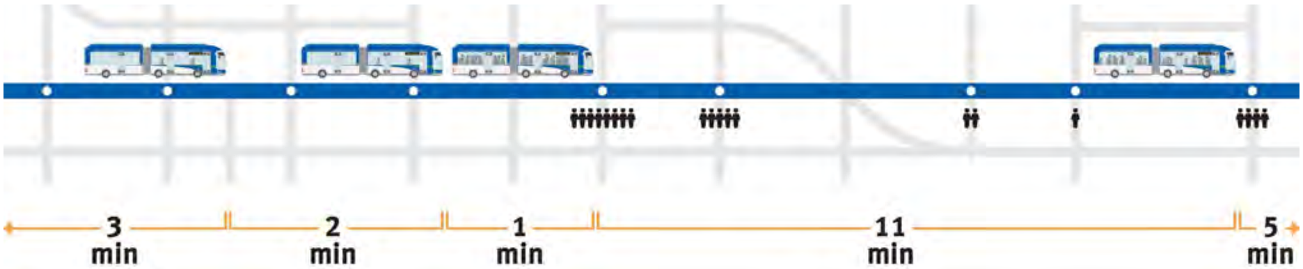
Travel Time Savings from R3 RapidBus Routing Adjustment Compared to Route 701, Weekdays, Fall 2025



This graphic illustrates bus travel time before implementation (dotted line) compared to after implementation (solid line), by hour. Blue shading highlights the travel time improvement. The grey bars below the graph show the hourly passenger load (number of passengers on-board buses).

Note: Based on combined run and dwell time. The comparison is between Harris Road and 203A Street.

Case Study: Headway Management



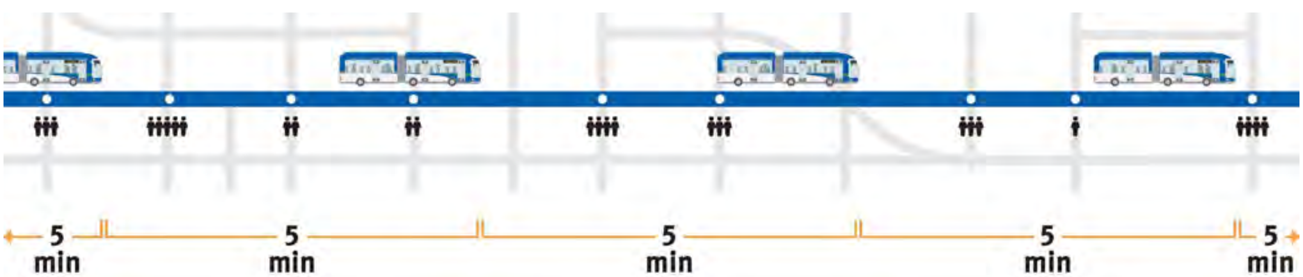
Traditional Management based on Schedule Timepoints: Managing buses based on schedules alone can lead to "bunching," overcrowding, or pass ups.

Why It Matters

Bus bunching is a persistent reliability issue that often begins with small, routine delays, but tends to worsen once it begins. Crowded buses take longer to board and alight passengers, slowing them down, while the buses that follow pick up fewer passengers, move faster, and catch up. This self-reinforcing dynamic can quickly result in full buses followed closely by empty ones—leading to pass-ups, customer complaints, and increased stress for operators.

A focus on schedule adherence does little to correct this condition. Once buses begin running close together, schedule-based operations struggle to restore spacing. The leading bus—delayed by heavy passenger loads—cannot easily recover time, while the following bus may catch up and be held to avoid running early. In some cases, it may even pass the leading bus and appear "early." Recovery time can be scheduled to absorb delays, but this does not resolve uneven spacing or prevent it from recurring. From a customer perspective, service remains unreliable even if individual trips are reported as "on time."

Headway management addresses this by prioritizing even spacing between vehicles, improving consistency of service and reducing the likelihood of bus bunching.



Headway Managment: Managing buses based on headways can help keep buses evenly spaced, avoiding unexpectedly long wait times and overcrowded buses.

What's New

Headway management has traditionally relied on active, real-time intervention by supervisors, supported by radio communication with drivers. Recent improvements in GPS accuracy, vehicle location data, and on-board information systems are making headway management easier to apply more consistently, with clearer and more timely guidance for both control room staff and operators.

These advances allow headway management to shift from a largely reactive practice to a more proactive and scalable operational tool.

Examples

Headway management is applied by transit agencies operating frequent bus networks, particularly as a real-time operational practice rather than a fully automated or system-wide approach. It is often used selectively on high-frequency routes, where customers are more sensitive to uneven service than to strict schedule adherence.

Typical applications range from simple to more advanced:

- **Holding vehicles briefly at selected stops** to restore spacing when early bunching is detected.
- **Real-time instructions from the control room** for drivers to adjust speed or dwell time to maintain even headways.
- **Supervisory dashboards using GPS-based vehicle location data** to identify emerging gaps or bunches before they cascade.
- **Integration with complementary priority measures,** such as conditional transit signal priority, to help regulated vehicles maintain spacing through congested segments.

Several large agencies have implemented headway management on frequent corridors. For example, the **San Francisco Municipal Transportation Agency** expanded headway-based management as part of its pandemic emergency response and has continued to apply it as a core operational practice. In the Seattle region, **King County Metro** has also applied headway management on selected RapidRide routes, supported by frequent service and active operational oversight.

Considerations

Headway management can theoretically be implemented within existing schedules and recovery structures, without changes to labour agreements or planned recovery time. In practice, more even headways can also improve the consistency of arrivals at termini, helping reduce congestion and supporting more predictable recovery periods for operators.

Over time, sustained use of headway management may enable more advanced approaches to scheduling and recovery design (sometimes referred to as fallback or circulation-based scheduling), which can reduce fleet requirements and terminal space needs. These approaches typically require additional coordination with labour agreements and operating practices and are often pursued only after agencies gain experience and confidence with headway-based operations