

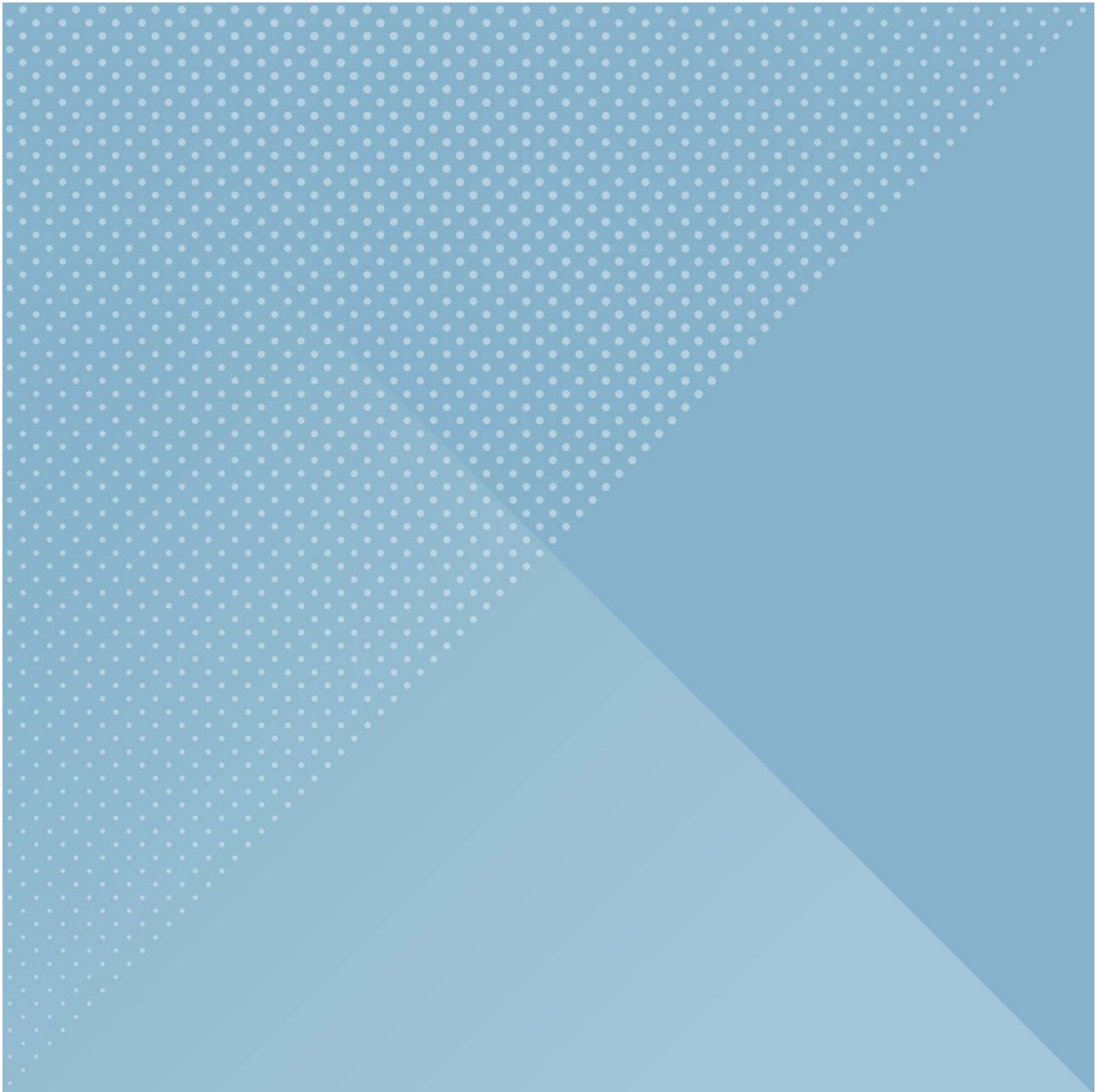


TransLink Transit Fare Review:
Existing Conditions Review

Report
November 2016

TransLink

Our ref: 22883301





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Executive Summary

Background

TransLink is conducting a comprehensive review of its approach to pricing transit to inform possible changes to fare policy. The ultimate goal of these changes will be to increase transit ridership by delivering a better customer experience and improving system efficiency.






This project includes a review of the existing fare structure, which has remained relatively unchanged for over 30 years, as well as an exploration of potential new structures that might vary fares by distance travelled, time of travel and/or service type. This project will also consider changes to products, user discounts and transfers. This review will leverage the new potential for fare structures based on the new technical capabilities of the Compass electronic payment system.

This study, which is part of the first phase of the Transit Fare Review, is focused on a review of the existing regional transit travel patterns as they relate to fares.

Existing Structure

The current fare structure in Metro Vancouver is based on a zone system implemented in 1984. To facilitate the introduction of the Compass Card, a temporary fare structure, Bus Anywhere charging a One Zone Fare for bus only trips (including HandyDART), came into effect on October 5, 2015. As shown in Fig. S-1, fares before the change were entirely zone-based for all modes with the number of zones varying for some of the service types.

Figure S-1: Metro Vancouver's Transit Fare Structure by Service Type (Pre- and Post- Compass Card Introduction)

Service type		Pre-Compass Card Introduction (up until Oct 4, 2015)	Post-Compass Card Introduction (Oct 5, 2015 - current) (Temporary)
	Bus	Shared zones (3-zones)	Flat fare (one-zone fare)
	SkyTrain	Shared zones (3-zones)	No change
	West Coast Express (WCE)	Unique zones (5-zones)	No change
	SeaBus	Shared zones (3-zones)	No change
	HandyDART	Unique zones (10-zones)	Flat fare (one-zone fare)

Travel Patterns

Transit travel patterns in the region were most recently and comprehensively captured in the 2011 TransLink Trip Diary Survey. This dataset was further analyzed for this project from a fare policy perspective.

The analysis of such patterns sets the context for exploring, designing, and evaluating future transit fare structures in a customer needs focused manner.

The analysis conducted in this stage of the fare policy review project identified trends based on services/modes used, distance travelled, times of travel, and income of travellers.

How do Travellers Use Different Transit Modes?

The analysis of transit modes noted that:

- 43% of average weekday transit trips completed were made by bus only services (including bus, trolleys and community shuttles without a transfer to another mode);
- Approximately 26% of trips were made by bus/rapid transit services (involving a transfer between these two modes);
- Approximately 15% of the total transit trips are made by rapid transit only (no transfers to other modes);
- About 10% of trips involve either park or kiss and rides (not analyzed further in this report);
- About 1% of trips involve the West Coast Express;
- About 1% of trips involve SeaBus – of which the majority transferred between modes; and
- Less than 1% of trips are made by HandyDART – of which 75% are short distance trip (<10 km).

Across these findings, an over-arching consideration is that about 40% of transit trips use multiple modes. This emphasizes the continued importance of providing an integrated and seamless fare structure for multimodal trips.

How Far do Transit Travellers Travel?

The review also assessed how transit traveller distance varied across the region in 2011:

- While some transit trips were long, most transit trips were below 10 km in length; and
- More than 50% were trips within each of Metro Vancouver's sub-regions (internal trips).

This analysis has two key ramifications for the review: (1) the majority of the system's customers pay a one-zone fare as zones do not divide subregions and (2) among trips completed by crossing Metro Vancouver sub-regional boundaries (external trips), there were also customers who travel less than 10 km and pay two-zone fares. These trips represent an issue for further exploration throughout the fare review: trips that pay a much greater fare than other trips of equivalent distance due to fare zone boundaries. The fact that some customers pay more for shorter travel provides direction for exploring structures based on actual distance travelled (such as a base fare for the first number of kilometres followed by a fare per kilometre travelled), smaller zones, or zone buffers to minimize this type of transit equity issue. If distance-based fares are applied to bus, this would require tap off on bus, so that the appropriate fare can be calculated.

When do Customers Travel?

The analysis of travel times noted that while crowding occurs on many routes, in all directions and across the day, transit services in Metro Vancouver see their heaviest utilization during peak times on weekdays, primarily for work/post-secondary commuting purposes. Although these customers may be less flexible to modify their travel schedule, especially during the AM peak period (which

tends to concentrate trips in fewer hours compared to a more dispersed PM peak period), fare products differentiated by time of travel (with discounts for travel in off-peak periods) may contribute to shifting demand to less congested times and make more efficient use of the transit system's capacity.

Historically, TransLink offered an 'off-peak' discount (eliminated in 1997) that provided a lower fare for mid-days during the work week. This discount, in addition to the evening and weekends discount, encouraged demand to shift from peak periods to off-peak by offering a reduced fare. Because travel patterns in the region have well defined peaks, which may add congestion to already crowded services, a future fare structure could consider time of day pricing or time of day products to manage demand and encourage all day use of transit.

How does Traveller Income Impact Travel?

The analysis of user income suggested that the higher the annual income reported by users, the greater the proportion of trips occurring within peak hours on weekdays. Customers with reported income above \$75,000 tend to travel most during peak periods. Conversely, demand from customers with an annual income below \$25,000 is very stable between 8:00 am and 5:00 pm with higher use of the system in the mid-day when more capacity is available. Given the greater share of trips made in the off-peak by low-income customers, off-peak discounts may be considered to better support equity goals and encourage broader use of the system.

How does Fare Value Vary Between Travellers?

When looking at how much customers pay to travel in the system, bus only services have the highest average fares per unit distance (\$/km) amongst all the transit modes. Customers who use bus only services are therefore likely to be subsidizing customers using bus/rapid transit, rapid transit only and West Coast Express services, the preferred modes for longer distance trips, which present lower average fares per unit distance and thus raises equity issues.

The analysis of fares by income shows that higher-income travelers tend to travel longer distances on the system and pay lower unit fares. Conversely, low-income travellers tend to take shorter distance trips and pay higher average unit fares. This preliminary finding suggests that there may exist equity issues that affect certain groups of travelers and that this could be addressed in the fare review.

How do Travellers Pay for Transit?

Analysis of methods of payment indicates that monthly passes comprise an important share of the transit trips in the region. In 2011, monthly passes represented more than a third of the total transit trips across different income ranges and trip purposes, followed by FareSavers and U-Pass BC (a discounted transit pass program for enrolled students at participating public post-secondary institutions). In mid-2016, over 40% of trips were made by monthly passes, followed by almost 30% made by stored value (FareSavers were discontinued in early 2016) with a further 20% of trips made using a BC Bus Pass or U-Pass BC Compass Card. Most of the fare products and programs have been migrated to Compass with about 95% of all trips now being made using a Compass product. Cash fares have declined to about 5% of the journeys made on the system. Given their widespread use, a potential fare structure could consider how to include frequency based discounts either as similar products to today or in the form of price caps (which allow free

or discounted travel after a predetermined threshold of usage is reached within a given period of time). Products should also be designed in a way that contributes to distributing demand towards the transit system's available capacity.

Further Areas for Research

The analysis conducted in this phase, "Discover" (Phase 1), is primarily based on the 2011 Trip Diary Survey, which is now 5 years old and may not provide high-quality data for certain variables associated to Metro Vancouver residents' current travel patterns. The following are identified as areas for further research and analysis:

- **Analysis of Park and Kiss and Ride Trips** - Future analysis can investigate how the cost and proximity of parking may affect the decision to take transit by understanding where people are driving from, getting on, and getting off transit during a park/kiss and ride trip.
- **Analysis of Compass Data** – There will be impacts on customers' decision making and travel patterns changes because of the implementation of a temporary fare structure with the introduction of the Compass system. These changes can be analysed and compared with the travel patterns recorded in the 2011 Trip Diary.
- **Use of data from the Regional Transport Model** - Because changes to fares will impact customer demand distribution and mode choice, demand models (such as the Regional Transport Model) play a critical role in evaluating and planning fare structures. This model could be used in further stages of the Fare Review to provide distributions of trips between origins and destinations, by journey purpose and to calibrate any further revenue and ridership models developed.

Next Steps

The analysis presented in this document is part of the "Discover" work phase – Phase 1 out of 4 phases within the Transit Fare Review project – which intends to understand transit travel patterns, as well as issues and opportunities to take into account in the development of a future transit fare structure that adjusts to the needs of Metro Vancouver's residents. The analysis and insights from this work will help inform subsequent phases of the project.

1 Introduction

1.1 Background

In mid-2015, TransLink began scoping and commissioned background work to support a comprehensive Transit Fare Review that aims to:

- increase transit ridership by delivering a better customer experience and improving system efficiency; and,
- define and investigate key fare questions through a combination of technical/analytical work and internal/external stakeholder engagement.

There are four main phases for the Transit Fare Review that will continue into late 2017:

- **Phase 1 – Discover:** Identify issues, challenges and opportunities
- **Phase 2 – Define:** Define the range of possible options and evaluate
- **Phase 3 – Develop:** Develop the most promising options into “packages” and evaluate
- **Phase 4 – Deliver:** Refine preferred package and advance for approval

This Existing Conditions Report was prepared by Steer Davies Gleave to identify the critical lessons for fare structure development that can be learned from existing usage and travel. This report analyzes data based on the current conditions to illustrate travel patterns based on the existing fare structure, as well as the opportunities that may need to be considered when defining a new fare structure.

1.2 Report Structure

The report includes three key sections:

- **Section 2 – Transit Network:** Summary of TransLink’s current and future transit network
- **Section 3 – Fare Structures:** Summary of considerations for fare development, Metro Vancouver’s transit fare structure and the pricing system
- **Section 4 – Travel Demand Analysis:** Summary of the approach and the analysis made to connect the transit fare structure with transit demand patterns

1.3 Glossary

The following provides a description of some of the relevant terms used throughout this report:

- **Average Fare:** The weighted average of the fare associated with the trips selected for analysis.

- **Average Unit Fare:** The weighted average of the fare divided by the total distance (in km) of the trips selected for analysis.
- **Bus/Rapid Transit Trip:** Includes trips using both a bus and a rapid transit service: a transfer is made between the two modes, and can occur at any stage of the trip.
- **Conventional Bus:** TransLink transit services provided by fixed route bus (including trolleys) excluding HandyDART.
- **Conventional System:** TransLink transit services provided by fixed route bus (including trolleys), SkyTrain and SeaBus, excluding HandyDART and West Coast Express.
- **Customer Group:** A group of transit users defined by income or trip purpose.
- **External Trips:** Trips between Metro Vancouver’s defined sub-regions (see below). A trip is *between* sub-regions if it starts in one sub-region and ends in another.
- **Gated System:** A fare payment and enforcement system where passengers must pass through a gate using a valid Compass product which then validates their fare payment. The gated system currently includes SkyTrain and SeaBus.
- **HandyDART only trip:** Trips completed by using HandyDART services only, which are a non-fixed route service for people with physical or cognitive disabilities unable to independently use conventional transit services.
- **Internal Trips:** Trips within each of Metro Vancouver’s defined sub-regions (see below). In contrast to an external trip, internal trips start and end in the same sub-region.
- **Bus only trip:** Trips completed using conventional bus (non-HandyDART) services only, including trolleys.
- **Primary Mode:** Main transit mode assigned by TransLink in the processing of the 2011 Trip Diary Survey, based on individual modes reported per trip in the survey.
- **Rapid transit only trip:** Trips completed using SkyTrain only.
- **WCE plus trip:** trips made by West Coast Express services (WCE) only or in conjunction with other transit modes
- **Sub-Region:** One of eight major sub-regions within Metro Vancouver:
 - *North Shore:* City and District of North Vancouver, West Vancouver, Bowen Island and Lions Bay
 - *Vancouver/UEL:* City of Vancouver and University Endowment Lands
 - *Burnaby/New Westminster*
 - *Northeast Sector:* Port Moody, Port Coquitlam, Coquitlam, Belcarra and Anmore
 - *Richmond/South Delta,* which include Tsawwassen First Nation
 - *South of Fraser:* Surrey, North Delta and White Rock
 - *Pitt Meadows/Maple Ridge*
 - *City and Township of Langley*
- **Travel Markets:** Parameter used to analyze travel patterns from the “Internal Trips” and “External Trips” perspective.
- **Trip Purpose:** One of five trip purposes defined in the 2001 Trip Diary, based on reported main trip purpose.
 - Escort (drop-off / pick-up)
 - Grade School
 - Shopping / Personal Business
 - Social / Recreational / Dining
 - Work / Post-secondary school

2 Transit Network

2.1 Overview

This section of the report contains information about TransLink's current transportation network, along with a look at future service levels and transit infrastructure.

2.2 Current Network

TransLink constantly monitors its transit network and makes adjustments based on operational and customer needs to support regional policies and sustainability goals. The transit network in the region contains the following transportation modes:

- **Conventional Bus:** Services are provided by trolley buses, standard buses, coaches and community shuttle buses. Articulated buses and trolley buses are used for higher demand routes and express services. Community Shuttle services use smaller buses than conventional buses and are provided within specific areas of the region.
- **SkyTrain:** The region has an automated, driverless rapid transit system. All SkyTrain stations (except Metrotown Station until station upgrades are completed) have fare gates and require a Compass product to open the fare gate. There are currently three lines operating:
 - **Expo Line:** Provides service between Downtown Vancouver, East Vancouver, Burnaby, and New Westminister and then branching back into Burnaby or across the Fraser River to Surrey;
 - **Millennium Line:** Provides service between East Vancouver and Lougheed Town Centre in Burnaby. The Evergreen Extension of the Millennium Line will provide service to Port Moody and Coquitlam once the Evergreen Extension opens in December 2016; and
 - **Canada Line:** Provides service between Downtown Vancouver, Richmond and Vancouver International Airport.
- **SeaBus:** This is a passenger-only ferry. This service currently operates at a frequency of 15-minutes during the daytime on weekdays and 30-minute service on the weekends and evenings. The SeaBus connects Downtown Vancouver with the City of North Vancouver by crossing the Burrard Inlet. The SeaBus terminals have fare gates and together with the SkyTrain network form the gated system.

- West Coast Express (WCE):** This is a commuter rail service providing weekday peak hour, peak direction service. The WCE connects the Northeast Sector, Pitt Meadows/Maple Ridge and Mission with Downtown Vancouver. Service is only operated inbound in the mornings and outbound in the afternoons/early evenings. The service is currently supplemented by a WCE TrainBus. Fare gates are only located at Waterfront Station.
- HandyDART:** is a special door-to-door, non-fixed route service available for people with disabilities who are unable to use conventional transit. Customers must verify eligibility for using this system, and have to book their trip up to seven days in advance. This service has been operated by MVT Canadian Bus, a private contractor since 2009.

2.3 Future Network

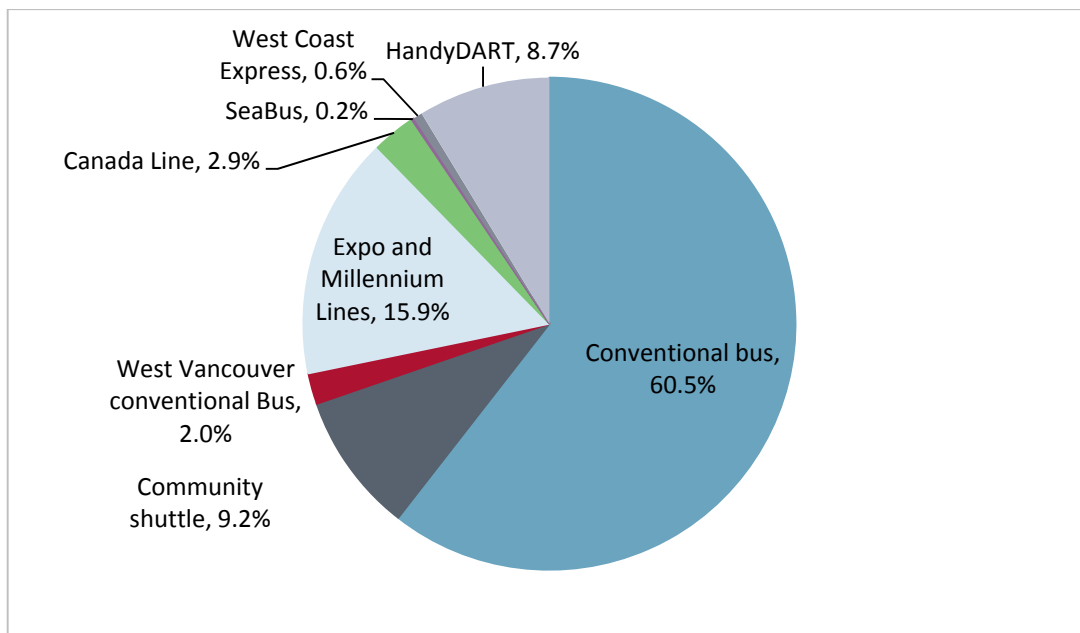
Changes to the region’s transit network have been reviewed to provide context on what a future fare structure must consider in terms of service levels and infrastructure.

2.3.1 Service Levels

The total number of transit service hours has remained relatively flat over the last several years at roughly 6.9 million service hours since 2011 (see Figure 2.1). The next major expansion will be the opening of the Evergreen extension of the Millennium Line in December 2016. TransLink is currently preparing a 2017 10-year Investment Plan following consultation with the public. Anticipated incremental funding will allow an increase in service hours. Until the Plan is adopted, future service levels are not confirmed.

Figure 2.1 shows the current breakdown of service hours by transit mode for services provided by TransLink.

Figure 2.1: Breakdown of Current Service Hours by Transit Mode Provided by TransLink

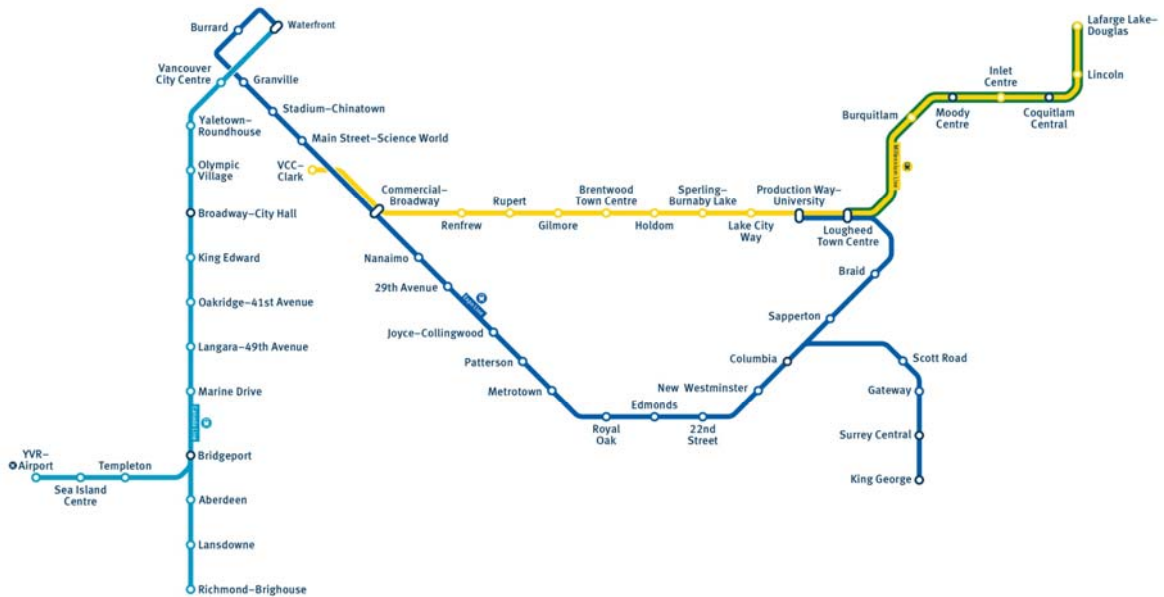


Source: TransLink’s Base Plan for 2014-2016 and Outlook for 2017- 2023

2.3.2 Future Transit Infrastructure

The opening of the Millennium Line Evergreen Extension is the largest change to the transit network in the near future. It is an 11 km extension of the SkyTrain system connecting Lougheed Town Centre in Northeast Burnaby to Lafarge Lake-Douglas in Coquitlam via Port Moody. Figure 2.2 shows a map of the future SkyTrain network. It is expected that the Evergreen Extension will be fully operational in December 2016.

Figure 2.2: SkyTrain Network Map Including Evergreen Extension



Source: TransLink

The South of Fraser Rapid Transit Project is part of the Mayors' Council 10-year Transportation Vision. A network of 27 km of Rapid Transit service along King George Boulevard, 104th Avenue, and Fraser Highway corridors has been proposed to connect residents in Surrey, City of Langley and Langley Township. The lines will connect to the SkyTrain at Surrey Central Station and King George Station.

The Millennium Line Broadway Extension Project is also incorporated in the Mayors' Council 10-year Transportation Vision, which would extend the line westward from the existing VCC-Clark Station to Arbutus Street, tunneled along the Broadway Corridor.

Funding discussions for the above lines, as well as upgrades and expansion of transit facilities, are currently underway and details about these new lines and facilities will be provided in TransLink's 10-year Investment Plan.

3 Fare Structures

3.1 Overview

This section outlines the considerations for fare development and provides a summary of Metro Vancouver’s transit fare structure, including products and programs, as well as key legislation related to pricing.

3.2 Background on Fare Development

This background review provides an introduction to fare concepts including approaches to setting fares and the uses of fares to achieve policy goals.

3.2.1 Setting Fares

Though multiple aspects should be taken into account when defining fare structures (for example: socio-demographic and economic level of customers, travel patterns, available infrastructure) there are two key considerations that are generally used regardless of the region:

- Fare differentiation by distance travelled; and
- Fare differentiation by service type.

Fare Differentiation by Distance Travelled

Fare differentiation by distance travelled suggests that the further customers travel, the more transit service they are using, and thus the higher their fare should be. Three common ways of setting fares based on the distance that customers travel are noted in Figure 3.1, and additional case studies are shown in Table 3.1.

Figure 3.1: Distance-based Fare Structure Approaches

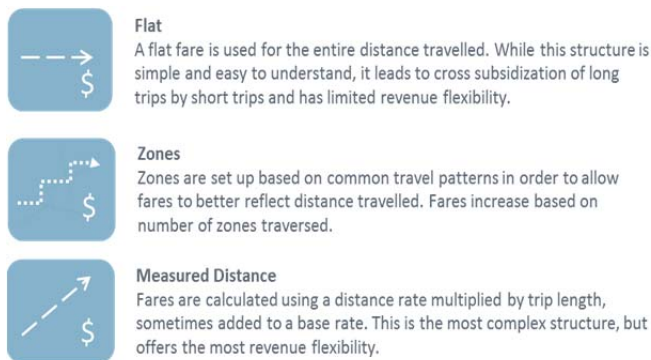





Table 3.1: Fare Structure Case Studies

Flat Fares (No Variation by Distance)	Fares by Zones	Fares by Measured Distance
<p><i>Example - Calgary Transit, Calgary, Alberta</i></p> 	<p><i>Example - TransLink, Metro Vancouver, British Columbia</i></p> 	<p><i>Example - Washington MATA, Washington DC</i></p> 
<p>A single fare is used for all services (bus, LRT) with time based transfers between services.</p> <p>2016 Regular Price (Adult Cash Fare) Single fare: \$3.15</p> <p>Source: https://www.calgarytransit.com/fares-passes</p>	<p>A three-zone system is used for SkyTrain and SeaBus during weekdays from start of service to 6:30 pm</p> <p>A one-zone fare applies throughout the entire system during weekdays after 6:30 pm, and all day Saturday, Sunday and Holidays.</p> <p>2016 Regular Price (Adult Cash Fare)</p> <ul style="list-style-type: none"> 1 Zone: \$2.75 2 Zone: \$4.00 3 Zone: \$5.50 <p>Source: http://www.translink.ca/en/Fares-and-Passes/Single-Fares.aspx</p>	<p>Fares are set with a base fare, which varies between the peak and the off-peak, plus the distance travelled.</p> <p>2016 Regular Price (Adult Cash Fare) Peak fares (USD \$2.15 min - USD \$5.90 max) in effect from:</p> <ul style="list-style-type: none"> Weekdays from the start of service to 9:30 am, and 3:00 pm to 7:00 pm Midnight until the end of service on Friday and Saturday nights. <p>Off-peak fares (USD \$1.75 min - USD \$3.60 max) are in effect at all other times.</p> <p>For a 2 km trip (from Dupont Circle to Metro Center station) - Peak fare: USD \$2.15; Off-peak fare: USD \$1.75.</p> <p>For a 17 km trip (from Dupont Circle to Whittle Flint station) - Peak fare: USD \$4.45; Off-peak fare: USD \$3.45. (Source: http://www.wmata.com/fares/)</p>

Fare Differentiation by Service Type

Differentiation by service type suggests that customers pay more for a higher quality of service. A structure where fares are differentiated by service allows for some or all service types to have their own fare structure, as shown in Table 3.2. Service types are generally defined by:

- **Physical System Parameters:** Such as region served and distance between stops.
- **Operation Parameters:** Such as travel speed and service frequency.
- **Customers Parameters:** Such as amenity/comfort and reliability, based on customers' perception of the service.

3.2.2 Aligning Fares with Policy Goals

Transit fare policy can be used to achieve multiple objectives, including financial and customer experience/system utilization objectives, but there will typically be conflicting objectives which require trade-offs to be made.

Revenue Collection to Capture Costs

The most critical and common role of fares is to collect revenue to cover some or all costs of providing and operating a transit service. However, in Canada, transit revenue is usually not enough to cover the entire operational costs of the system. Subsidies from other government revenue sources play an important role in most transportation systems around the world, helping to cover the outstanding costs that are not typically transferred to customers.

To achieve revenue collection objectives, the following considerations are generally included when setting fares:

- Maximum fares that customers will tolerate, without resulting in significant decrease in ridership;
- Availability of operating subsidies; and
- Cost of providing the service - including capital, operating, and renewal costs.

Transport Demand Management and System Optimization

Fares may also be used to achieve system optimization objectives, in addition to collecting revenue. In this context, fares are used as a disincentive or incentive to push or pull customers to or from a particular mode or service type. The main system optimization methods for fares as shown in Table 3.3 are:

- **Service optimizing fares:** Shift demand to available capacity on other services
- **Market development fares:** Develop transit ridership in line with development goals and objectives
- **Congestion optimizing fares:** Shift demand to alternative times where capacity is available

Table 3.2: Fare by Service Type Case Studies







Fares by Physical System Parameters	Fares by Operation Parameters	Fares by Customer Parameters
<p style="text-align: center;"><i>Example – BKK, Budapest, Hungary</i></p>  <p>Source: http://epelettar.hu/cikk/az-alstom-atadta-az-uj-metroszerelvenyt-budapestnek</p>	<p style="text-align: center;"><i>Example - Beijing Subway and Beijing Public Transport Holdings, Beijing, China</i></p>  <p>Source: https://futureofstorytelling.org/beijing-subway-library/</p>	<p style="text-align: center;"><i>Example – Union Pearson Express, Metrolinx, Toronto, ON</i></p>  <p>Source: http://www.torontosun.com/2015/04/19/key-up-express-financial-info-kept-under-wraps</p>
<p>Fares vary by geographical area (within Budapest and Metropolitan area), as well as between service types and modal interchange:</p> <p>Ticket for up to 3 stops : HUF 300</p> <p>Single ticket (uninterrupted trip without transfer): HUF 350</p> <p>Single ticket for public transport boat : HUF 750</p> <p>Metropolitan area ticket (uninterrupted trip without transfer): HUF 250</p> <p>Suburban railway extension (outside Budapest Admin area boundaries): range from 10km (HUF 250) to 30km (HUF 560)</p> <p>Source : http://www.bkk.hu/en/tickets-and-passes/prices/</p>	<p>Both, subway and bus systems are based on a fare by distance structure. However, the minimum charge for buses is lower than subway services.</p> <p>Bus:</p> <p>CNY 2 for the first 10 km (CNY 1 added per additional 5 km)</p> <p>Subway:</p> <p>CNY 3 for the first 6km</p> <p>CNY 4 between 6km and 12km</p> <p>CNY 5 between 12km and 22km</p> <p>CNY 6 between 22km and 32km</p> <p>Extra CNY 2 for every additional 20km over 32km</p> <p>Source:http://www.bjbus.com/home/fun_news_detail.php?uNewsCode=00002547&uNewsType=6 and http://www.bjsubway.com/support/ccgd/</p>	<p>UP Express train service in Toronto allows customers to travel between Toronto Pearson International Airport and Downtown Toronto (and intermediate stations). It is the swiftest and most reliable way to travel and with the highest level of passenger amenities. Same trip can also be completed by using bus or a combination of bus and rapid transit.</p> <p>From Toronto Pearson to Union Station</p> <p>UP Express: \$12.00 Adult (35 mins approx.)</p> <p>Bus/rapid transit: \$3.25 Adult (65 mins approx.)</p> <p>Source: https://www.upexpress.com/Tickets/BuyTicket and https://www.ttc.ca/Fares_and_passes/Prices/index.jsp</p>

Table 3.3: Fare Purpose Case Studies

Fares for Service Optimization (Capacity)	Fares for Market Development	Fares for Congestion Optimization
<p data-bbox="247 347 688 375"><i>Example - Transport for London, London, UK</i></p>  <p data-bbox="331 776 604 800">Source: Steer Davies Gleave</p>	<p data-bbox="758 347 1297 375"><i>Example - Public Transport Victoria, Melbourne, Australia</i></p>  <p data-bbox="894 776 1167 800">Source: www.ptv.vic.gov.au</p>	<p data-bbox="1360 347 1829 375"><i>Example - Land Transport Authority, Singapore</i></p>  <p data-bbox="1455 776 1728 800">Source: Steer Davies Gleave</p>
<p data-bbox="205 821 724 992">A zone-based fare system has been used to make travel in certain zones more costly than others. This can limit short distance trips on congested subway lines, and shift demand to buses or active modes.</p>	<p data-bbox="745 821 1297 1065">The transit system in Melbourne is divided into two zones: Zone 1 for the Central Business District (CBD) and the inner suburbs, and Zone 2 for the middle and outer suburbs. Regional services are based on a multi-zone system, including metropolitan trains, trams and buses in Zone 1 and 2.</p> <p data-bbox="745 1076 1297 1247">In January 2015, a Free Tram Zone was introduced to the CBD. This program encourages transit usage for trips that may otherwise be taken with other transportation modes.</p>	<p data-bbox="1333 821 1852 1206">Singapore offers an off-peak monthly travel pass as a fare product, which allows unlimited trips on buses and trains every day, except on weekdays from 6:30 am to 9:00 am and from 5:00 pm to 7:30 pm. This pass is intended for people who are flexible to make travel changes and travel during off-peak time. It is an example of fare structures being used to relieve congestion and make use of available capacity based on time-of-day pricing.</p>

3.3 Metro Vancouver's Fare Structure

The current fare structure in Metro Vancouver is based on a zone system implemented in 1984. In October 2015 a temporary fare structure was implemented along with the introduction of the Compass Card (an electronic payment system), which changes bus fares from a zonal structure to a flat fare.

The existing fare structure can be characterized by six dimensions:

- **Distance travelled:** Customers pay more for each zone boundary they cross. Currently, all buses and HandyDART temporarily operate under a one-zone fare structure, SkyTrain and SeaBus operate under a three-zone fare structure, and West Coast Express operates under its own five-zone fare structure.
- **Transit service:** There is one set of prices for buses, SkyTrain, and SeaBus (excluding the distance travelled component for SkyTrain and SeaBus as noted above). The West Coast Express is a higher priced service. Concessionary fares are not available on HandyDART services.
- **Time of travel:** Customers travelling outside of peak times (after 6:30 pm on weekdays, and all day weekends and holidays), only pay a one-zone fare on SkyTrain and SeaBus.
- **Fare product:** Customers can choose to purchase a single-ride ticket, use their Compass Card to get a discount by using Stored Value, or purchase a DayPass or a Monthly Pass.
- **Customer group:** Adults pay full price. Children, youth, seniors, and people with disabilities that impact their ability to travel independently are eligible to travel at a reduced price. Children up to and including 4 years of age travel for free when accompanied by an adult.
- **Transfers:** Customers using buses, SkyTrain, or SeaBus can transfer among these transit modes (except as noted above) without additional charge for up to 90 minutes from the time a fare is first used, and up to 120 minutes with a West Coast Express fare. However, customers paying cash on bus must pay a separate fare if they wish to transfer to SkyTrain or SeaBus and AddFares apply on SkyTrain and SeaBus if crossing a zone boundary on weekdays before 6:30pm.

Sub-sections 3.3.1 and 3.3.2 describe in detail the fare structure in place in the TransLink service area during 2011 (in line with the last Trip Diary Survey which is analyzed in Section 4) and 2016 (current fare structure), including the available fare products and programs.

3.3.1 2011 Transit Fare Structure

In 2011, there were three different transit fare structures within Metro Vancouver:

- **Conventional System Fare Structure:** 3-zone system.
- **West Coast Express Fare Structure:** 5-zone system.
- **HandyDART Fare Structure:** 10-zone system.

Conventional System Fare Structure in 2011

The general transit fare structure for Metro Vancouver during 2011 was based on three main fare zones within specific boundaries, applicable to trips taken by bus, SkyTrain, and SeaBus (noted in

Table 3.4 and shown in Figure 3.2). HandyDART and West Coast Express services had their own fare structure in 2011.

The zone system applies during weekdays from the start of service until 6:30 pm. After 6:30 pm, and during weekends and holidays, customers pay a one-zone fare to travel across the entire system. Riders on the conventional system have up to 90 minutes to transfer to other transit vehicles after purchasing a single transit fare, although an AddFare may apply. All 2011 fares for the conventional system are outlined in Table 3.5.

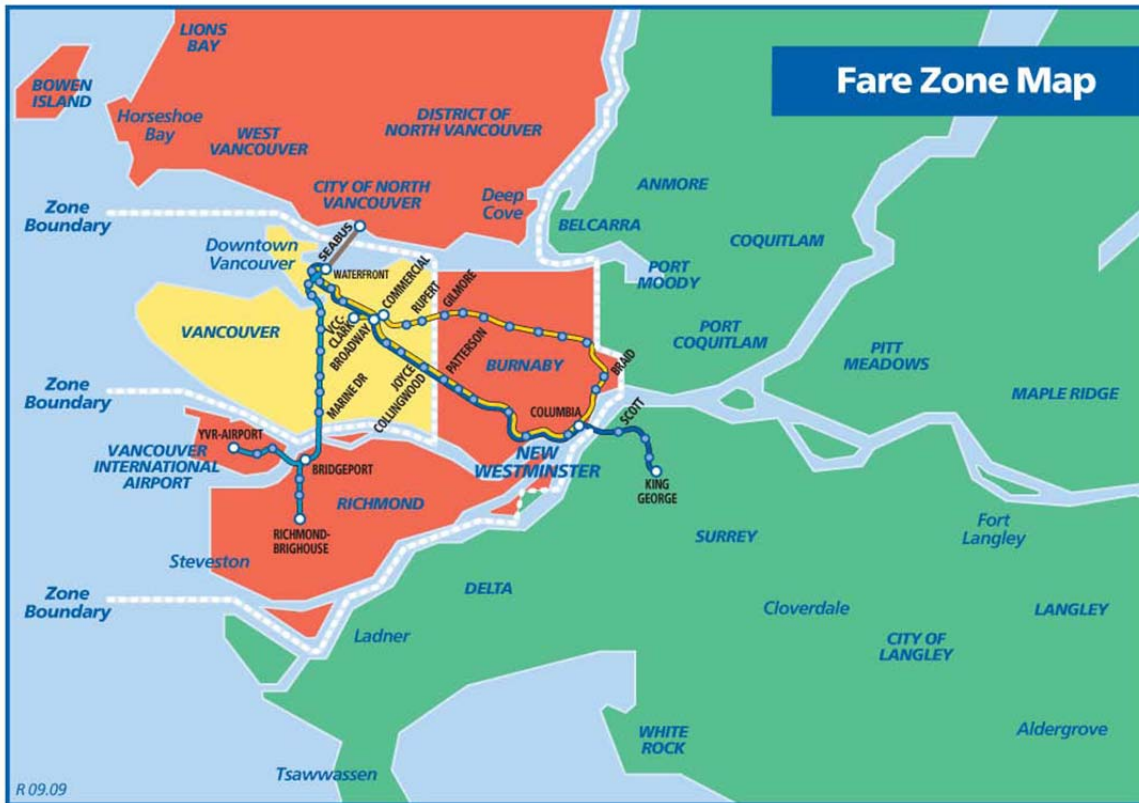
Table 3.4: Municipalities Included in Fare Zones for the Conventional System, 2011

Zone 1 (map: yellow color)	Zone 2 (map: orange color)	Zone 3 (map: green color)
City of Vancouver University Endowment Lands	Annacis Island (common zone – Zone 2/3) Bowen Island Bus stops located on Barnet Highway at the Petro-Canada refinery* City of Burnaby City of North Vancouver District of North Vancouver District of West Vancouver City of New Westminster City of Richmond Village of Lions Bay	Annacis Island (common zone – Zone 2/3) City of Langley Township of Langley City of Port Moody City of Coquitlam City of Maple Ridge City of Port Coquitlam City of Pitt Meadows City of Surrey City of White Rock Corporation of Delta Electoral Area "C" east of Indian Arm Village of Anmore Village of Belcarra

* Belongs to zone 3 in 2016

Source: TransLink Tariff Bylaw 70 – 2010

Figure 3.2: Fare Zone Map for the Conventional System, 2011



Source: TransLink Tariff Bylaw 70 - 2010

Table 3.5: Conventional 3-zone Transit System Fares, 2011

Category	One-zone	Two-zones	Three-zones	YVR AddFare
Adult Cash	\$2.50	\$3.75	\$5.00	\$5.00
Concession Cash	\$1.75	\$2.50	\$3.50	\$5.00
Adult FareSaver Tickets	\$2.10	\$3.15	\$4.20	
Concession FareSaver Tickets (all zones)			\$1.70	

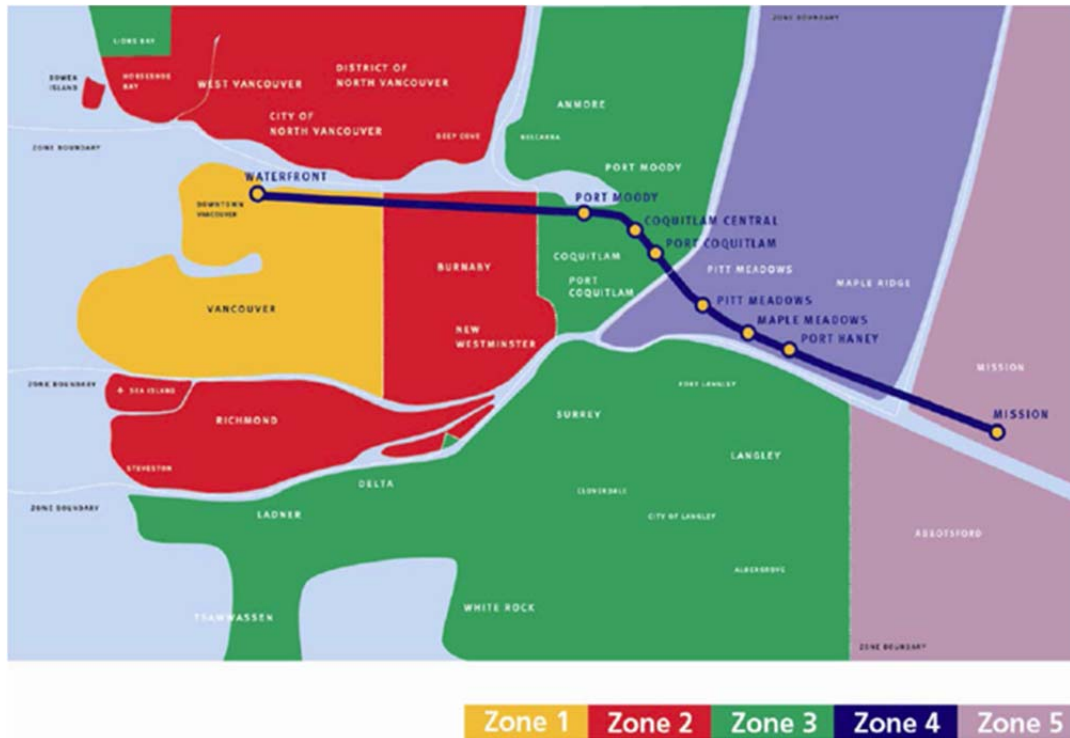
Source: TransLink

An additional fare was incorporated in 2010 to pay for closing the funding gap for the Canada Line which consists of a \$5.00 Canada Line YVR AddFare. In 2011, the Canada Line YVR AddFare applied to cash tickets purchased at any of the Sea Island Canada Line Stations (YVR-Airport, Sea Island Centre, and Templeton) for eastbound travel beyond the Sea Island. All pre-purchased products were exempt from paying the fee at the time. Travel between any of the three Sea Island stations is free. Changes were subsequently made to the Canada Line YVR AddFare and it is now also charged on stored value trips for journeys travelling beyond Sea Island on the Canada Line.

West Coast Express Fare Structure in 2011

West Coast Express (WCE) operates from Monday to Friday during the AM peak (in one direction to Waterfront Station only) and PM peak times (in the reverse direction). A TrainBus service is provided during off-peak weekday periods on a limited basis. WCE ticket prices are based on the number of zones travelled through, which are shown in Figure 3.3. The zone system for WCE is different than that of the conventional system; the WCE has five-zones, with the fifth zone being located in Mission. In the conventional 3-zone system, Maple Ridge and Pitt Meadows are located in Zone 3, while under the West Coast Express zone system they are located in Zone 4.

Figure 3.3: Fare Zone Map for the WCE System



Source: TransLink, Key Facts for Transit Fare Update 2015.

Riders taking WCE have up to 120 minutes to transfer to the conventional system if required. 2011 WCE fares are shown in Table 3.6.

Table 3.6: WCE 5-Zone Transit System Fares (to Downtown Vancouver, Zone 1), 2011

Zone*	Station	Adult One-way Cash	Adult Return Cash
1 and 2	None	N/A	N/A
3	Port Moody, Coquitlam Central, and Port Coquitlam	\$6.75	\$12.50
4	Pitt Meadows, Maple Meadows, and Port Haney	\$8.25	\$15.50
5	Mission	\$11.25	\$21.00

Source: TransLink, *No stations in zone 2

HandyDART Fare Structure in 2011

In 2011, the HandyDART fare structure was based on a 10-zone system (presented in Figure 3.4, note only shows zones 1-9, zone 10 covers Lions Bay and is not shown), in which regular adult fares applied to all customers (concession fares are not valid for HandyDART trips). FareSaver tickets were available for HandyDART customers in 2011. HandyDART fares in 2011 are shown in Table 3.7.

Figure 3.4: Fare Zone Map for the HandyDART System, 2011



Source: TransLink Tariff Bylaw 70 – 2010. Note: Zone 10 (not shown) covers Lion’s Bay.

Table 3.7: HandyDART 10-Zone Transit System Fares, 2011

Zones	Example Trip	Cash Fare
One or Two-Zones	Within same city or adjacent city	\$2.50
Three-Zones	Surrey to Richmond/Burnaby	\$3.75
Four-Zones or more	Surrey to Vancouver	\$5.00

Source: TransLink

Fare Products in 2011

A variety of fare products are available to provide fares aligned with customer needs/wants and to promote transit usage.

For fare purposes, the public transit system in Metro Vancouver classifies customers into two groups: adult and concession. Concession fares are lower than adult fares and in 2011 applied to children between 5 and 13 years (inclusive), students (between 14 and 18 years inclusive with a valid GoCard¹), seniors of 65 years and older, and HandyCard² holders. All customers with a concession fare have to present valid ID if requested, except children. Children up to and including 4 years old travel for free on the system when accompanied by an adult.

Some of the fare products that were available during the 2011 Trip Diary survey are listed below. In addition to these products, a variety of fare programs targeted towards specific socio-economic groups were also available in 2011. Since almost all of these fare programs continue to be in place for 2016, a discussion of them occurs below, in section 3.3.3.

Products in 2011

- **Single ride/cash ticket:** Exact cash fare paid directly on buses or at ticket vending machines available at stations.
- **FareSavers:** Pre-paid payment method with magnetic stripes available in books of 10 tickets, allowing customers to travel through 1, 2 or 3-zones in the system at a discounted price.
- **DayPass:** 3-zone pass available for traveling during one entire day (from start of service to end of service) on conventional transit (excluding West Coast Express).
- **FareCards:** Allow unlimited travel during the month shown on the card. Available for 1, 2 or 3-zones, except for the concession card, which is available for all 3-zones at a higher discounted price.
- **WCE weekly card:** Valid for seven consecutive days.
- **WCE 28-day card:** Valid for 28 consecutive calendar days, including weekend and holidays.

3.3.2 2016 System Fare Structure

The implementation of the Compass Card as the new primary form of transit payment resulted in a number of changes to the fare structure. The main changes implemented since October 5, 2015, compared to the previous fare structure are:






- One-zone fares apply for all trips on buses and HandyDART, regardless of day or distance travelled; and
- Compass customers must always tap in for all service types, but are not required to tap out from buses at the end of their trip. Customers are only required to tap out when using SkyTrain, SeaBus, and West Coast Express services.

¹ Decal that transforms an ordinary student ID card into a GoCard that entitles students to purchase concession fares. GoCards were discontinued in September 2016 (see 2016 Fare Structure section), where students' eligibility for concession fares was broadened to a more general 'youth' age-based fare policy.

² Photo ID for registered customers with disabilities that allow them to pay concession fares when using conventional transit.

Table 3.8 shows a comparison between the fare structures before and after the implementation of the Compass Card system.

Table 3.8: Comparison of Metro Vancouver's Transit Fare Structure by Service Type (Pre and Post-Compass Card System)

Service Type		Pre-Compass Card System (up until Oct 4, 2015)	Post-Compass Card System (Oct 5, 2015 - current) (Temporary)
	Bus	Shared zones (3 zones)	Flat fare (one zone fare)
	SkyTrain/Canada Line	Shared zones (3 zones)	No change
	West Coast Express	Unique zones (5 zones)	No change
	SeaBus	Shared zones (3 zones)	No change
	HandyDART	Unique zones (10 zones)	Flat fare (one zone fare)

Source: TransLink

The previous fare structure for SkyTrain and SeaBus (conventional 3-zone system), and the West Coast Express service (5-zone system) remain intact with no changes. If customers transfer from the bus, and/or travel within more than one zone on SkyTrain or SeaBus before 6:30 pm on a weekday, an AddFare will be required for the additional zone(s) travelled through. The 2016 fares are shown in Table 3.9 and Table 3.10.

Table 3.9: Conventional 3-Zone and HandyDART Transit System Fares, 2016

Description*	One Zone	Two Zones	Three Zones	Day Pass
Adult Cash Fare	\$2.75	\$4.00	\$5.50	\$9.75
Adult Stored Value Fare	\$2.10	\$3.15	\$4.20	\$9.75
Adult Monthly Pass Fare	\$91.00	\$124.00	\$170.00	
Concession Cash and Stored Value Fares	\$1.75	\$2.75	\$3.75	\$7.50
Concession Monthly Pass Fare	\$52.00 for all three zones			

*One zone fares apply to conventional buses and HandyDART. Concession Fares are not valid on HandyDART.

Source: TransLink

Table 3.10: WCE 5-zone Transit System Fares (to Downtown Vancouver, Zone 1), 2016

Zone*	Zone 3	Zone 4	Zone 5
Station	Port Moody, Coquitlam Central, and Port Coquitlam	Pitt Meadows, Maple Meadows, and Port Haney	Mission
One-way Adult (Cash Fare)	\$7.25	\$9.00	\$12.25

One-way Stored Value Adult Fare	\$6.05	\$7.45	\$10.20
Adult Return (Cash Fare)	\$13.75	\$17.00	\$23.00
Adult Return Stored Value	\$13.00	\$16.25	\$22.00
Adult Monthly Pass	\$201.00	\$244.00	\$335.75
One-way Concession Compass Ticket (Cash Fare)	\$4.25	\$5.50	\$7.50
One-way Stored Value Concession Fare	\$3.50	\$4.60	\$6.25
Return Concession (Cash Fare)	\$8.25	\$10.50	\$14.50
Return Concession Stored Value Fare	\$7.75	\$10.00	\$13.75
Concession Monthly Pass	\$124.50	\$154.25	\$217.25

Source: TransLink, *No stations in zones 1 and 2 except Waterfront

Products

With the introduction of the Compass Card to the public, various traditional ticket types (FareSavers and FareCards) were phased out or discontinued on the conventional system, to enable the fare gates at stations to be closed. Between early April and July 2016 all fare gates were closed.

TransLink's various fare products and programs have been migrated to Compass Card for both the conventional system and WCE (HandyDART continues to use FareSavers and FareCards as proof of payment until an account-based Compass Card is implemented). Single ride and daily passes are the only ones provided as Compass single day fare media. However, customers who purchase cash tickets or use FareSaver on a bus must purchase a second fare if they wish to transfer to the gated system (SkyTrain or SeaBus).

TransLink uses blue Compass Cards for loading adult fares and orange Compass Cards for loading concession fares. The following are the available adult and concession fare products as of 2016:

- **Single ride/cash ticket:** cash fare paid directly on buses (exact) or at Compass Vending Machines available at stations. Tickets purchased from buses are not compatible with the Compass Card system and cannot be used to transfer to SkyTrain or SeaBus.
- **Stored Value:** value stored on a Compass Card for pay as you go. It was introduced at the same prices as previous FareSavers.
- **DayPass:** 3-zone pass available for traveling during one entire service day on conventional transit (excluding West Coast Express).
- **Monthly Pass:** monthly calendar pass for 1, 2 or 3-zone adult travel or 3-zone concession travel on the conventional system.
- **WCE return pass:** product available from 1 to 5 WCE zones for customers who make more than two trips per day available to Compass Card users, including unlimited use of the conventional system for that service day.
- **WCE monthly pass:** calendar monthly passes for travel on WCE for 1 to 5 zones. It includes free use of the conventional system.

- **Temporary** – FareSavers and FareCards for HandyDART Trips until account-based Compass Card system implemented.

3.3.3 Fare Programs

In addition to concession fares, specific programs help support transit use by special customer groups such as post-secondary students, low income seniors, and people with disabilities, among others. These programs were in place in 2011 and have continued into 2016 except for the employer pass program:

- **Government of BC Bus Pass:** Transit passes provided by the Province of BC that are available to low-income seniors and individuals receiving disability assistance from the province. Valid for unlimited travel on both TransLink and BC Transit conventional services and allows eligibility for concession fares on West Coast Express. Low income seniors currently pay a \$45.00 annual administration fee and disability assistance users currently pay a \$52.00 monthly fee (starting in Fall 2016). Both fees are paid directly to the Government of BC, who in turn pay TransLink a negotiated value for passes distributed in Metro Vancouver.
- **Canadian National Institute for the Blind (CNIB) Pass:** Pass for people who are blind or partially sighted as determined by the CNIB criteria. These customers ride for free on both the conventional system and WCE, when holding a CNIB ID Compass card.
- **War Amputee Passes:** Transit passes provided to veterans for World Wars 1 and 2 who are members of the War Amputees Association allowing free unlimited travel on the conventional and West Coast Express systems
- **TransLink Employee Pass:** TransLink provides a free pass program for eligible staff.
- **U-Pass BC:** Discounted transit passes available to eligible students enrolled at participating, publicly funded, post-secondary institutions within Metro Vancouver. The passes are valid for unlimited travel on the conventional system and are eligible for a discounted monthly pass on West Coast Express. The program in Metro Vancouver is a partnership between the Province of BC, TransLink and participating post-secondary institutions and their student associations. All eligible students are charged a mandatory monthly fee, currently \$39.50, through student fees collected by their post-secondary institution. In addition to these fees remitted by post-secondary institutions, TransLink receives a funding contribution from the Province of BC for delivery of the program. TransLink contributes to the discounted fare offered by the U-Pass BC program and takes on the costs to administer and deliver the program.
- **Employer Pass (conventional system and WCE):** Passes made available through participating employers to their employees, whereby TransLink provided a 15% discount on its monthly pass fare for a 12-month commitment from employees to participate. This product was discontinued in 2013.
- **TaxiSavers:** Pre-paid coupons that provide HandyCard registered customers a 50% subsidy when using taxis.

3.3.4 Transit Revenue

The revenues across the different fare products, programs and provincial contributions are shown in Table 3.11.

Table 3.11: 2015 Transit Revenues

Product or Program	Revenue (millions \$)
Fares	
Single Use	\$107.9
Prepaid Fares	\$280.0
Programs	
BC Bus Pass (Provincial Contribution)	\$46.1
U-Pass BC (Student Fees)	\$47.5
U-Pass BC (Provincial Contribution)	\$10.9
Other Transit Revenues	19.0
TOTAL TRANSIT REVENUES	\$511.4

3.3.5 2016 Distribution of Products and Programs³

In May, 2016, over 90% of TransLink trips were taken using a Compass Card. Monthly passes account for the largest share of trips using TransLink services (41%), with stored value tickets accounting for 30%. U-Pass BC and BC Bus Pass users account for a further 20%. In contrast, only 6% of trips used cash (see Figure 3.5).

Almost 90% of these cash fares were used for a single zone trip, compared to only 62% of monthly passes (see Figure 3.6).

³ The information of product and program distribution presented in this section (including Figures 3.5 and 3.6) is based on preliminary Compass data. This information is provided for illustrative context only as the actual distribution may vary throughout the year.

Figure 3.5: Distribution of Fare Products and Programs by Trips Taken, May 2016

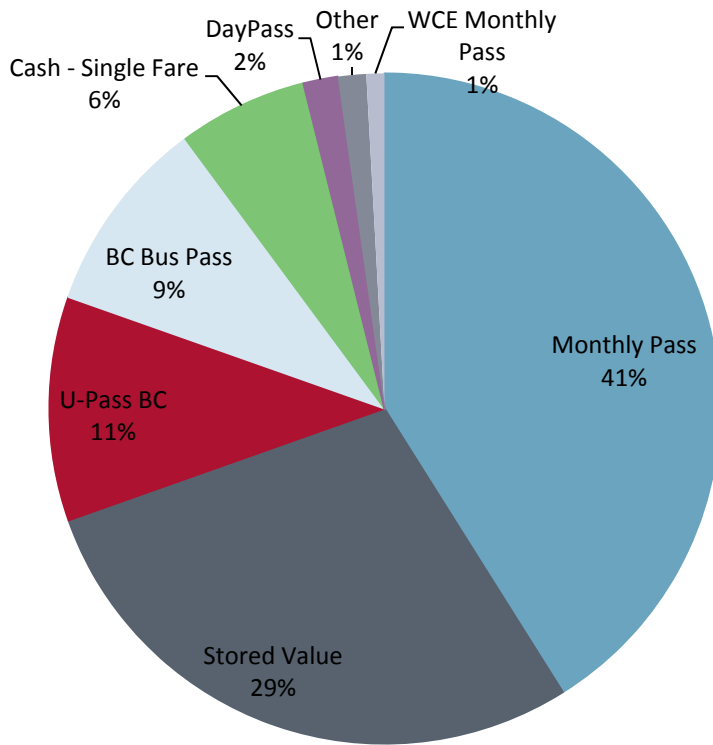
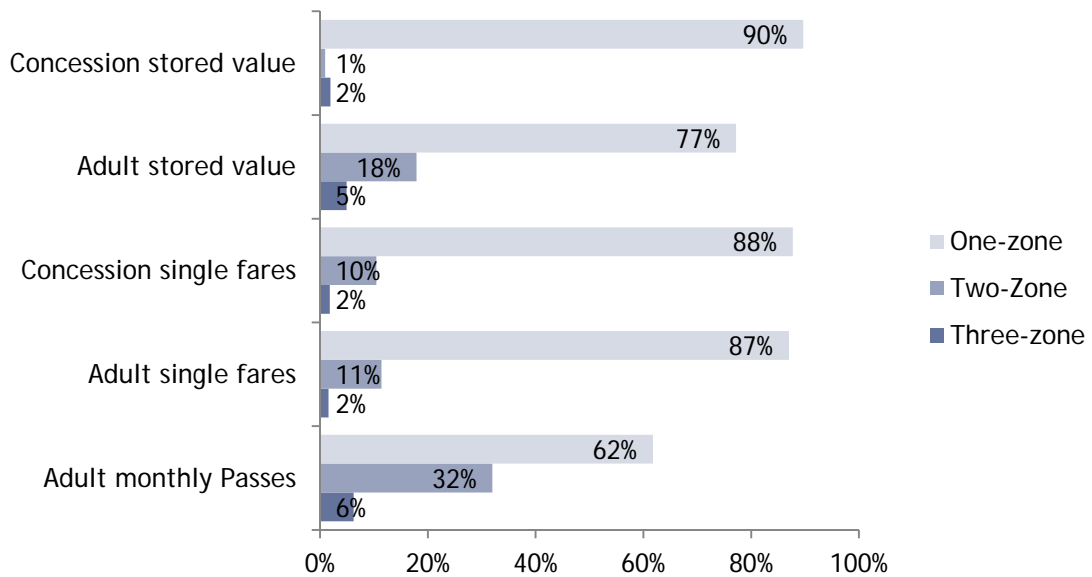


Figure 3.6: Distribution of Fare Products Used by Trips Taken and Zones Travelled, May 2016



3.4 Fare Pricing Legislation

The South Coast British Columbia Transportation Authority (SCBCTA) Act contains provisions governing the establishment of all TransLink's fares. The Act also regulates TransLink's "short-term fares" (passes of up to 3 days of duration), and requires Mayors' Council approval before introduction. Under the SCBCTA Act, TransLink adopts bylaws and special regulations for the transportation system across the region⁴.

The SCBCTA Act defines a "target" fare level for short-term fares, equal to 2008 fare rates plus annual compounding growth of 2% per year. Prior to the SCBCTA Act amendments enacted in 2014, TransLink had to apply to the Regional Transportation Commissioner to exceed target fares. The role of the Regional Transportation Commissioner was dissolved in 2014, and the responsibility for approval of supplementary fare increases was transferred to the Mayors' Council on Regional Transportation.

Through the approval of the TransLink 10-Year Investment Plan, the Mayors' Council may approve short-term fares set below, equal to, or above target fares. Upon approval of the Investment Plan by the Mayors' Council, the fare rates specified therein (for all products) may not be exceeded until a new Plan is adopted. If the Mayors' Council does not approve the Investment Plan, the TransLink Board can set short-term fare values at rates as high as the target fare, as well as set other (non-short term) fares.

⁴ The Parent Bylaw number 3-1999 (effective from April 1, 1999), to which multiple individual amendments have been incorporated throughout time, regulates the Transit Tariff in the region. The Consolidated Bylaw number 109-2016 (effective from April 4, 2016), corresponds to the last version of Transit Tariff's regulation.

4 Travel Demand Analysis

4.1 Overview

This section outlines the approach and the analysis that was undertaken to link the transit fare structure with transit demand patterns. It goes beyond the material covered in the TransLink 2011 Trip Diary Report.

4.1.1 Data Sources

The main data sources used in the analysis are:

- 2011 Metro Vancouver Trip Diary Survey - Traffic Analysis Zone (TAZ) level dataset used by TransLink. This zone system defines 641 traffic zones for which land use data is compiled and stored in the Regional Transport Model (RTM);
- Information provided directly by TransLink – including past policies, description of operations, and previously conducted analysis; and
- TransLink’s website (<http://www.translink.ca>) for general background information.

4.1.2 Limitations

This analysis has the following limitations:

- TAZs with a small number of sample households are not included in the analysis (50 out of 641 TAZs);
- More up to date data on travel patterns connected to socio-economic characteristics of individual or households is not available. The 2011 data, which was the most recent trip diary survey available, was used. However, this data does not reflect the potential effects of changes to the fare structure since 2011, such as the Bus Anywhere on a One Zone Fare including for HandyDART services, conversion to Compass Card, closure of station fare gates, and the elimination of some program passes such as the Employer Pass Program.

4.2 Key Project Considerations and Analytical Approach

4.2.1 Overview

A comprehensive approach was developed to analyze the connection between fares and use of transit in Metro Vancouver. Specifically, this analysis identifies key fare considerations based on trip purpose, length, type of service being used, and customers’ age and income.

This approach is applicable to all transit trips within Metro Vancouver, and includes three key questions:

- How do customers travel and for what purpose?
- When do customers travel?
- How much and how do customers pay to travel?

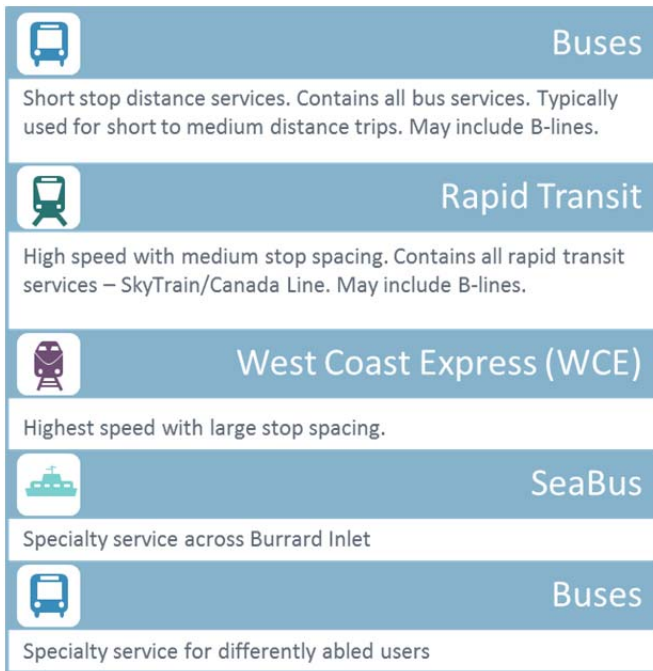
How do customers travel and for what purpose?

This section of the analysis focuses on identifying the transit modes that are used as well as the distances travelled, reported annual income and trip purpose. The goal of this analysis is to highlight multiple aspects that could be relevant to the Transit Fare Review. As shown in Figure 4.1, the analysis presented in this report is based on a specific categorisation of transit service in the region in order to accomplish the following:

- Determine the relationship between customer groups (reported income and trip purpose), and the chosen service type; and
- Find the key differences in travel behaviour by service type.

This categorization has been developed to understand how transit is used in the region. A different structure may be used to group services during the design of a fare structure.⁵

Figure 4.1: Modes of Transit Service Used in the Analysis



Note that B-Lines could also fall under the rapid transit category, but were placed in the Bus category for the purpose of this analysis. In the future rapid transit could include LRT.

⁵ TransLink is currently updating its Transit Service Guidelines which uses a different typology for service types. The typology used for this report is specific for analyzing and discussing transit fares.

The majority of the analysis focuses on bus, rapid transit, and WCE services. SeaBus (a unique fixed distance service) and HandyDART (providing service for differently abled users) are discussed in greater detail in section 4.6. SeaBus and HandyDART only trips, or trips that involve a transfer with these two modes are not included in the analysis in Section 4.5.

Trips are not entirely taken on only one transit mode. In order to better understand trip patterns a trip typology has been developed to help understand how different services are used within Metro Vancouver (see Table 4.1).

Table 4.1: Trip Types



Bus only – This category includes trips by bus/trolley only and excludes HandyDART. It includes trips that transfer between different bus services.



Rapid transit only – This category includes trips using rapid transit (i.e SkyTrain services). It does not include trips that transfer from other transit modes.



Bus / rapid transit – This category includes trips using both a bus and a rapid transit service: a transfer is made between the two modes, and can occur at any stage of the trip. A traveller performing this category of trip could use a bus to access a SkyTrain station, use a bus to get from a SkyTrain station to their final destination, or use a bus to connect two SkyTrain journeys.



WCE plus - This category includes all trips that use, either for the entire journey or for a part of it, West Coast Express services. Therefore a WCE plus trip is one where the traveller uses only WCE, uses a bus (or buses) and WCE, uses rapid transit and WCE, or uses a bus (or buses), rapid transit, and WCE.

When do customers travel?

This part of the analysis focuses on identifying how travel patterns may vary based on the time of day. The following time segments are used for the analysis:

- AM peak: from 6:00 am to 8:59 am
- Midday: from 9:00 am to 2:59 pm
- PM peak: from 3:00 pm to 5:59 pm
- Evening: from 6:00 pm to 11:59 pm
- Night Time: from 00:00 am to 5:59 am

Peak time comprises AM peak and PM peak periods, while off-peak time comprises Midday, Evening and Night Time periods (recognizing that the 30 minutes from 6:00 to 6:30 pm where regular fares apply on weekdays was not included). In order to determine the proposed fare structure, time of travel data has been analyzed against distance travelled, trip type, trip purpose, and customer group.

How much and how do customers pay to travel?

This part of the analysis focuses on identifying how fares may influence the payment methods that customers use when purchasing transit tickets. There are two ways a price of a trip is investigated this analysis:

Average Fare: Corresponds to the weighted average of the fare (price by travelled zones) associated with the trips selected for analysis. This value is calculated based on the 2011 fare structure and FareSavers values (except WCE where cash fares are used). Table 4.2 provides an example.

Table 4.2: Calculating Average Fare

To calculate average fare for a specific group: <ul style="list-style-type: none"> • Multiply trips by the fare paid for each trip. This is the total gross fare. • Divide total gross fare by the total number of trips taken. 	# Trips	Fare per trip	Gross Fare
	3	2	6
	5	3	15
	1	8	8
	Total	9	29
	Average Fare		\$ 3.22

Average Unit Fare: Corresponds to the weighted average of the fare (price by travelled zones) divided by the total distance (in km) of the trips selected for analysis. This value is also calculated based on the 2011 fare structure and FareSavers values (except WCE where cash fares are used). Table 4.3 provides an example.

Table 4.3: Calculating Average Unit Fare

To calculate average unit fare for a specific group: <ul style="list-style-type: none"> • Calculating gross fare, as in Table 4.2. • Calculate gross distance by multiplying the km for each trip by the number of trips, then summing. • Divide gross fare by gross distance 	# Trips	Fare per trip	Gross Fare	Km for trip	Gross distance
	3	2	6	8	24
	5	3	15	14	70
	1	8	8	30	30
	Total	9	29		124
	Average unit fare				\$ 0.23

The analysis of how customers pay is mainly based on the available payment methods, the customer group, and the trip purpose.

This section aims to identify fare barriers or issues with the existing fare structure.

4.2.2 Analytical Approach

Each of the three areas for analysis (how do customers travel, when do customers travel, and what do they pay to travel) can be explored using a common set of parameters drawn from the 2011 Metro Vancouver Trip Diary Survey, including:

- Travel Markets;
- Distance Travelled; and
- Customer Group.

These parameters help to conduct market and customer analysis (by service/distance), and derive key insights for consideration in subsequent phases of the Transit Fare Review.

Travel Markets

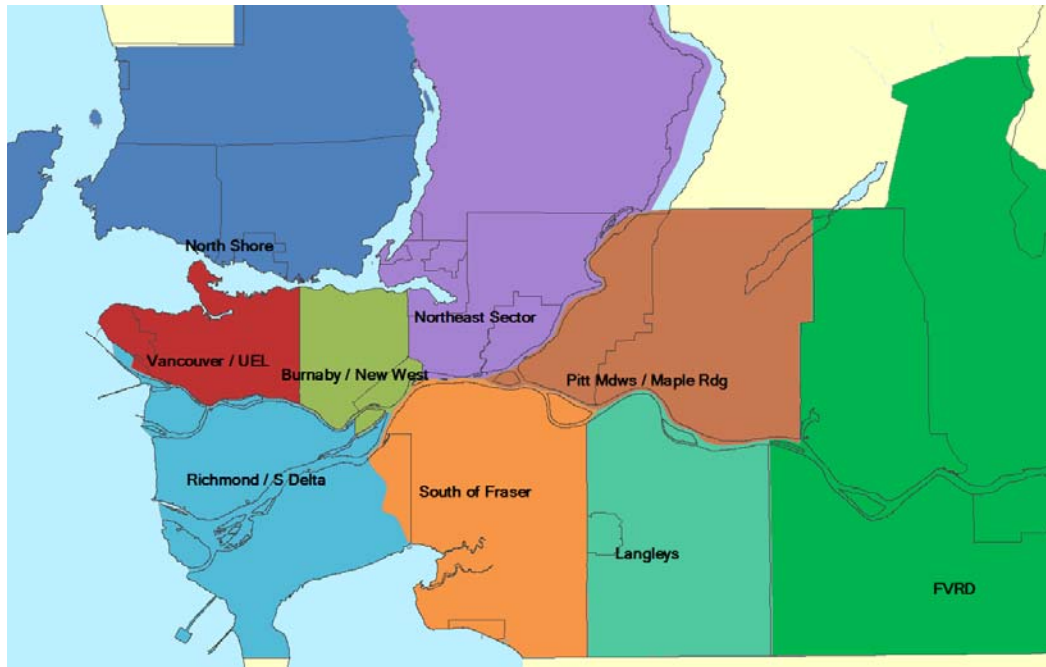
Travel markets are used to assess trips based on types of travel. In general, travel is categorized as:

- Internal: Trips taking place within a specific sub-region.
- External: Trips that cross sub-regional boundaries.

Travel markets analyzed in this report are based on the sub-regions defined in the 2011 Trip Diary Report for Metro Vancouver:

- North Shore: City and District of North Vancouver, West Vancouver, Bowen Island and Lions Bay
- Vancouver/UEL: City of Vancouver and University Endowment Lands
- Burnaby/New Westminster
- Northeast Sector: Port Moody, Port Coquitlam, Coquitlam, Belcarra and Anmore
- Richmond/South Delta, including Tsawwassen First Nation.
- South of Fraser: Surrey, North Delta and White Rock
- Pitt Meadows/Maple Ridge
- City and Township of Langley (labelled as Langleys on the charts and map)

Figure 4.2: Map of 2011 Trip Diary Sub-regions



Distance Travelled

The analysis includes two ways for measuring distance travelled:

- Measured distance: Trip distance in kilometres as provided in the 2011 Trip Diary Survey results. The trip distance provided in the 2011 Trip Diary is an estimated network distance based on the self-reported origin and destination in the diary.

- Number of zones travelled through: Based on the fare structure in 2011 for conventional system, WCE, and HandyDART.

Measured distance is useful for understanding the distribution of distances travelled within Metro Vancouver, and how fares by distance may impact different travellers. Analyzing the number of zones crossed and the distance travelled allows for an understanding of how well the current zone system differentiates fares based on distance.

Customer Groups

Trips by customer groups have been analyzed based on two variables recorded in the 2011 Trip Diary Survey:

- Reported income
- Trip purpose

The sub-categories for each of these variables are included in Table 4.4.

Table 4.4: Customer Groups for Travel Behaviour Analysis

Category	Breakdown
Reported income	<ul style="list-style-type: none"> • Less than \$25,000 • \$25,000 to less than \$50,000 • \$50,000 to less than \$75,000 • \$75,000 to less than \$100,000 • \$100,000 to less than \$150,000 • \$150,000 or more • Refuse/missing
Trip purpose	<ul style="list-style-type: none"> • Escort (drop-off / pick-up) • Grade School • Shopping / Personal Business • Social / Recreational / Dining • Work / Post-secondary school

Source: 2011 Trip Diary

Reported income and trip purpose are two critical factors in understanding both typical services used (e.g., fares paid, and products used based on household income and trip purpose) and potential equity issues.

4.3 How do Customers Travel?

4.3.1 Background

According to the data provided,⁶ on average, 5.94 million weekday trips were estimated to occur in the Metro Vancouver area based on the 2011 Trip Diary. As presented in Figure 4.3, the predominant modes are Auto Driver and Auto Passenger, which represent a share of 72% of trips

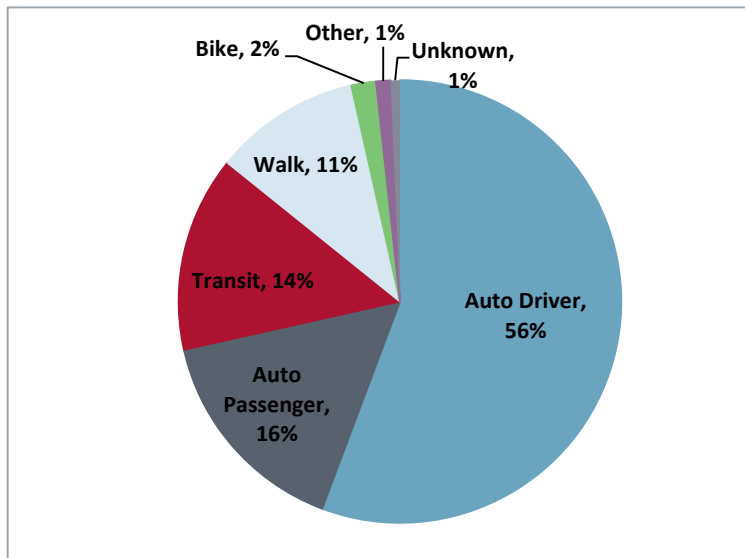
⁶ For more information, please refer to Sections 4.1.1 and 4.1.2.

(4.28 million trips); followed by Transit, with a share of 14% (848,700 trips). Walking and cycling have a combined mode share of 13% (742,000 trips).

The number provided above for Transit as the main mode of travel does not only include transit services provided by TransLink, but also other services such as BC Ferries,.

The analysis presented in this document focuses on the 846,400 average weekday trips (onwards referred to as “total transit trips”).⁷ This number includes HandyDART trips, which were classified in the category “Other” in the 2011 Trip Diary data processing, but does not include BC Ferries and other transit trips without a defined mode in the data.

Figure 4.3: Metro Vancouver’s Average Weekday Travel Total Mode Split, 2011










Source: 2011 Trip Diary data

4.3.2 Transit Service Utilization

The largest share of transit trips provided by TransLink are made on buses, reaching 365,300 average weekday trips, equivalent to 43% of the total transit trips (Table 4.5).

⁷ Although there are 848,700 transit trips the Trip Dairy, only 846,400 are trips that have all other associated information required for the analysis, including mode assignment.

Table 4.5: Transit Trips Distribution by Mode, 2011

Modes	Trip Type	Trips	%
Bus	 Bus only	365,300	43.0%
Rapid transit	 Rapid transit (RT) only	124,000	15.0%
Bus and rapid transit	 Bus / rapid transit	218,900	26.0%
WCE + bus and/or RT	 WCE plus	4,700	0.6%
WCE	 WCE plus	3,400	0.4%
Park/kiss and ride	 RT only, bus / RT, or WCE plus depending on mode used	85,300	10.0%
TransLink services + other modes (e.g. cycling)	 Dependent on transit mode used	18,100	2.0%
Bus + Seabus	Not categorized	5,900	0.7%
HandyDART	Not categorized	5,700	0.7%
Bus, RT, and SeaBus	Not categorized	5,000	0.6%
RT and SeaBus	Not categorized	3,500	0.4%
SeaBus only	Not categorized	3,400	0.4%
Other TransLink combinations	Not categorized	3,200	0.4%
TOTAL TRANSIT		846,400	100.0%

Source: 2011 Trip Diary data adjusted

Bus/rapid transit trips accounts for the second largest share of trips in the system (26%), significantly higher compared to rapid transit only trips, which accounts for 15% of the total. Trips only on West Coast Express account for 3,400 trips per day. However, trips that use WCE for at least one part of their journey (the WCE plus trip type) account for 8,100 trips per day.

As shown in Table 4.6, the bus network provides most of the short distance trips. Rapid transit and WCE networks are most used for the medium (10 to 20 km) to long distance (greater than 20km) trips.

Table 4.6: Average Weekday Transit Trips Distribution by Mode and Distance, 2011

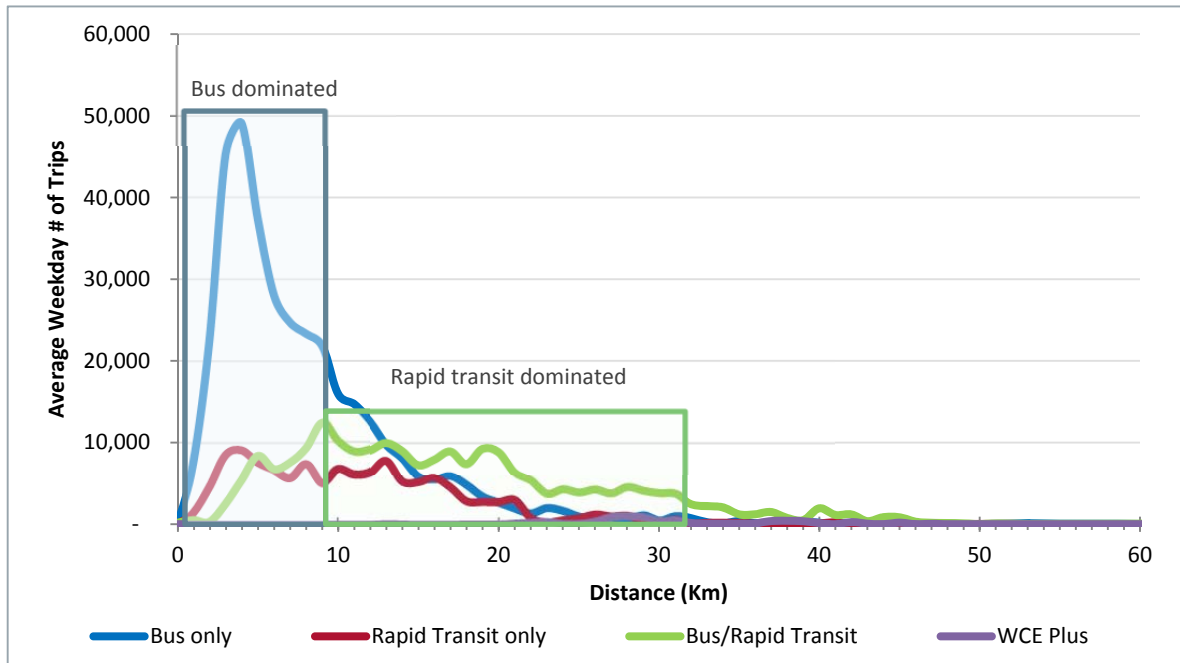
Mode	< 10 Km	10 – 20 Km	> 20 Km	Total
Bus only	76%	20%	4%	100%
Rapid transit only	51%	40%	9%	100%
Bus / rapid transit	29%	40%	31%	100%
WCE plus	0%	3%	97%	100%

Source: 2011 Trip Diary data adjusted

Figure 4.4 and Figure 4.5 present the direct distance and the cumulative distance distributions, respectively, of trips by mode within Metro Vancouver. As mentioned, bus only trips dominate

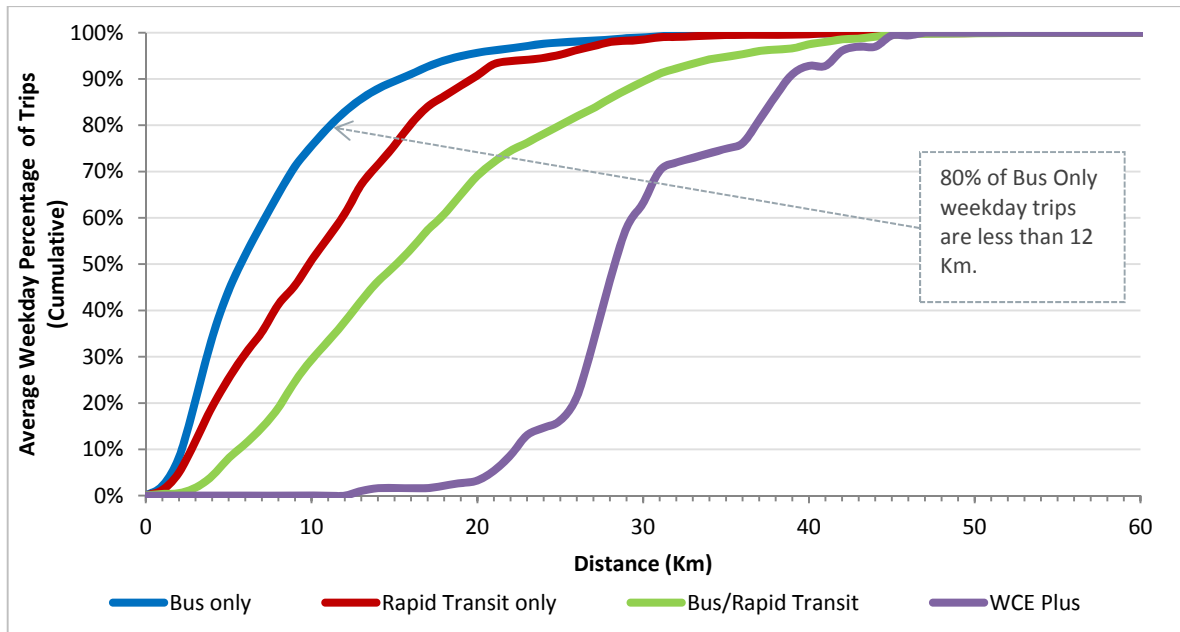
short distance trips, with almost 162,000 trips 5 km or less; 80% of bus only trips are 11 km or less. Rapid transit only plays an important share in short and long distance segments, although 90% of the trips are within 20 km or less. The bus / rapid transit combination is mostly focused on trips above 10 km (75% trips are 10km or greater). WCE plus trips are mostly above 20 km (97%), although this is mostly due to the infrastructure and purpose of WCE services (limited stops over a long distance network).

Figure 4.4: Distance Profile by Transit Mode, 2011 (Per Km)



Source: 2011 Trip Diary data adjusted

Figure 4.5: Cumulative Distance Profile by Transit Mode, 2011 (Per Km)



Source: 2011 Trip Diary data adjusted

4.3.3 Market Analysis

Trips Internal to Sub-regions

Internal sub-region trips represent a very important market for public transit. By internal trips we mean those trips that both begin and end in the same sub-region. Approximately 52% (438,800 trips) out of the total transit trips are completed within each sub-region. As shown in Table 4.7, Vancouver/UEL is the highest generator of this type of trip, with 282,400 trips, equivalent to 65% of the total transit trips originating within this sub-region, ending in this sub-region, followed by Burnaby/New Westminster with 62,100 trips, equivalent to 40% of the sub-region’s total transit trips.

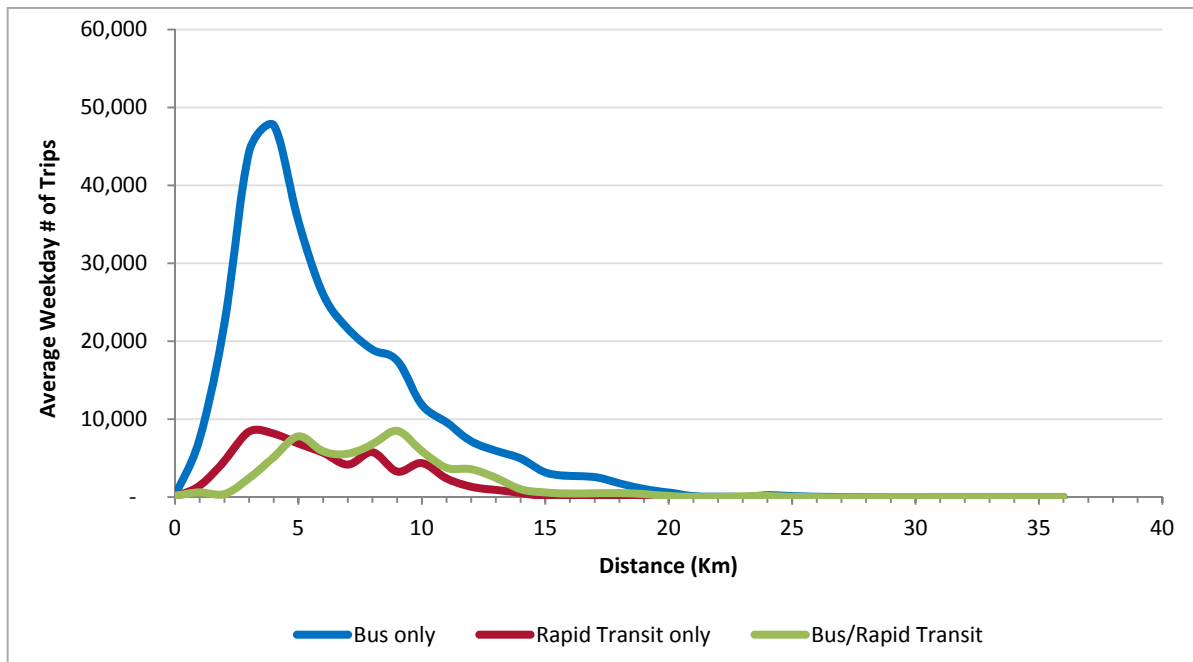
Table 4.7: Average Daily Trip Distribution for Internal Transit Trips, 2011

Sub-region	Internal trips	% of sub-region transit trips	Total average daily trips
Vancouver/UEL	282,400	65%	434,900
Burnaby/New Westminster	62,100	40%	156,000
South of Fraser	34,100	39%	87,200
Richmond/South Delta	20,300	34%	60,300
North Shore	18,200	39%	47,000
Northeast Sector	13,700	34%	40,500
City and Township of Langley	4,200	41%	10,300
Pitt Meadows/Maple Ridge	3,800	37%	10,300
TOTAL	438,800	52%	846,400

Source: 2011 Trip Diary data adjusted

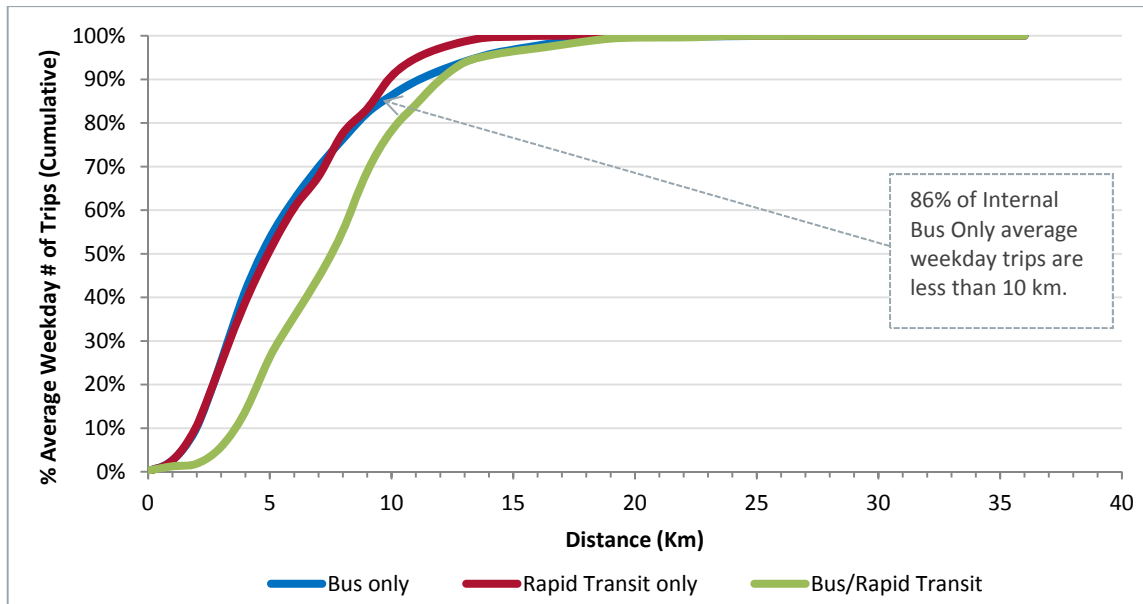
The use of bus services is predominant for trips within each sub-region, due to the higher service coverage across the region of buses (no other transit mode is available in many cases), and the majority of these types of trips are less than 10 km (Figure 4.6 and Figure 4.7).

Figure 4.6: Distance Profile for Internal Transit Trips, 2011 (per Km)



Source: 2011 Trip Diary data adjusted. Note, there are no internal WCE plus trips.

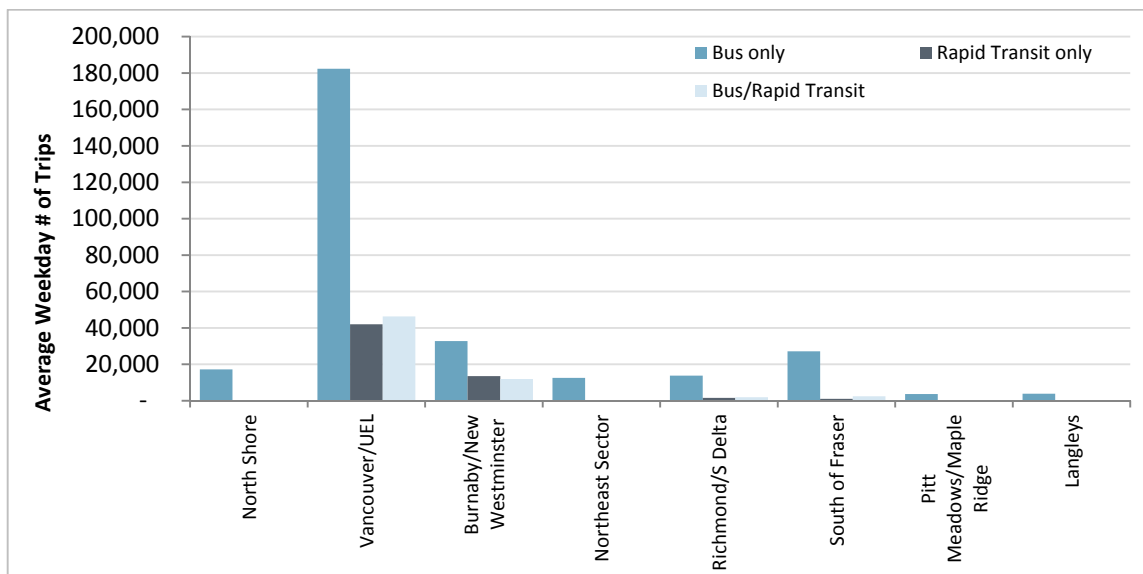
Figure 4.7: Cumulative Distance Profile for Internal Transit Trips, 2011 (Per Km)



Source: 2011 Trip Diary data adjusted. Note, there are no internal WCE plus trips.

Figure 4.8 shows that in Vancouver/UEL about 180,000 trips are completed by using bus only services, which represents almost 50% of the total bus only services provided in Metro Vancouver (365,300 trips; as shown in Table 4.5). This is important for fare policy since the current fare structure for bus only services is flat. Any change to a distance based fare structure on bus services would have an important impact on travellers on bus only services, especially in Vancouver/UEL.

Figure 4.8: Internal Trips by Mode and Sub-region, 2011



Source: 2011 Trip Diary data adjusted

External Trips between Sub-Regions

About 407,600 trips, equivalent to 48% of the total transit trips are crossing Metro Vancouver's sub-regional boundaries. Similar to internal trips, Vancouver/UEL is the largest attractor of external transit services, as 152,500 trips on average are taken to or from this destination (noted in Table 4.8).

Table 4.8: Average Daily Trip for External Transit Trips, 2011

Sub-region of destination	External trips	% of sub-region transit trips	Total average daily trips
Vancouver/UEL	152,500	35%	434,900
Burnaby/New Westminster	93,900	60%	156,000
South of Fraser	53,100	61%	87,200
Richmond/South Delta	40,000	66%	60,300
North Shore	28,800	61%	47,000
Northeast Sector	26,800	66%	40,500
City and Township of Langley	6,100	59%	10,300
Pitt Meadows/Maple Ridge	6,500	63%	10,300
TOTAL	407,600	48%	846,400

Source: 2011 Trip Diary data adjusted

Due to the limited coverage of rapid transit across the region, the combination of bus/rapid transit has become the most frequently used mode for cross-boundary trips, which are typically longer than 15 km in the majority of the cases (see Figure 4.9 and Figure 4.10). Bus only trips play an important role for long distance external trips where a rapid transit line is not available for rapid transit only or bus/rapid transit trips.

Figure 4.9: Direct Distance Profile for External Transit Trips, 2011 (Per Km)

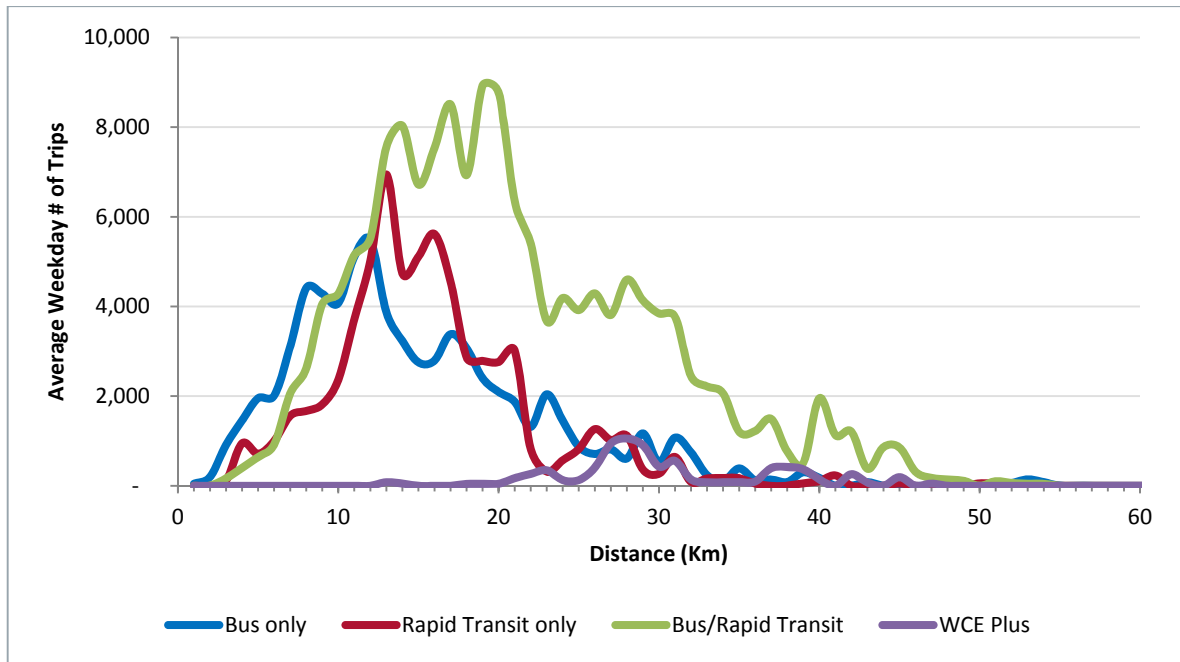
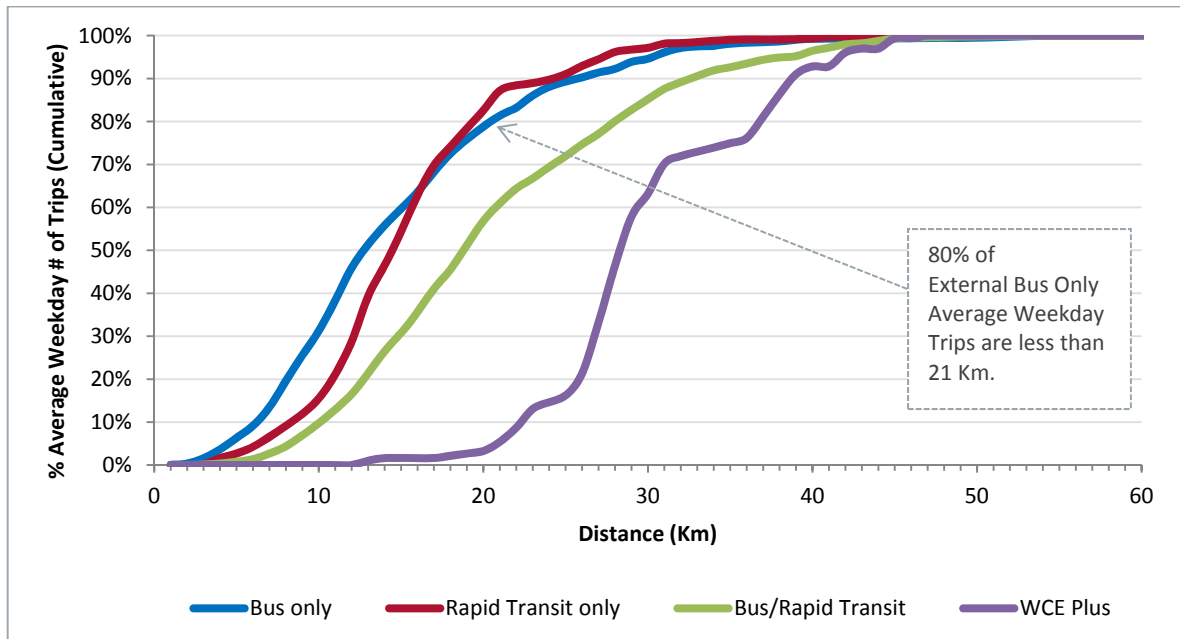


Figure 4.10: Cumulative Distance Profile for External Transit Trips, 2011 (Per Km)

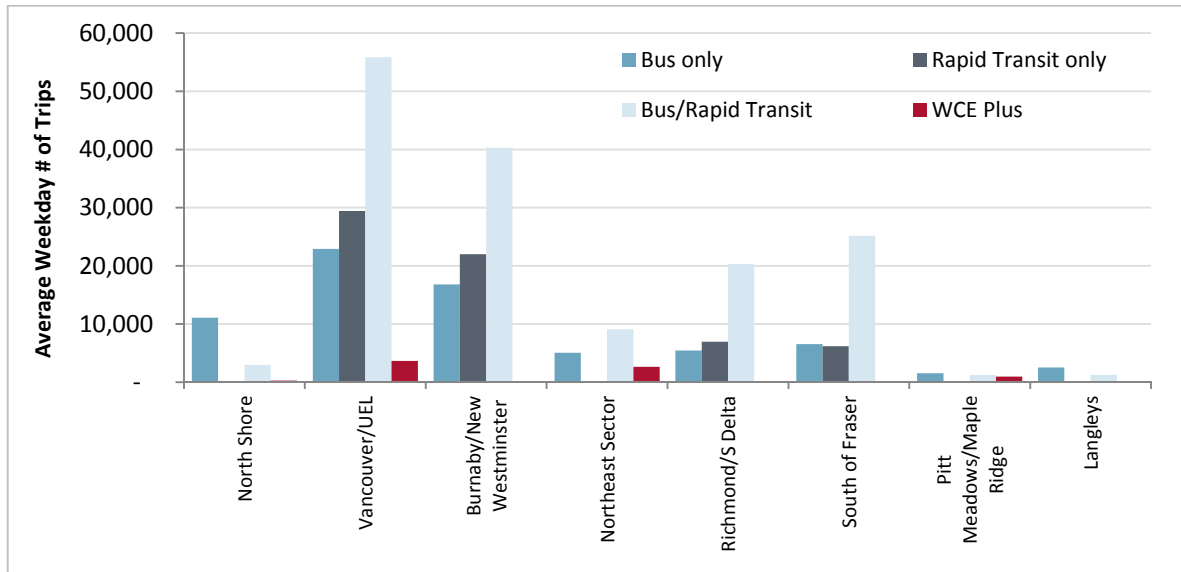


Source: 2011 Trip Diary data adjusted

As noted in Figure 4.11, the bus/rapid transit option is the most frequently used mode for external trips within all of Metro Vancouver’s sub-regions; except on the North Shore, Pitt Meadows/Maple Ridge, and the City and Township of Langley, where trips provided by bus only services are the majority between the analyzed modes (recognizing that none of these subregions has rapid transit access and rapid transit may only available in adjacent subregions). Therefore,

where there is rapid transit available within the sub-region or in the immediately adjacent sub-region, the highest share of external trips is typically by bus/rapid transit.

Figure 4.11: External Trips per Mode and Sub-Region, 2011



Source: 2011 Trip Diary data adjusted

4.3.4 Customer Analysis

Income range and the trip purpose influence travel behaviour and willingness to pay for transit service.

Reported Income

Transit users in Metro Vancouver have varying levels of income relative to the distribution of the general population. Table 4.9 presents the number of trips made by people with reported household incomes. Those with household income above \$150,000 accounts for only 7% of the total trips from the 2011 Trip Diary Survey compared to 9% of households in the region in this income group.

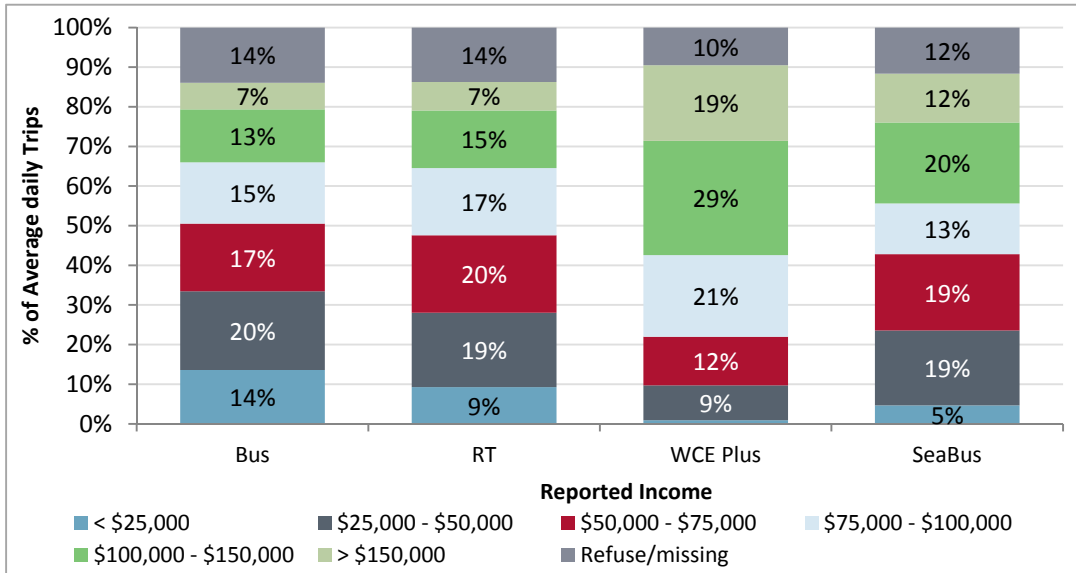
Table 4.9: Transit Trips Distribution by Reported Income, 2011

Annual income range	Trips	%	Proportion of Households in the Region
<\$25,000	94,500	11%	9%
\$25,000 - \$50,000	161,100	19%	19%
\$50,000 - \$75,000	153,900	18%	19%
\$75,000 - \$100,000	137,200	16%	16%
\$100,000 - \$150,000	121,600	15%	15%
>\$150,000	61,400	7%	9%
TOTAL	846,400	100%	

Source: Trip data, 2011 Trip Diary data adjusted & 2011. Household data, Metro Vancouver Regional Trip Diary Survey –Analysis Report

The relationship between the transit service used and income is shown in Figure 4.12. This analysis suggests that bus services and rapid transit services (based on their primary mode of travel) serve an important number of trips made by customers who reported a household income of \$75,000 or less (51% and 48%, correspondingly). WCE (primary mode) customers tend to have a higher income profile, with 69% of the trips made by customers who reported income above \$75,000. However it should be noted that WCE is substantially more expensive than other services therefore customers would generally be expected to have a higher income level.

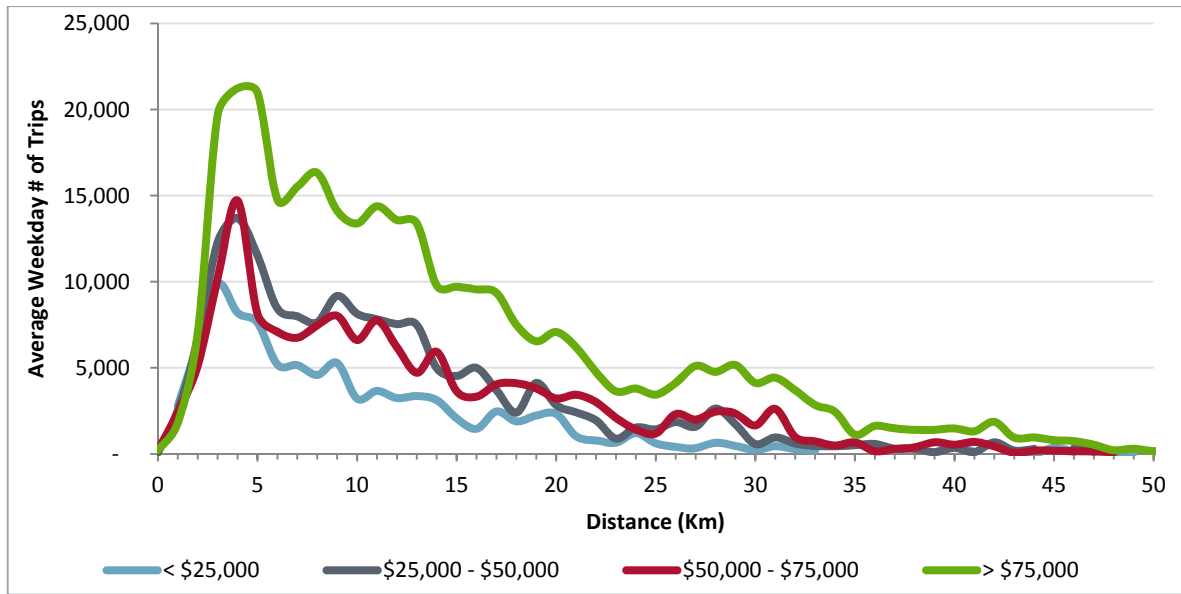
Figure 4.12: Transit Trips Distribution by Mode and Income Range (Based on Primary Mode), 2011



Source: 2011 Trip Diary data adjusted

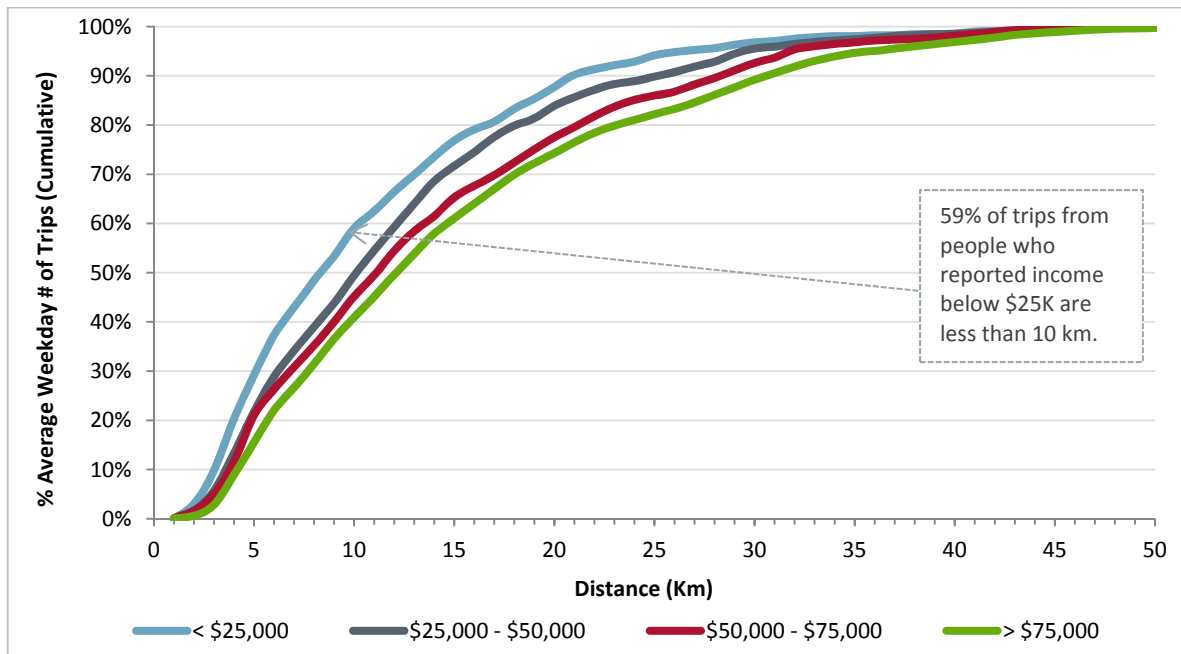
From analysis of distance travelled by reported income (as noted in Figure 4.13 and Figure 4.14), it is evident that the distance distribution varies among the different income ranges. Most of the trips in general, including those from low-income customers, are less than 10 km, and are concentrated around the 4 km mark. However, higher reported income groups do tend to travel slightly further; a majority of trips (59%) by customers with household incomes of \$75,000 or more are over 10 km in length. This situation could have equity implications, as short travel distance, low income customers may be cross-subsidizing long distance, higher income customers under the current zone fare system. Figure 4.14 shows that the distance distribution for travelers does not vary significantly by income. This analysis is further explored in Section 0.

Figure 4.13: Direct Transit Distance Profile for Reported Income, 2011 (Per Km)



Source: 2011 Trip Diary data adjusted

Figure 4.14: Cumulative Transit Distance Profile for Reported Income, 2011 (Per Km)



Source: 2011 Trip Diary data adjusted

Trip Purpose

Trips distributed by purpose are presented in Table 4.10, which shows that a high number of weekday trips in Metro Vancouver are for work/post-secondary purposes (61%); this confirms that transit services play a strong role in commuting.

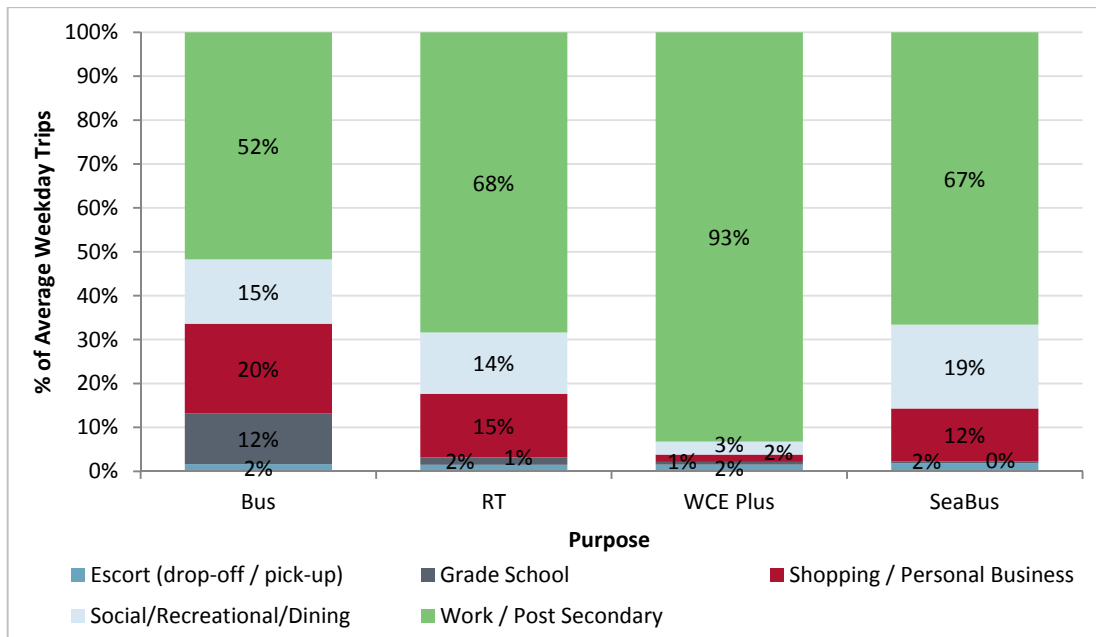
Table 4.10: Transit Trips Distribution by Purpose, 2011

Income range	Trips	%
Work/Post-Secondary	516,400	61%
Shopping/Personal Business	144,500	17%
Social/Recreational/Dining	120,600	14%
Grade School	51,600	6%
Escort (drop-off/pick-up)	13,300	2%
TOTAL	846,400	100%

Source: 2011 Trip Diary data adjusted

The transit services used by trip purpose are shown in Figure 4.15. WCE services are predominantly used for commuting trips on weekdays (93% of weekday trips). Bus services have the most diverse trip purposes due to their widespread availability. Social/Recreational and Shopping/Personal Business are also representative categories, reaching between 29% and 35% of weekday trips using buses, RT and SeaBus, this proportion would be expected to be higher if weekends were included.

Figure 4.15: Transit Trips Distribution by Mode and Purpose (Based on Primary Mode), 2011

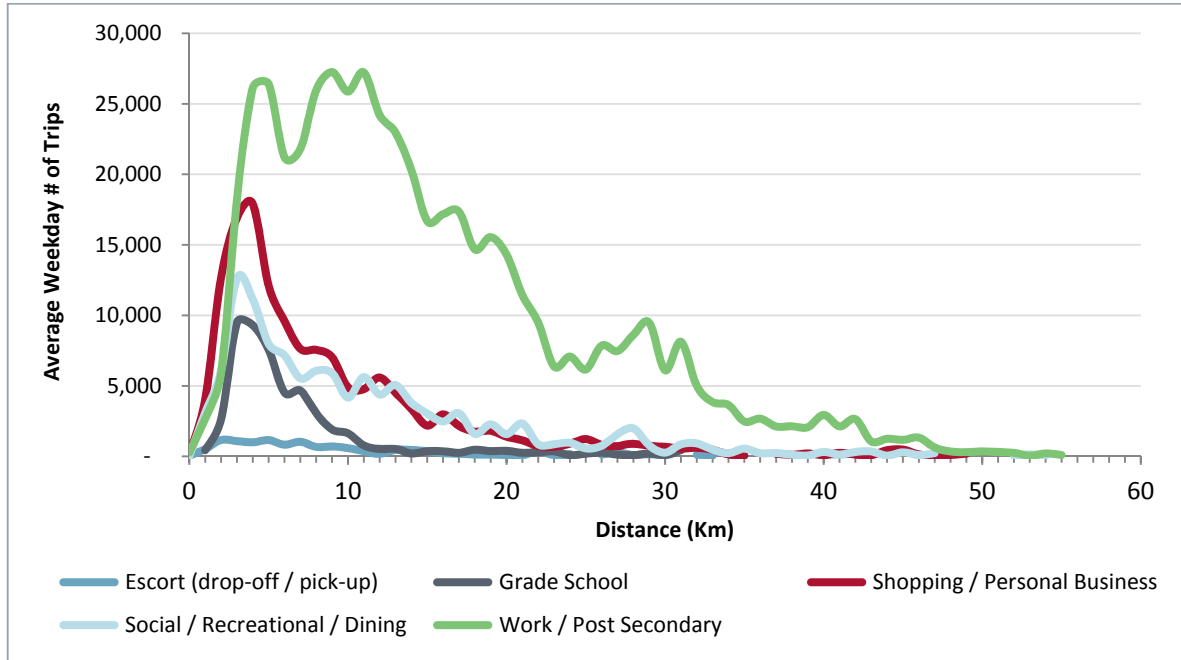


Source: 2011 Trip Diary data adjusted

The analysis of the distribution by trip purpose and distance (Figure 4.16 and Figure 4.17) suggests that trips for work/post-secondary purposes by transit presents a wider distribution of distance travelled compared to the other trip purposes. For work/post-secondary the majority of trip distances are between 5 km and 20 km, whereas for other journey purposes distance travelled is more concentrated between 0 km to 10 km. This may be due to centres of post-secondary education and employment being more dispersed locations (reflected in longer travel distances),

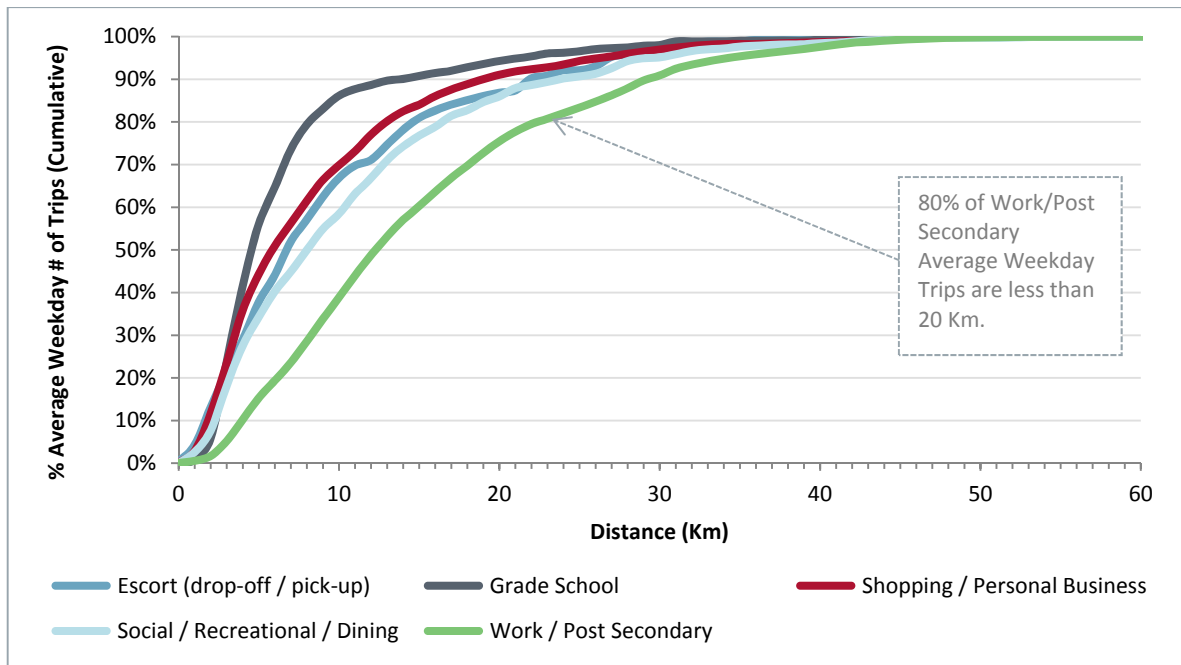
whereas recreational trips may have destinations closer to trip origins (reflected in shorter travel distances).

Figure 4.16: Direct Distance Profile for Transit Trip Purpose, 2011 (Per Km)



Source: 2011 Trip Diary data adjusted

Figure 4.17: Cumulative Distance Profile for Transit Trip Purpose, 2011 (Per Km)



Source: 2011 Trip Diary data adjusted

4.3.5 Key Insights

Key insights and potential implications from the “How do Customers Travel?” analysis for the transit fare review are presented in Table 4.11.

Table 4.11: Key Insights - How do Customers Travel?

Aspect	Insight	Implication for Potential Fare Structures
Market Analysis	<p>Not all transit modes are available for all trips types and purposes, and sometimes various modes provide similar services.</p> <p>Not all sub-regions that have rapid transit can use it to complete trips from origin to destination (for example, east-west trips in Richmond). In these cases, bus services may be required to complement trips.</p>	<p>A fare structure that derives fares based on distance should have comparable fares for trips that are a similar distance such that customers who only have access to a higher order service are not overly penalized for using it for short distance trips that may typically use a lower order service.</p>
	<p>Bus only: accounts for 43% of the trips, and is primarily used for short trips. If there are no rapid transit options available, bus only is also used for long trips (76% of bus trips are <10 km.)</p>	<p>A fare structure based on distance should consider: If a zonal system is used zones should be smaller than 10 km as 76% of trips are less than 10 km in length – a minimum size should be developed based on technical analysis</p> <p>System is based on measured distance: the rate for increasing fares should increase over distance aligned with the drop in demand for longest distances. If fares increase too steeply past 15 km, there may be a decrease in ridership due to a switch to car.</p>
	<p>Rapid transit only: accounts for 15% of the trips, and is a ‘multipurpose’ mode that serves all markets:</p> <ul style="list-style-type: none"> • 51% short distance trips (<10 km) (compared to 80% of bus only trips); • 40% medium distance trips (10-20 km); and, • 9% long distance (> 20 km): which is the segment dominated by bus/rapid transit and WCE plus trips. 	<p>RT networks are based on station to station travel and are therefore readily amenable to distance based fares, which are more precise than zones. Additionally, the new fare gates in all RT stations can facilitate distance fares. This structure allows fares to better reflect the value of the trip, while collecting transit revenue that better reflects the cost of long distance travel.</p>
	<p>Bus/rapid transit: accounts for 26% of all trips. It is used where no direct rapid transit connection is available between origin-destination and covers an important number of medium and long distance trips (71% of total bus/RT trips are medium/long distance trips greater than 10 km).</p>	<p>The current network depends on connectivity/transfers between bus and rapid transit services. New fare structures should continue to ensure a seamless transfer structure.</p>
	<p>WCE plus: accounts for 1% of the total trips, and primarily serves long distance trips that are not directly served by rapid transit (although this will change when the Evergreen Extension opens).</p> <p>58% of all WCE multimode trips (4,700 trips) require a transfer.</p>	<p>Since a slight majority of WCE trips require a transfer, a new fare structure should continue with effective/seamless transfers with the bus and RT transit systems and SeaBus (Specialty).</p> <p>WCE plays a similar role as RT: the new fare structure may set comparable fares to create a continuous or seamless fare system for long distance trips. However, cost of service, capacity and reliability of each mode should also be considered.</p>
Customer Analysis	<p>Bus: 51% of the trips are made by customers with incomes <\$75,000 and 14% of trips are made by</p>	<p>Demand from low to middle income customers may be sensitive to adjustments of bus fares or setting higher fares based on distance or having flat fares (no variation</p>

Aspect	Insight	Implication for Potential Fare Structures
	customers below \$25,000. 64% of weekday bus trips are for Work/Study purposes	by distance).
	Rapid transit: 48% of the trips are made by customers who reported an income <\$75,000, versus 39% of trips are made by customers with an income >\$75,000 (remaining 14% are unknown) 70% of all weekday RT trips are for work/study purposes (biggest share across all the modes, except for WCE).	Rapid transit is used by multiple customers across the income spectrum for long distance trips – either as a solo mode or chained with other modes. Because RT plays a critical role in many medium and long distance trips changes to its fares must clarify equity impacts and identify appropriate mitigation measures, especially as low income travellers who rely on RT may be sensitive to large changes in fare.
	SeaBus: all income ranges have an important share in SeaBus trips, except the income range <\$25,000 (5%). This may be due to SeaBus being a 2-zone fare (although in 2011, bus trips were also a 2-zone fare). 67% of all SeaBus weekday trips are for Work/Post-Secondary purposes.	Further analysis should be done to determine expected changes in the demographics of the SeaBus market. SeaBus operates a fixed route length that serves diverse purposes, including work/study, and tourism Products could be developed to reflect a best fare for specific purposes (for example, based on the time of travel or based on number of trips in a loyalty or cap based program).
	WCE plus: 79% of customers taking WCE plus trips reported an income >\$75,000. Hence, this service is largely used by higher income travellers.	WCE customers are in higher-income brackets, which typically use cars. Fares should be set to capture market while maintaining revenue.

4.4 When do Customers Travel?

4.4.1 Background

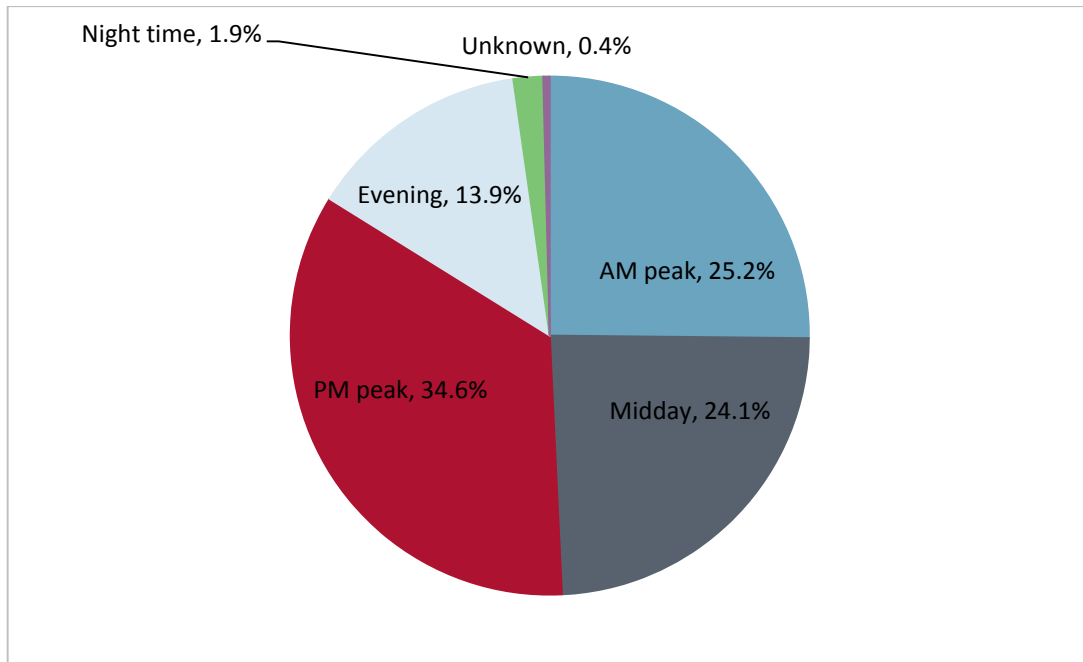
Time of travel is a key consideration for fare structure review and development. For example, the relationship between peak and off-peak fares may be a means to reduce peak crowding.

As shown in Figure 4.18, 59.8% of average weekday transit trips in Metro Vancouver (equivalent to 505,700 trips) are concentrated during peak hours (AM peak: 6:00 am – 8:59 am and PM peak: 3:00 pm – 5:59 pm), reinforcing the idea that transit is strongly used for commuting. It should be noted that the majority of these trips are in the PM peak (34.6%)

Note that the evening period (6:00 pm to 11:59 pm) also has an important share of trips in the system (13.9% - equivalent to 117,600 trips).

The Midday period (09:00 am – 2.59 pm accounts for 24.1 % of trips (204,000) in the system.

Figure 4.18: Total Transit Trips Distribution by Weekday Time Periods, 2011



Source: 2011 Trip Diary data adjusted

4.4.2 Market Analysis

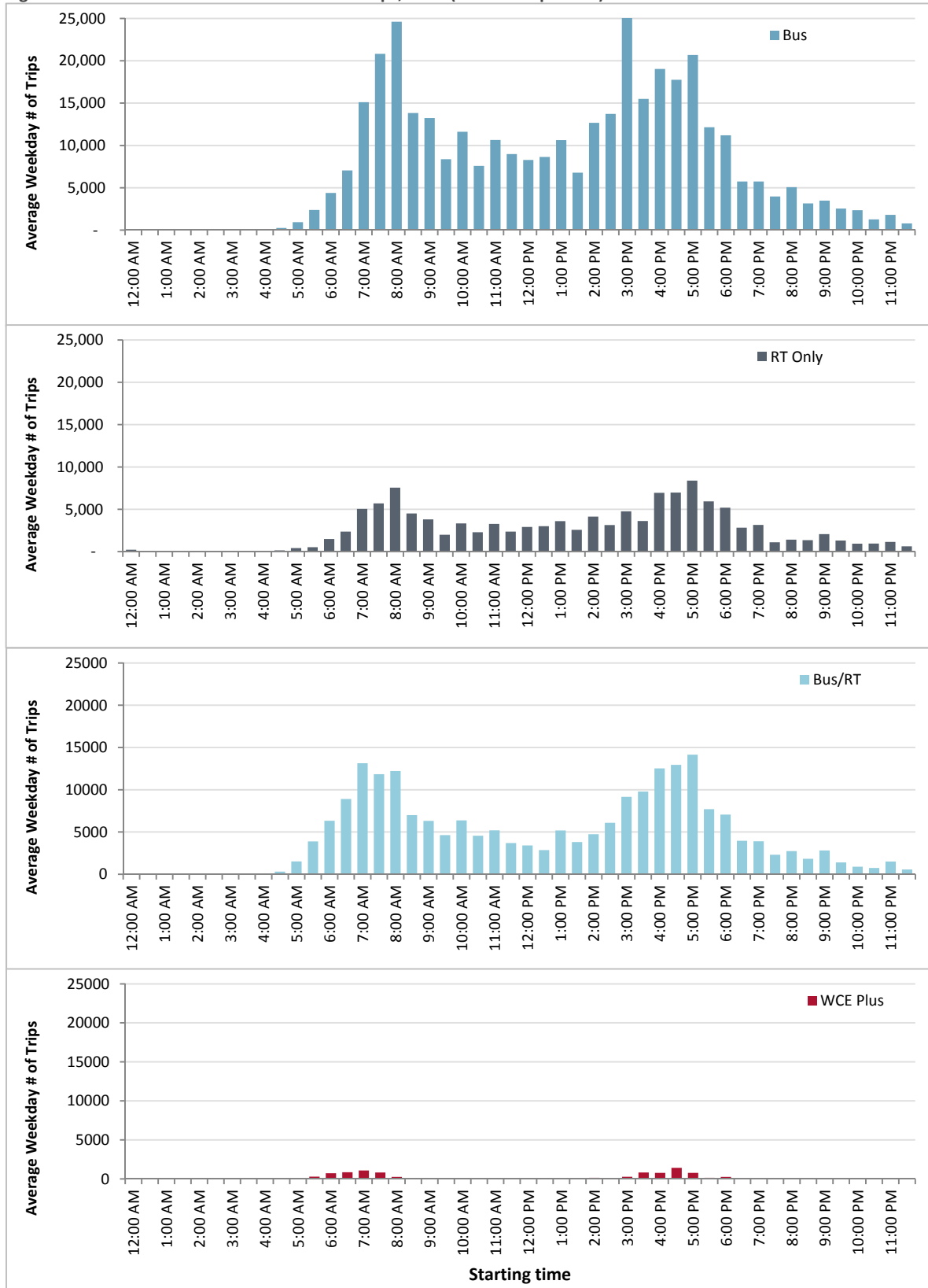
Total Trips

Table 4.12 shows time of travel profiles for all transit trips in the Metro Vancouver area. PM peak period travel accounts for the heaviest time of travel, with 34.6% of trips during the day within that 3 hour period. Interestingly, the Midday represents the second heaviest period of travel, with 24.1% of trips spread over 6 hours. The profiles (Figure 4.19) confirm that the AM and PM peaks are the heaviest periods for each mode. It is interesting to note the 3:00pm peak for bus only, possibly the result of school related trips.

Table 4.12: Total Transit Trips Distribution by Time Period, 2011

Time Period	Trips	%
AM peak (6:00 am to 8:59 am)	212,900	25.2%
Midday (9:00 am to 2:59 pm)	204,000	24.1%
PM peak (3:00 pm to 5:59 pm)	292,800	34.6%
Evening (6:00 pm to 11:59 pm)	117,600	13.9%
Night time (00:00 am to 5:59 am)	15,700	1.9%
Unknown	3,400	0.4%
Total	846,400	100%

Figure 4.19: Time of Travel Profile for Transit Trips, 2011 (30 minute periods)



Internal Trips

The highest share (35%) of internal transit trips within Metro Vancouver's sub-regions is during the PM Peak time, compared to all other time periods (Table 4.13). In addition, the share of trips during the 6-hour midday period is 28% and 22% for the 3-hour AM peak time.

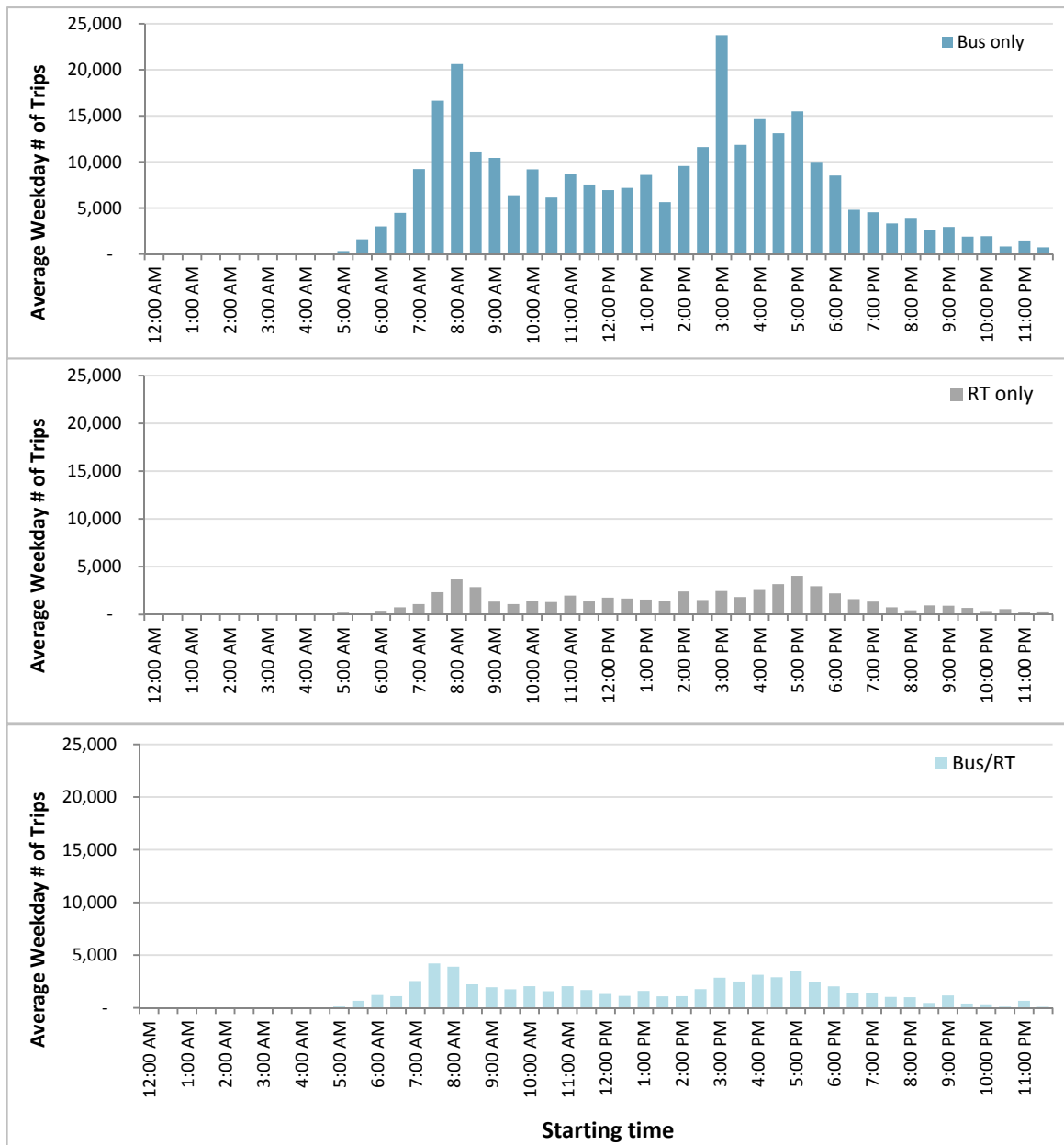
Though there is not a significant difference between when different transit modes are provided, bus only trips tend to peak between 7:00 am and 9:00 am and around 3:00 pm, compared to other modes and the rest of the peak time. Trips completed via rapid transit only peak between 4:30 pm and 5:30 pm, which mirrors the share of trips between 7:30 am and 8:30 am (Figure 4.20).

Table 4.13: Internal Transit Trips Distribution by Time Periods, 2011

Time period	Trips	%
AM peak (6:00 am to 8:59 am)	97,600	22%
Midday (9:00 am to 2:59 pm)	122,200	28%
PM peak (3:00 pm to 5:59 pm)	151,700	35%
Evening (6:00 pm to 11:59 pm)	60,700	14%
Night time (00:00 am to 5:59 am)	3,800	1%
Unknown	2,800	1%
TOTAL	438,800	100%

Source: 2011 Trip Diary data adjusted

Figure 4.20: Time of Travel Profile for Internal Transit Trips, 2011 (30 minute periods)



Source: 2011 Trip Diary data adjusted

The distribution of trips across the day also depends on distance travelled: the longer the trip, the earlier people begin their journey using the system. During the AM Peak, this is a more common situation for bus/RT customers, as on average they travel longer compared to bus only and RT only customers.

External Trips

As shown in Table 4.14, and similar to the internal trips, the average external weekday trips between Metro Vancouver's sub-regions have the highest share during the PM peak (35%), followed by the AM Peak (28%).

Table 4.14: External Transit Trips Distribution, 2011

Time period	Trips	%
AM peak (6:00 am to 8:59 am)	115,300	28%
Midday (9:00 am to 2:59 pm)	81,800	20%
PM peak (3:00 pm to 5:59 pm)	141,100	35%
Evening (6:00 pm to 11:59 pm)	56,900	14%
Night time (00:00 am to 5:59 am)	11,900	3%
Unknown	600	0.1%
TOTAL	407,600	100%

Source: 2011 Trip Diary data adjusted

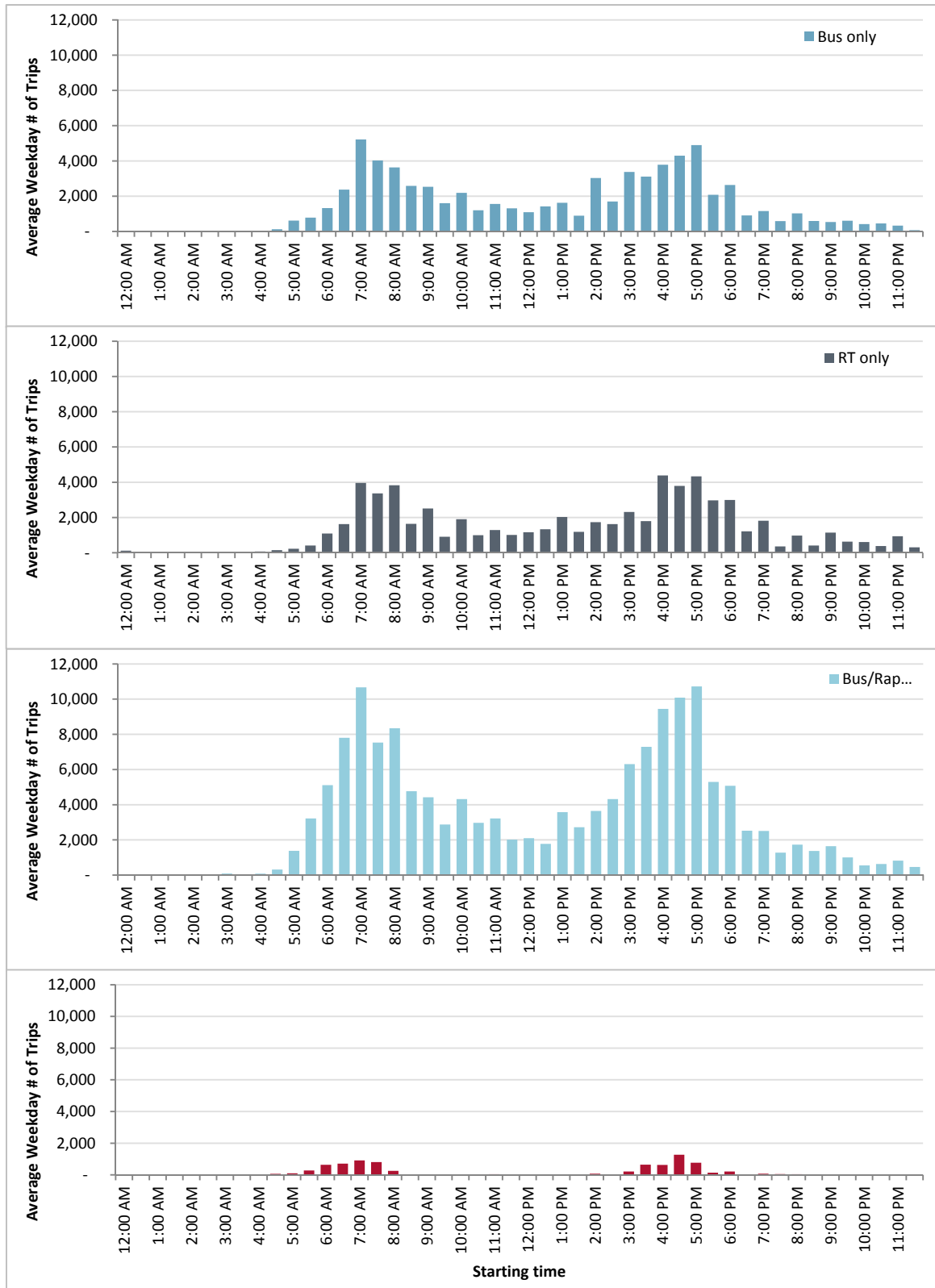
In general, the distribution of external trips tends to be more dispersed during peak periods, especially the PM Peak, compared to internal trips. Evening trips (6:00 pm to 11:59 pm) have the same share in both internal and external trips (14%). Night time external trips (00:00 am to 5:59 am – which mostly accounts for services operating at around midnight and after 4:30 am) have a higher share (3%) compared to the same timeframe for internal trips (1%).

External trips tend to be longer and use rapid transit (SkyTrain), WCE, and a combination of modes. Therefore, customers start using the system earlier during the AM Peak time (shown in Figure 4.21).

For external trips, the largest portion of trips during the AM peak period is between 7:00 am and 8:00 am, which differs from internal trips, where the largest portion of trips in the AM Peak is between 7:30 am and 8:30 am (bus/rapid transit – longer distance travel) and 8:00 am (bus only and rapid transit only). The number of external bus only trips starts to peak from 7:00 am to 9:00 am. After 12:00 pm, demand gradually increases again until about 2:00 pm, reaching its highest PM Peak point at 5:00 pm and decreasing its demand to a lower more stable level after 6:30 pm.

The external rapid transit only trips distribution shows similar fluctuations to the bus only trips. The situation is a bit different when looking at the bus/RT trip distribution, as they present a more gradual increase towards both the AM and the PM Peak periods. With regards to WCE plus trips, the highest demand level is registered at around 4:30 pm (possibly according to work ending schedules and recognizing that there are only 5 trains that leave Waterfront Station roughly over the 3 hours of the PM peak), far earlier than the other demand periods. This may be due to the high share of commuting trips, as presented previously in Figure 4.15.

Figure 4.21: Time of Travel Profile for External Transit Trips, 2011 (30 minute periods)



4.4.3 Customer Analysis

Reported Income

Figure 4.22 outlines Metro Vancouver's average weekday trip distributions over time by different income ranges. It is important to note that there are not necessarily peak periods in the system for customers with reported income below \$25,000, as this distribution of trips is quite stable between 8:00 am and 5:00 pm. This may be due to customers with employment starting and ending outside the conventional '9:00 am to 5:00 pm' window; not being employed or not having a usual place or time of work; being a part- or full-time student; having trips with different purposes; and/or having low or no accessibility to a private car. These reasons may encourage the use of transit services at any time during the day.

According to the data, the higher the income level, the peakier the distribution of trips are in the peak periods, which is most pronounced for customers with reported income above \$75,000. This may be a result of the high number of trips for work/post-secondary purposes, as shown before in Table 4.10, attracting a high number of customers with more stable employment periods (conventional office hours). In addition, transit may be considered as a good travel option in terms of total travel time and cost (parking costs and parking availability in certain areas such as downtown Vancouver may discourage the use of the car).

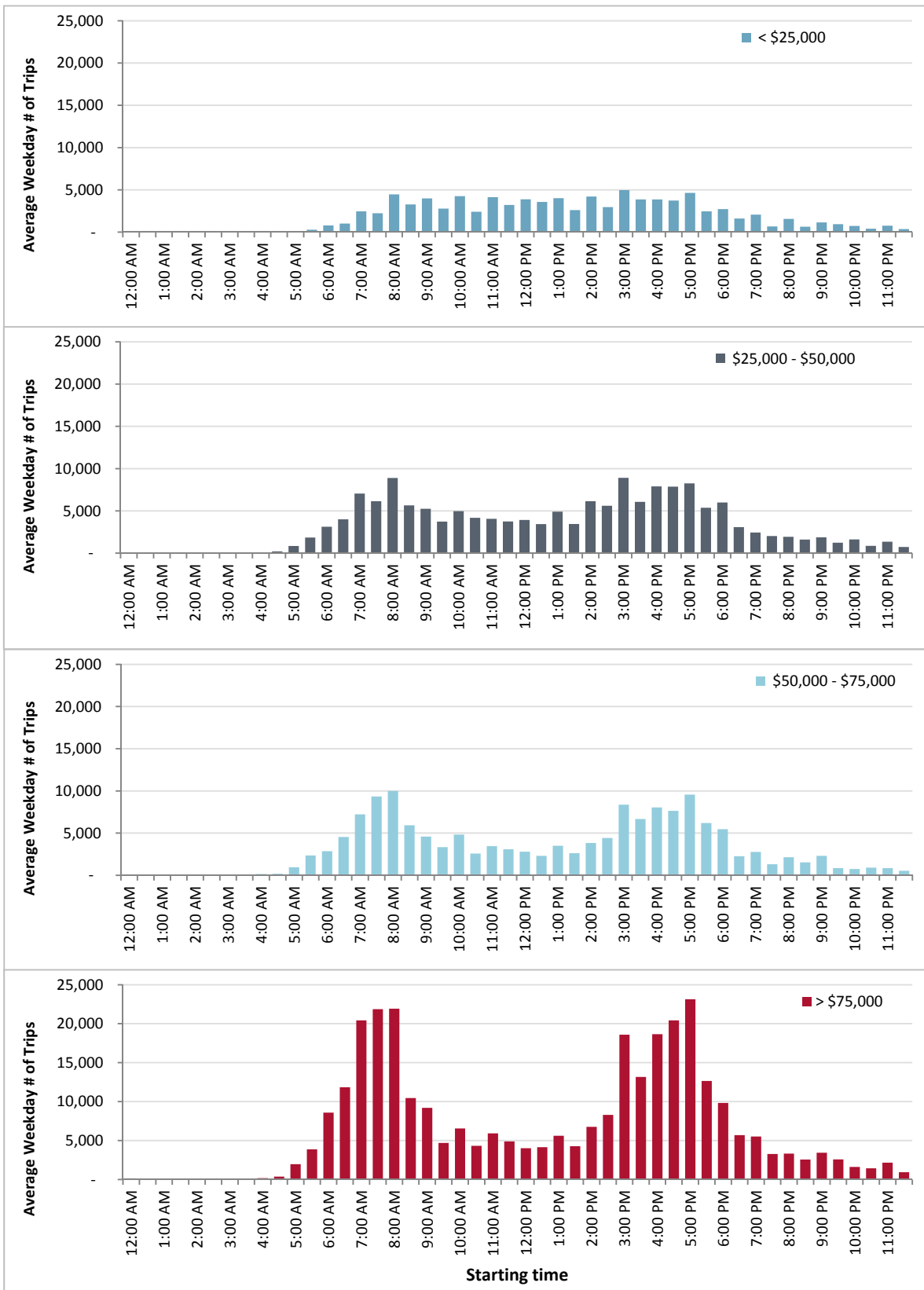
Trip Purpose

Time of travel by different trip purposes in Metro Vancouver is shown in Figure 4.23. As expected, trips for Escort, Grade School, and Work/Post-Secondary purposes present well-defined peak periods, as they mostly depend on fixed operation time at educational institutions and workplaces. A different situation is observed for the time of travel distribution by Shopping/Personal Business, and Social/Recreational purposes, as they are activities that can be performed throughout the day, especially between 2:00 pm and 7:00 pm. Customers travelling for Shopping/Personal Business and Social/Recreational purposes typically have more flexibility in terms of time, so the distribution presented is in line with the expectations for travel behaviour.

As mentioned, the majority of weekday trips in the transit system are made for Work/Post-Secondary purposes. These trips are highly concentrated between 7:00 am and 8:00 am, reaching up to 37,000 average weekday trips per 30 minute period, a similar situation occurs between 4:00 pm and 5:00 pm, when many people are typically travelling home. This kind of trip decreases after 5:30 pm, and reaches Midday levels after 6:30 pm.

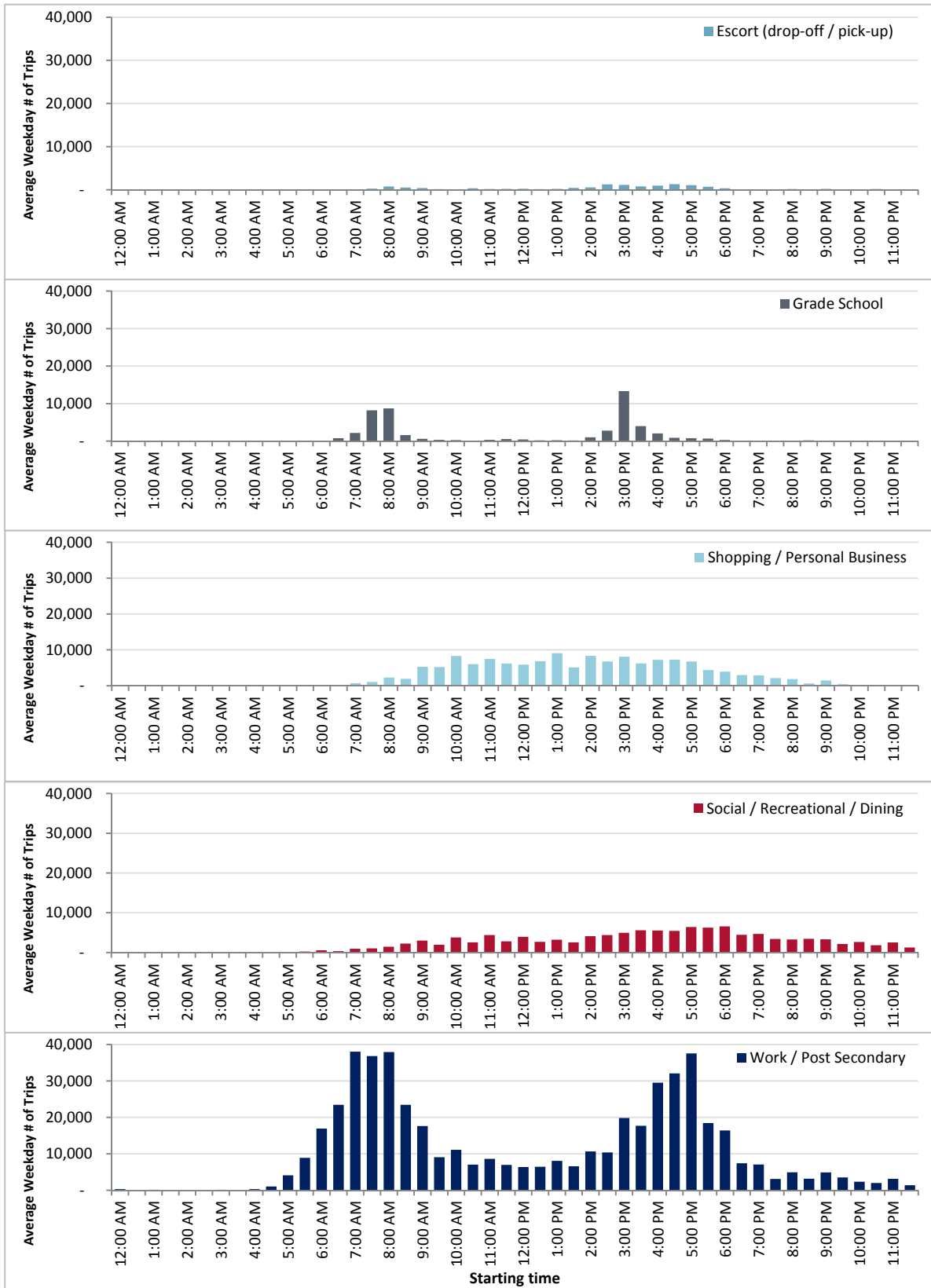
In general, this travel behaviour analysis suggests a future opportunity to introduce fare products differentiated by Peak/Off-peak time frames. This could potentially redistribute demand towards time periods with available capacity in the system. However, certain customer groups may not have the flexibility to change their travel behavior.

Figure 4.22: Time of Travel Profile for Transit Trips by Reported Income, 2011 (30 min periods)



Source: 2011 Trip Diary data adjusted

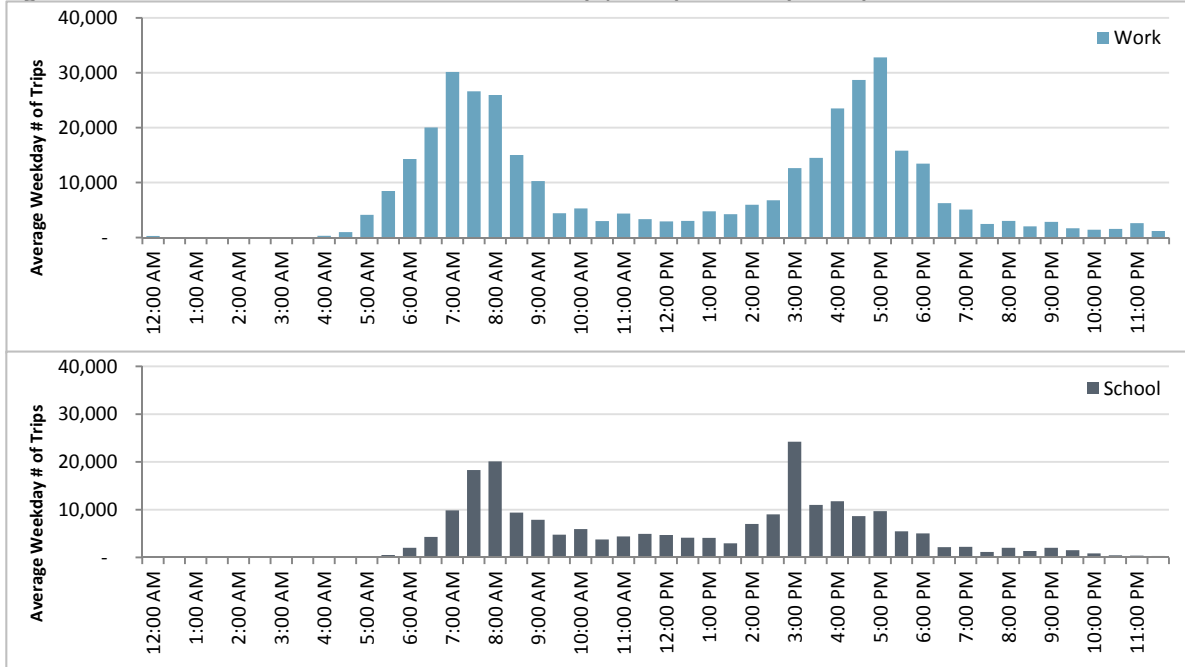
Figure 4.23: Time of Travel Profile for Transit Trips by Trip Purpose, 2011 (30 minute periods)



Source: 2011 Trip Diary data adjusted

Work trips (Figure 4.24) show a virtually identical profile to Work / Post-Secondary trips shown in Figure 4.23. School trips (including Post-Secondary trips) display a much more concentrated peak between 7:00 am – 8:00 am and around 3:00 pm.

Figure 4.24: Time of Travel Profile for Work and School Trips, 2011 (30 minute periods)

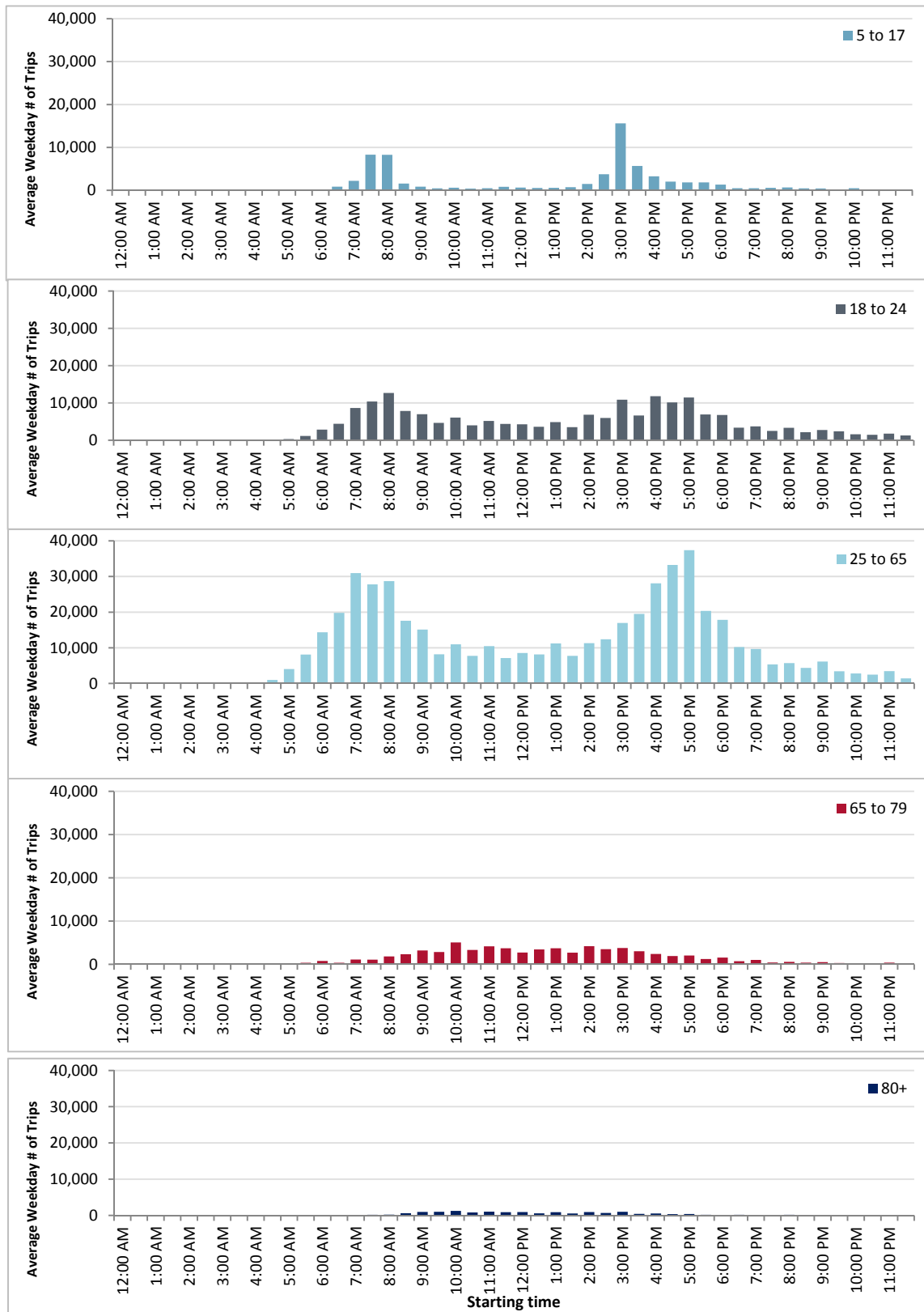


Source: 2011 Trip Diary data adjusted

Customer Age and Fare Payment Methods

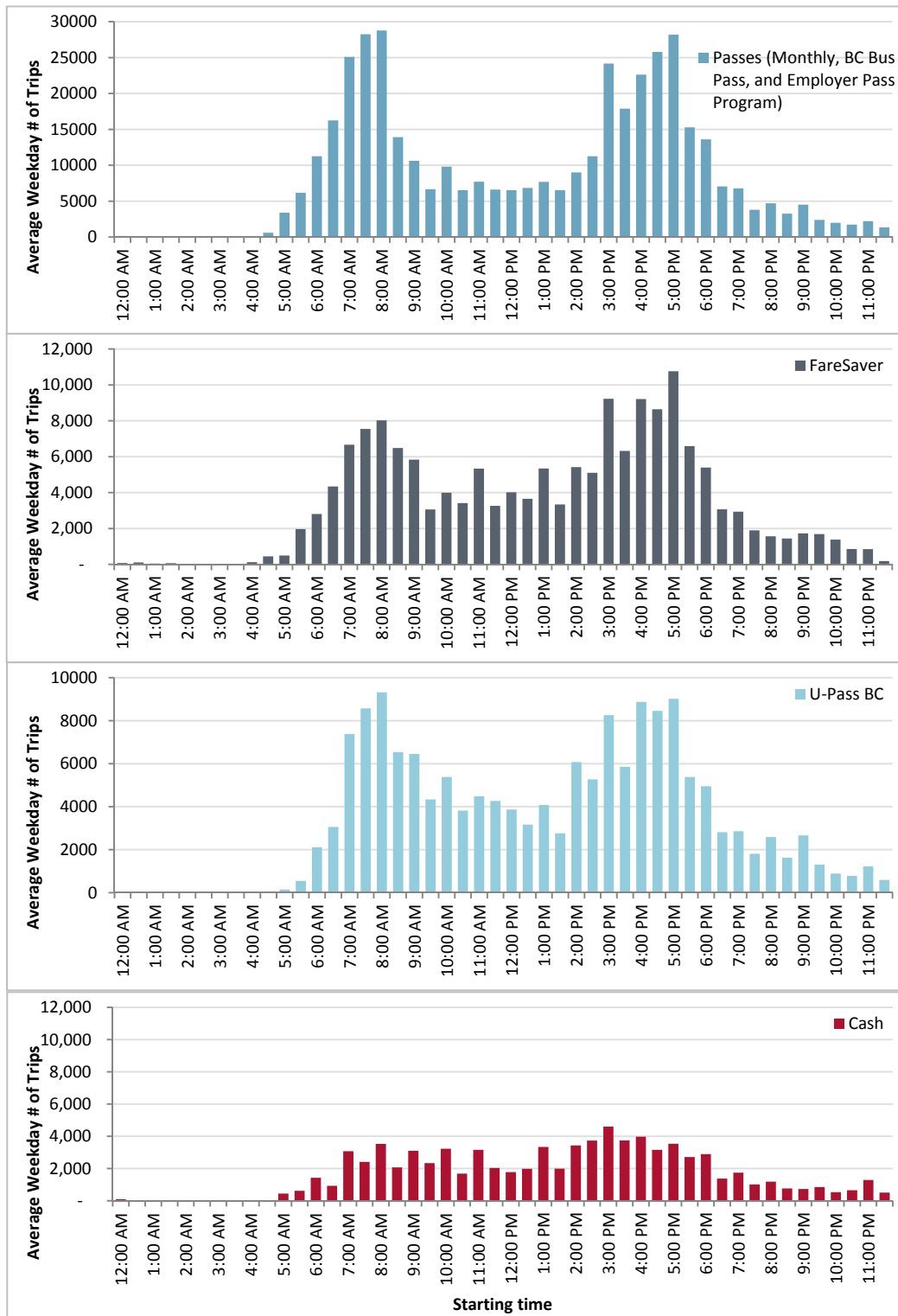
Looking at time of travel profiles for customer age (Figure 4.25) and fare payment methods (Figure 4.26) reveals that different customers use the transit system differently. Those aged 25-65 have significant peaks in travel in the AM and PM periods. In contrast, those 65 and older and 18-24 have less significant travel peaks. Interestingly, fare holders also demonstrate significant peaks. Cash users and U-Pass BC holders do not display a significant peak.

Figure 4.25: Time of Travel Profile for Transit Trips by Customer Age, 2011 (30 minute periods)



Source: 2011 Trip Diary data adjusted

Figure 4.26: Time of Travel Profile for Different Fare Payment Methods, 2011 (30 min periods)



Source: 2011 Trip Diary data adjusted

*Income, Purpose of Travel, and Time of Travel*⁸

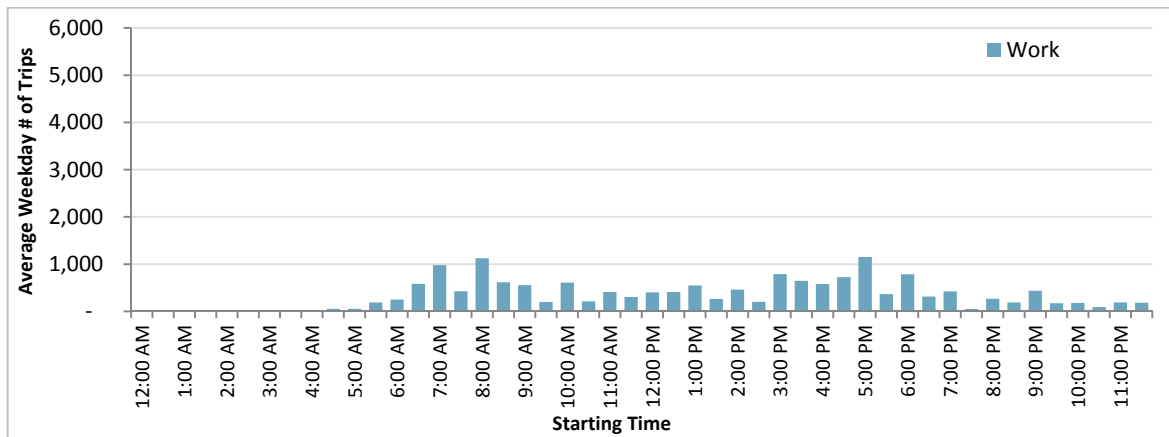
Figure 4.27 and Figure 4.28 show time of travel for work and non-work purposes for those residing in a household earning less than \$25,000 per year and between \$25,000 and \$50,000 respectively. Both income groups display the typical peak (in the morning and evening for work travel) and both have most non-work trips occurring between 7:00 am to 6:00 pm. However, 16% of total trips are work trips for those earning less than \$25,000, compared to 37% for those earning between \$25,000-\$50,000 (Table 4.15). This indicates that the lowest income group has lower overall work trips taken on transit. More research is required to investigate this finding further.

Table 4.15: Amount and Percentage of Trips by Income, Purpose, and Time of Travel

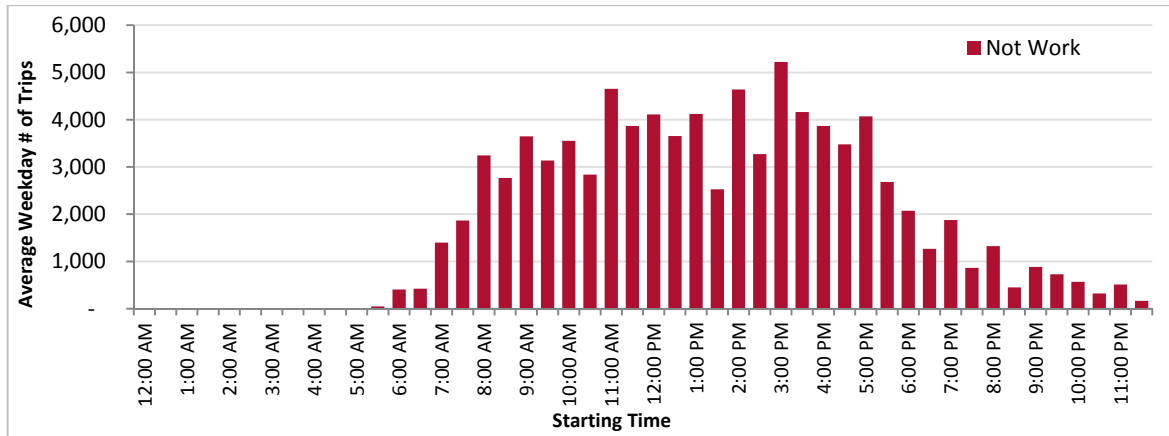
	Time	Work		Non-Work		Total	
		<\$25,000	\$25,000 - 50,000	<\$25,000	\$25,000 - 50,000	<\$25,000	\$25,000 - 50,000
AM peak (6:00 am to 8:59 am)	# of Trips	4,000	19,100	10,100	12,400	14,100	31,500
	% of Trips	24%	29%	11%	11%	13%	18%
Midday (9:00 am to 2:59 pm)	# of Trips	4,600	13,800	44,000	47,900	48,600	61,600
	% of Trips	28%	21%	50%	43%	46%	35%
PM peak (3:00 pm to 5:59 pm)	# of Trips	4,200	20,000	23,500	31,000	27,700	51,100
	% of Trips	26%	31%	26%	28%	26%	29%
Evening (6:00 pm to 11:59 pm)	# of Trips	3,300	11,200	11,000	20,900	14,300	32,100
	% of Trips	20%	17%	12%	19%	14%	18%
Night time (00:00 am to 5:59 am)	# of Trips	297	1,200	50	100	300	1,300
	% of Trips	2%	2%	0%	0%	0%	1%
Total	# of Trips	16,400	65,400	88,700	112,300	105,100	177,700
	% of Total Trips	16%	37%	84%	63%	100%	100%

Source: 2011 Trip Diary

Figure 4.27: Time of Travel for Work and Non-Work Purposes, Household Income Less Than \$25,000 Per Year

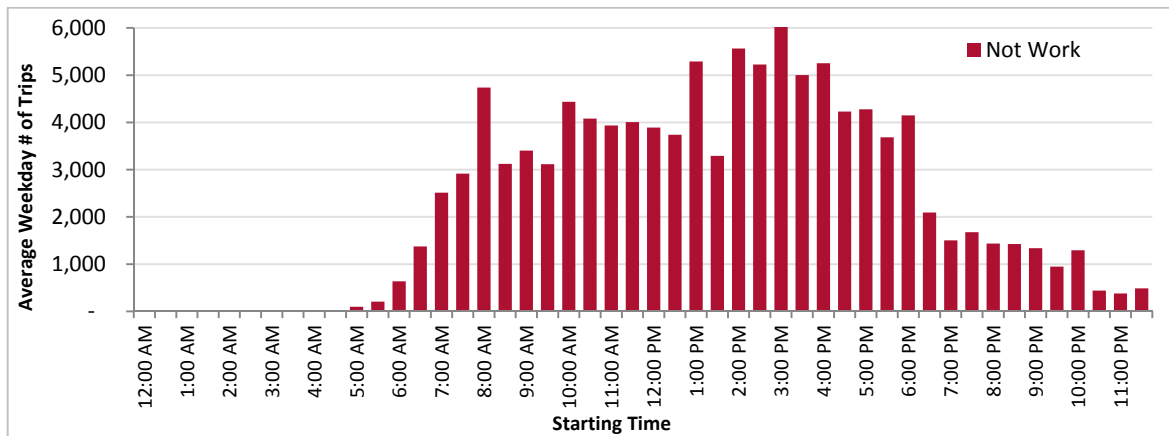
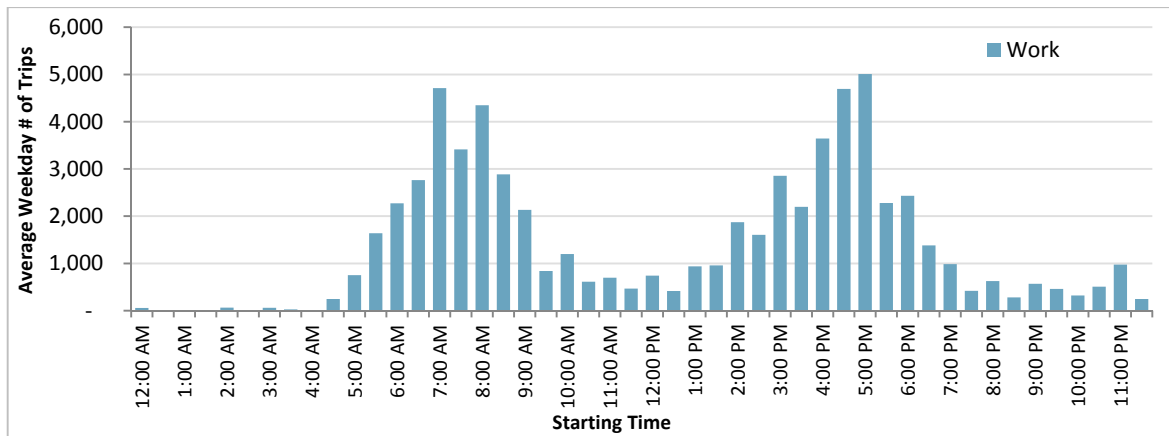


⁸ Note, *Work* includes journeys to and from work. *Not Work* is for any other trips except for trips to home, a trip during work, a companion trip, or for a first trip of the day not starting at home.



Source: 2011 Trip Diary.

Figure 4.28: Time of Travel for Work and Non-Work Purposes, Household Income of \$25,000-\$50,00 Per Year



Source: 2011 Trip Diary. Note, *Work* includes journeys to and from work. *Not Work* is for any other trips except for trips to home, a trip during work, a companion trip, or for a first trip of the day not starting at home.

Key Insights

Key insights and potential implications from the “*When do Customers Travel?*” analysis are presented in Table 4.16.

Table 4.16: Key Insights - When do Customers Travel?

Aspect	Insight	Implication for potential fare structures
Market Analysis	Average weekday trips and congestion in the system are strongly tied to the AM and PM peak periods (57%). Customers are more likely to be flexible and modify travel patterns in the PM peak, compared to the AM peak, especially those with work trip purposes (for example, some customers could leave work later/earlier than normal).	A fare structure that includes fare pricing or products based on time of travel (peak and discounts for off-peak), could encourage some people to shift their travel times to before or after the peaks in order to spread demand or decrease congestion in some parts of the system.
	Both internal and external trips follow similar time travel trends across modes (according to availability), though travel times for external trips start typically earlier than internal trips due to longer travel distances.	Discounted off-peak fares may further displace demand for cross-boundary trips to earlier travel times, which may support congestion relief.
Customer Analysis	There are travel patterns differences between customers with reported income below \$25,000 and customers with reported annual income above \$25,000 as the share of the lower income group taking transit trips is much higher during off-peak periods (midday), being many of those trips completed with bus only services.	Given the greater share of trips made in the Off-peak by low-income customers, off-peak discounts may better support equity goals.
	AM and PM weekday peak travel in Metro Vancouver is highly driven by Work/School purposes, while weekday trips with Shopping/Personal Business and Social/Recreational/Dining purposes are more dispersed throughout the day.	As mentioned above in the market analysis, a fare structure that includes fare pricing and products based on time of travel could encourage people to change travel patterns within and between peaks in order to spread demand or decrease congestion.

4.5 How much and how do Customers Pay to Travel?

4.5.1 Methodology

The assessment of how much customers pay is based on the transit service fare (average fare) and kilometres travelled (average unit fare), as explained in section 4.2.1, which depends on how far customers travelled throughout the fare zones for the conventional system, WCE and HandyDART, according to the 2011 Trip Diary data. This analysis also takes into account the Fare Structure System in place during 2011.

Since there are limitations to determine the number of trips completed by customers with a specific fare product or fare program, the average fares presented in this section were calculated for each transit mode, taking into account the following considerations:

- Number of fare zones travelled across based on the 2011 fare structure;
- FareSavers value (except WCE trips where cash fares were used);
- WCE customers get free transfers to other modes in all cases; and
- Trips after 6:30 pm on the conventional system are considered one-zone fare trips.

These calculations are for analysis/informative purposes only and do not intend to replicate 2011 TransLink's transit revenue values.

Note also that the methods of payment mentioned throughout the analysis of “How do Customers Pay to Travel?” are based on the specific answer options provided by the 2011 Trip Diary Survey. Therefore, the analysis included in this section may not fully represent the fare product used for completing trips in Metro Vancouver.

4.5.2 Background

As shown in Table 4.17, transit modes that serve shorter distance markets such as bus only, rapid transit only and HandyDART only in Metro Vancouver, have the lowest average fare but have a higher average unit fare. This may indicate that a greater share of operational costs for these services is covered by fare revenue since the customer pays more per kilometre.

Table 4.17: Average Fare by Mode in 2011

Mode	Average Distance (km)	Average Fare (\$/Trip)	Average Unit Fare (\$/km)
Bus only	7.53	\$2.28	\$0.30
Rapid transit only	10.76	\$2.64	\$0.25
WCE plus	32.15	\$7.30	\$0.23
Bus/Rapid transit	16.82	\$2.96	\$0.18
HandyDART only	8.17	\$2.14	\$0.26

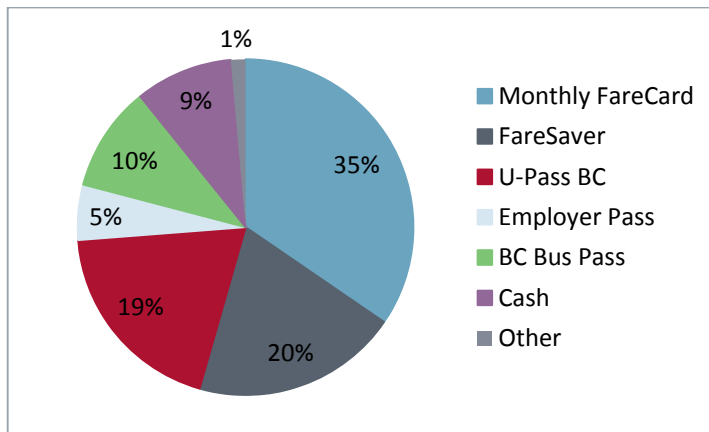
Source: Steer Davies Gleave's calculations based on 2011 Trip Diary adjusted data and travelled fare zones information provided by TransLink

Conversely, longer distance markets covered by WCE plus, bus/rapid transit and other combination of modes, have the highest average fare due to the typically multi-zone nature of these trips. Nevertheless, these longer distance trips have the lowest average unit fare, suggesting

that the fares for these distances are not fully scaled based on distance travelled. In fact, shorter travel distance customers (which are the majority in the system) pay more per distance unit compared to customers that take longer distance trips.

Figure 4.29 provides an overview of the payment methods used to travel within Metro Vancouver in 2011. Two fare products (FareSavers and monthly FareCards) represent 55% of transit trips, which along with a low share of cash fares (only 9%), shows customers' preference for products that allow them to save money. U-Pass BC is the fare program with the highest share of trips in the region, reaching 19% (equivalent to 160,300 weekday trips).

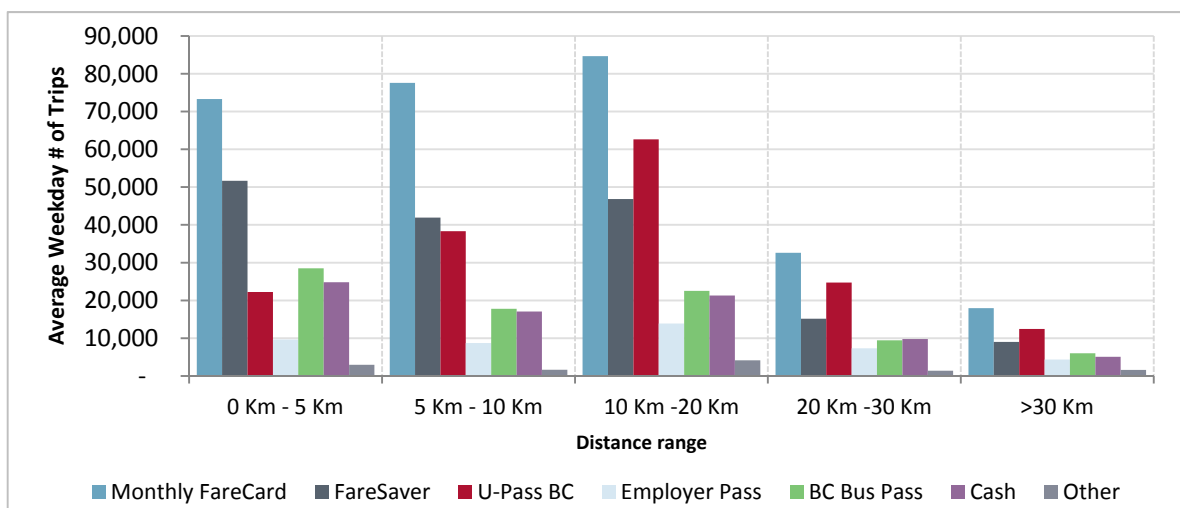
Figure 4.29: Transit Trips Distribution by Method of Payment, 2011



Source: 2011 Trip Diary data adjusted

Figure 4.30 shows trip distribution by distance and methods of payment. Monthly FareCards are the method of payment that dominates across all trip distance ranges, which indicates that this is a very important product for both short and long distance trips.

Figure 4.30: Transit Trips Distribution by Distance Ranges and Method of Payment, 2011



Source: 2011 Trip Diary data adjusted

Note that the use of U-Pass BC increases with distance travelled, but then it decreases again with trips longer than 20 km. This may reflect how there are fewer dispersed universities than other types of destinations. However, the lack of affordable housing on the West Side of Vancouver (for University of British Columbia) and on Burnaby Mountain (for Simon Fraser University) may contribute to longer distance trips for some U-Pass BC customers.

4.5.3 Market Analysis

Internal Trips

Internal average fares are comparable for all modes due to the fare zone system. A useful comparison is shown in Figure 4.32, which summarizes the average unit fare for internal trips. Typically internal trips are a one-zone fare and are a short distance. Bus trips within Metro Vancouver’s sub-regions have relatively high average unit fares due to short distances of travel on a single fare. Average fares (not by km) are virtually the same for all internal trips (see Figure 4.31)

Figure 4.31: Average Fare for Internal Trips, 2011

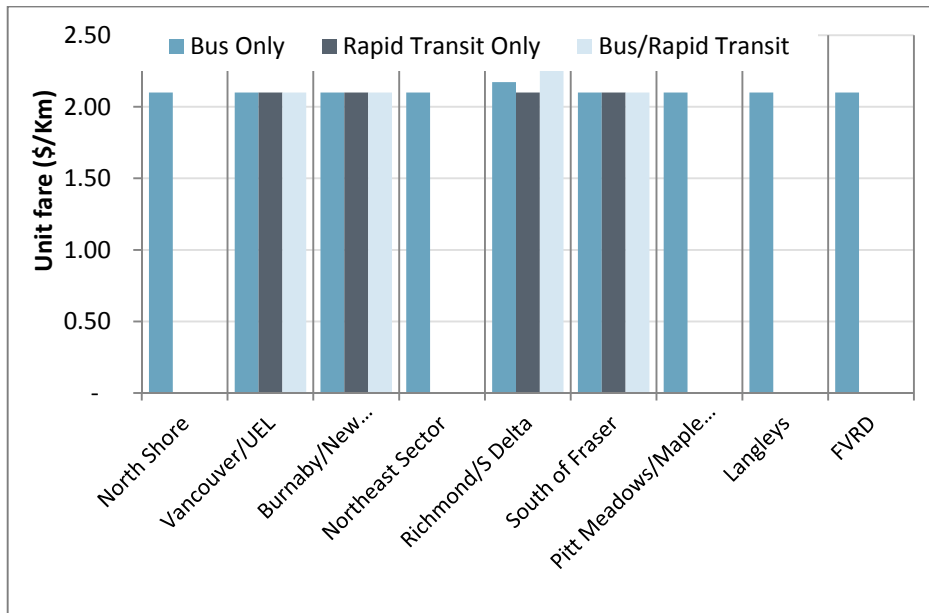
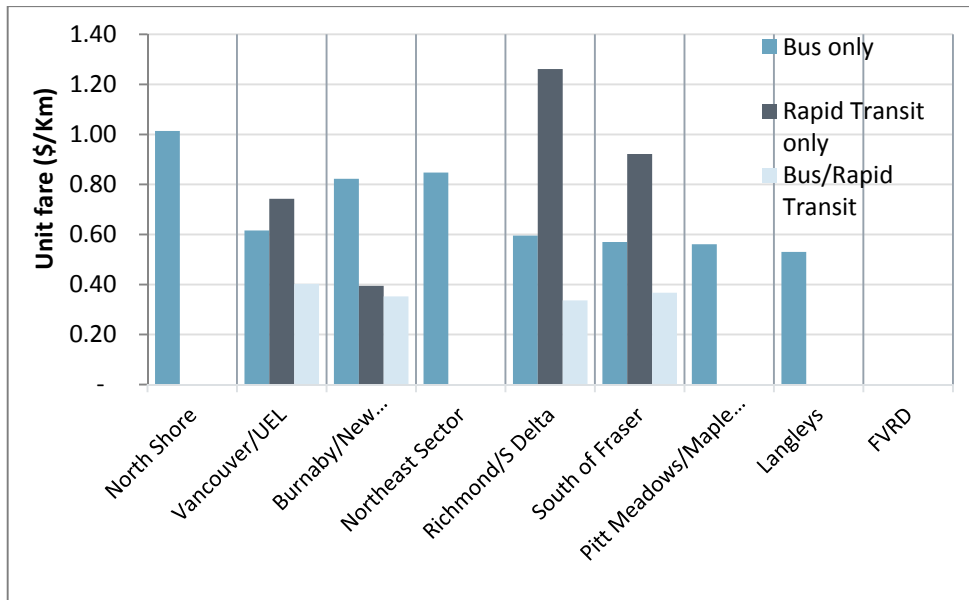


Figure 4.32: Average Unit Fare (\$/Km) for Internal Trips, 2011



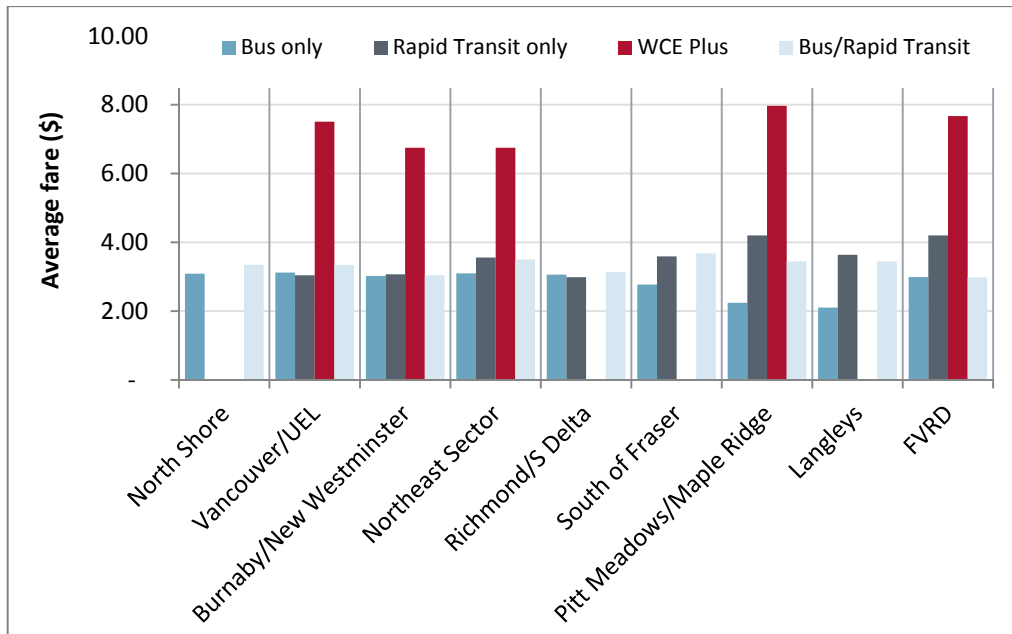
Source: Steer Davies Gleave’s calculations based on 2011 Trip Diary adjusted data and travelled fare zones information provided by TransLink

Rapid transit only trips within Richmond/South Delta and South of Fraser sub-regions have higher average unit fares due to the more limited availability of rapid transit stations. Since these are rapid transit only trips, they must by their very nature be short trips (no more than travel to 3 stations), which contributes to their higher average unit fare. It should be noted that there are not many trips of this nature in these areas.

External Trips

Figure 4.33 outlines the average fare for external trips made between Metro Vancouver sub-regions. WCE plus services have the highest average fare, as WCE’s cheapest fare is the same as a three-zone fare for conventional transit. Bus only, rapid transit only, and bus/rapid transit combinations present similar average fares among all Metro Vancouver’s sub-regions. Average fares for external trips are generally higher on Rapid Transit and WCE Plus when compared to internal trips.

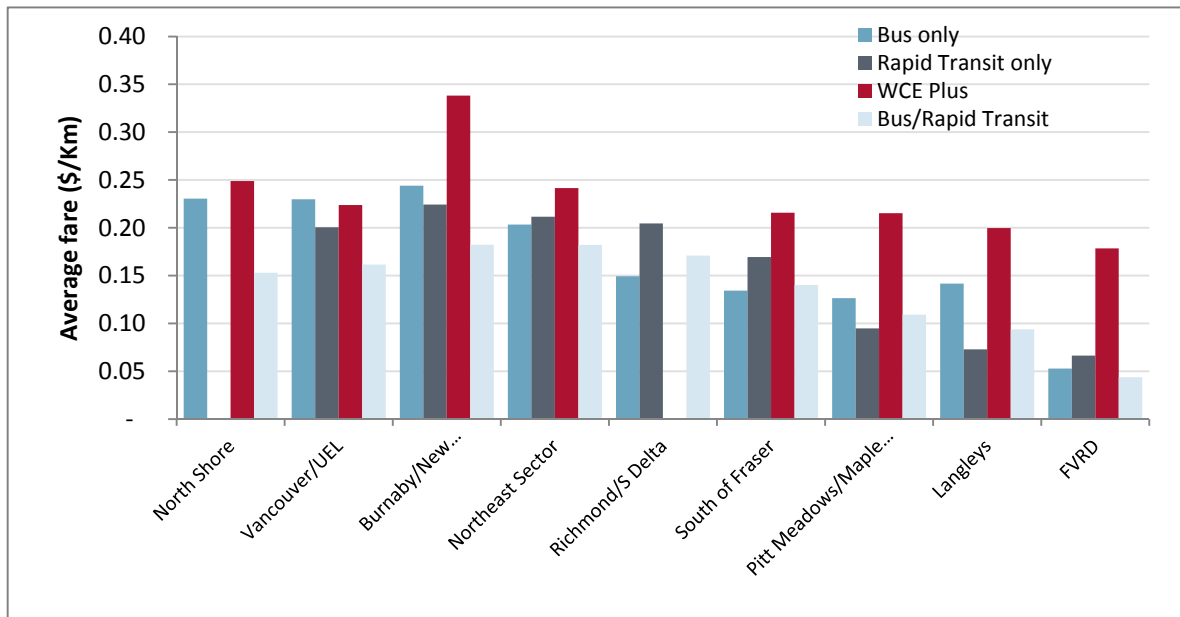
Figure 4.33: Average Fare (\$/Trip) for External Trips, 2011



Source: Steer Davies Gleave's calculations based on 2011 Trip Diary adjusted data and travelled fare zones information provided by TransLink. Note: WCE Plus average fares for North Shore, South of Fraser, and Langley's have been excluded because a small (less than 7%) of all WCE trips start/end in this area.

Figure 4.34 shows the average unit fare for all services for trips crossing sub-regional boundaries. Bus trips have higher average unit fares compared to the other modes, due to short distances of travel on a singular fare. WCE plus trips typically have a higher average fare than rapid transit trips, which depending on the sub-region and the distance travelled, leads to a higher average unit fare. However, when distances are comparable for middle distance travel, rapid transit may have a higher average unit fare due to differences in the zone systems (as in Vancouver/UEL sub-region).

Figure 4.34: Average Unit Fare (\$/Km) for External Trips, 2011



Source: Steer Davies Gleave’s calculations based on 2011 Trip Diary adjusted data and travelled fare zones information provided by TransLink

The combination of bus/rapid transit typically serves long distance trips. This results in relatively lower average unit fares despite the fact that the average fare for the trip may involve a multi-zone fare.

It is also interesting to note that average unit fares for external trips are much lower than average unit fares for internal trips. For example rapid transit only external trips to/from Vancouver/UEL cost, on average, \$0.20 per km, compared to \$0.74 per km for internal trips.

4.5.4 Customer Analysis

Reported Income

The analysis of average fares based on trips from customers with diverse income ranges, as noted in Table 4.18, shows important differences across customer groups. The trips by customers who reported income below \$25,000 represent the lowest average fare (\$2.47/trip) but highest average unit fare (\$0.26/km). Comparing to the trips by customers with reported income above \$25,000, the highest average fare and the lowest average unit fare reaches \$2.83/trip and \$0.19/km for \$100,000 and \$150,000 income ranges respectively.

Table 4.18: Average Fares by Income Range, 2011

Income range	Average Distance (km)	Average Fare (\$)	Average Unit Fare (\$/km)
<\$25,000	9.66	\$2.47	\$0.26
\$25,000 - \$50,000	11.24	\$2.61	\$0.23
\$50,000 - \$75,000	12.89	\$2.71	\$0.21
\$75,000 - \$100,000	14.02	\$2.78	\$0.20
\$100,000 - \$150,000	14.64	\$2.83	\$0.19
>\$150,000	13.84	\$2.78	\$0.20

Source: Steer Davies Gleave's calculations based on 2011 Trip Diary adjusted data and travelled fare zones information provided by TransLink

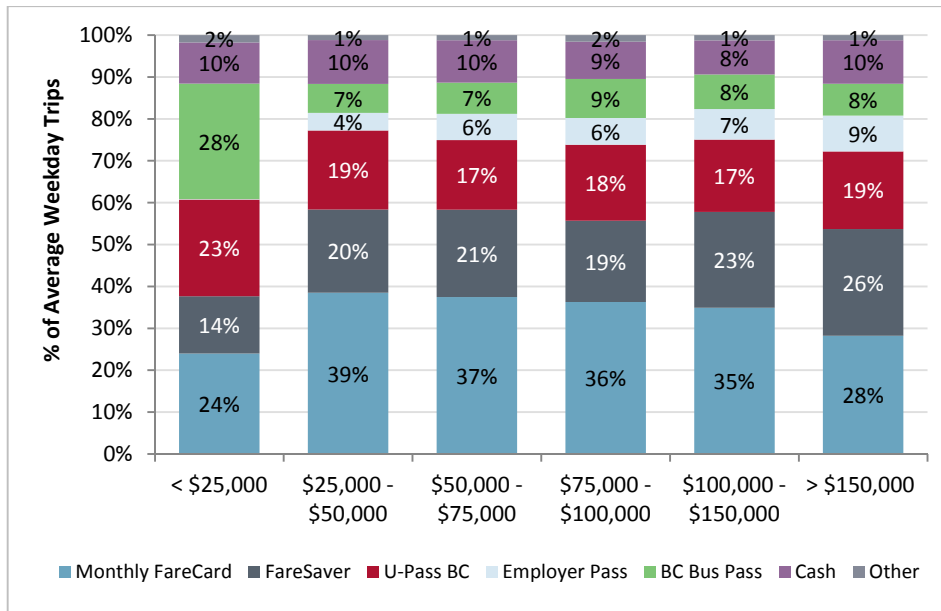
The analysis above suggests that low-income customers tend to take short distance trips with a one-zone fare, but ultimately end up paying the most per kilometre travelled as a result. The opposite happens with higher-income customers tend to make longer trips, typically to a centre of employment like downtown Vancouver, which leads to a lower average unit fare despite them typically paying a multi-zone fare. However, the operating cost per passenger km will be higher for short urban trips compared to longer trips, the latter which have higher average speeds, whilst costs such as fare collection remain the same regardless of passenger trip distance.

Figure 4.35 presents the distribution of trips by income range and method of payment. It should be noted that data from the 2011 Trip Diary recorded the most frequent payment method in the last month as opposed to every journey.

Monthly FareCards are the most common method of payment, though it has the lowest share in the <\$25,000 income range compared to all the other income ranges (24%), possibly because there are other more affordable options for these customers, such as the BC Bus Pass for low-income seniors or persons with disabilities (based on eligibility). Note also that the Employer Pass share (fare program discontinued in 2013) increases with a higher income range, from a share of 4% for customers with reported income between \$25,000 - \$50,000 to a share of 9% for customers with reported income above \$150,000. Though this is not the most used method of payment, the data indicates that the Employer Pass was helping higher-income customers in the decision of taking transit despite higher accessibility to a private car.

U-Pass BC also has an important share as a method of payment across all the income ranges (ranging between 17% and 23%). Though it is expected that many post-secondary students did not have a higher-income level during the years when they are studying, it is important to consider that the U-Pass BC eligibility includes full-time and part-time students. Customers from the latter group may have a job at the same time they are studying. Also it should be remembered that it is *household* income that is reported, and therefore someone eligible for the U-Pass BC may not be responsible for their household income (e.g. a post-secondary student living at home with their parents).

Figure 4.35: Transit Trips Distribution by Income Range and Method of Payment, 2011



Source: 2011 Trip Diary data adjusted

Trip Purpose

According to Table 4.19, trips made by customers who commute every day for Work/Post-Secondary purposes have the highest average fare per trip (\$2.86), although their average unit fare is by far the lowest (\$0.19/km). This reflects that they are one of the customer groups who travel the longest distances on the system at an average travel distance of 15 km. Grade school purposes have the highest average unit fare (\$0.33/km), in line with the expected short distance nature of these trips.

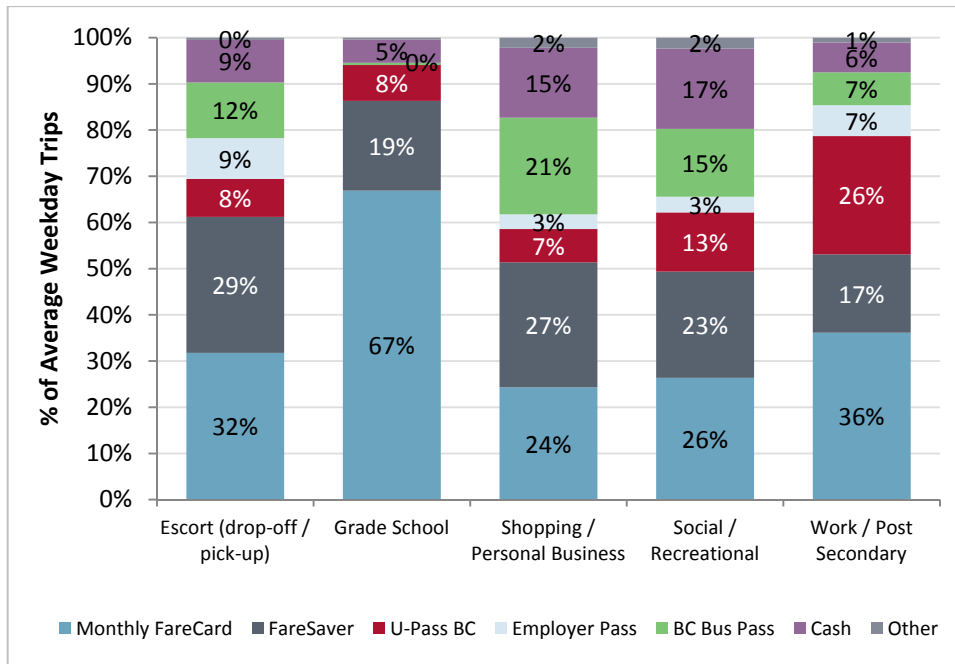
Table 4.19: Average Fares by Trip Purpose, 2011

Trip Purpose	Average Distance (km)	Average Fare (\$)	Average Unit Fare (\$/km)
Work/Post-Secondary	15.04	\$2.86	\$0.19
Shopping/Personal Business	8.82	\$2.46	\$0.28
Social/Recreational/Dining	10.60	\$2.47	\$0.23
Grade School	6.85	\$2.25	\$0.33
Escort (drop-off/pick-up)	10.08	\$2.54	\$0.25

Source: Steer Davies Gleave’s calculations based on 2011 Trip Diary adjusted data and travelled fare zones information provided by TransLink

Figure 4.36 presents the trip distribution by trip purpose and method of payment. Similar to the previous figure, monthly FareCards are also the most common method of payment among all different trip purposes, being very important for Grade School purposes (concession cards), especially because it allows these customers to travel throughout the conventional three-zone system for a discounted price.

Figure 4.36: Transit Trips Distribution by Trip Purpose and Method of Payment, 2011



Source: 2011 Trip Diary data adjusted

Note also that trips made by customers reporting Grade School as the trip purpose have included the use of U-Pass BC as one of their methods of payment (8% of the trips), which could be parents with a U-Pass dropping off or picking up their children at school.

4.5.5 Key Insights

Key insights and potential implications from the “How much and how do Customers Pay to Travel?” analysis are presented in Table 4.20.

Table 4.20: Key Insights - How Much and How do Customers Pay to Travel?

Aspect	Insight	Implication
Market Analysis	Bus only: pays a lower average fare (\$/trip), but a higher average unit fare (\$/km) due to typical shorter distance trips.	Customers may be overpaying for short bus trips (cross subsidizing long distance trips) due to a one-zone fare not capturing the actual distance travelled (typically lower than 10 km). This is most evident in sub-regions such as the North Shore (internal trips).
	Rapid transit only: average fare varies based on number of zones travelled. Because rapid transit only can be used as a commute system, average fare increases as distance travelled increases.	A zone system may disadvantage short cross boundary trips, unless there is a base fare for the first kilometers of the trip, the zone size is small enough to not create disadvantages for any customers or there is a common zone (that allows travel from one zone into the adjacent common zone for a one-zone fare).
	Bus/rapid transit: fares are typically similar to rapid transit fares, except where a bus (bus service) is used to access a rapid transit station in a different zone than the origin zone.	Comparable rapid transit only and bus/rapid transit average fares do not disadvantage customers who do not have immediate RT access. This should be maintained to continue market development.
	WCE plus: it has the highest average fares as a reflection of the longer distances it is meant to serve; however this leads to lower average unit fare as the fare gradations are finer (five zones instead of three).	Smaller zones or a fare by measured distance may allow WCE to offer a similar average fare on their services for trips of similar distances.
Customer Analysis	Higher income customers tend to make longer distance trips (having lower average unit fares), making use of both WCE plus and RT only, and complementing it with other transit options.	A new fare structure should take into account how WCE demand (long distance service used by higher income customers mostly) will be affected by the opening of parallel transit network extensions (Evergreen Extension and potential B-Line paralleling the WCE to Maple Ridge) and access to other transit services that have lower average fares.
	Monthly FareCards are one of the most important methods of payment across all the income ranges and trip purposes.	A potential new fare structure should ensure that a similar product(s) (or equivalent) is (are) included. However, they should also be designed in such a way that contributes to shifting demand towards available capacity on the system.

4.6 Special Service Analysis

4.6.1 HandyDART

HandyDART, one of the special services provided by TransLink, served 5,800 average weekday trips within Metro Vancouver in 2011 (5,700 trips with HandyDART as a unique travel mode reported), reaching 0.98 million trips during the same year. HandyDART makes a smaller number of trips because this service has a specific purpose, which is to provide public transportation to people with physical or cognitive disabilities unable to independently use conventional transit services. This is a door-to-door, no fixed route service that operates 18 hours/day, and has about 300 vehicles available. TaxiSavers is a service that 'bridges the gaps' in the conventional system accessibility. TaxiSavers form part of the HandyCard programme.

According to Table 4.21, which shows the distribution of HandyDART only trips per distance ranges, most of the average weekday trips reported in the 2011 Trip Diary data are short distance trips, with 74% of trip distances below 10 km. It also means that most of the customers pay a one-zone fare for this service. Note that the price for a one-zone and a two-zone fare is the same for HandyDART. Also note that the HandyDART zones – 10 in total - are much smaller in size than the zones for the conventional system.

Table 4.21: Distribution of HandyDART only Trips per Distance Ranges, 2011

Service	0 – 10 Km	10 – 20 Km	> 20 Km	Total
HandyDART only trips	4,200	1,200	300	5,700
% Trips	74%	20%	6%	100%

Source: 2011 Trip Diary data adjusted

As mentioned, HandyDART trips are supplemented by taxi trips, which have been increasing their share of the total trips in the last few years, as presented in Table 4.22. According to the data, taxi trips had a 2% share (21,400 annual trips) of the total trips provided to HandyDART customers in 2009; by 2015 this had increased to 8% (99,900 annual trips). The change also reflects some policy and funding allocation changes to the TaxiSaver program over this time period.

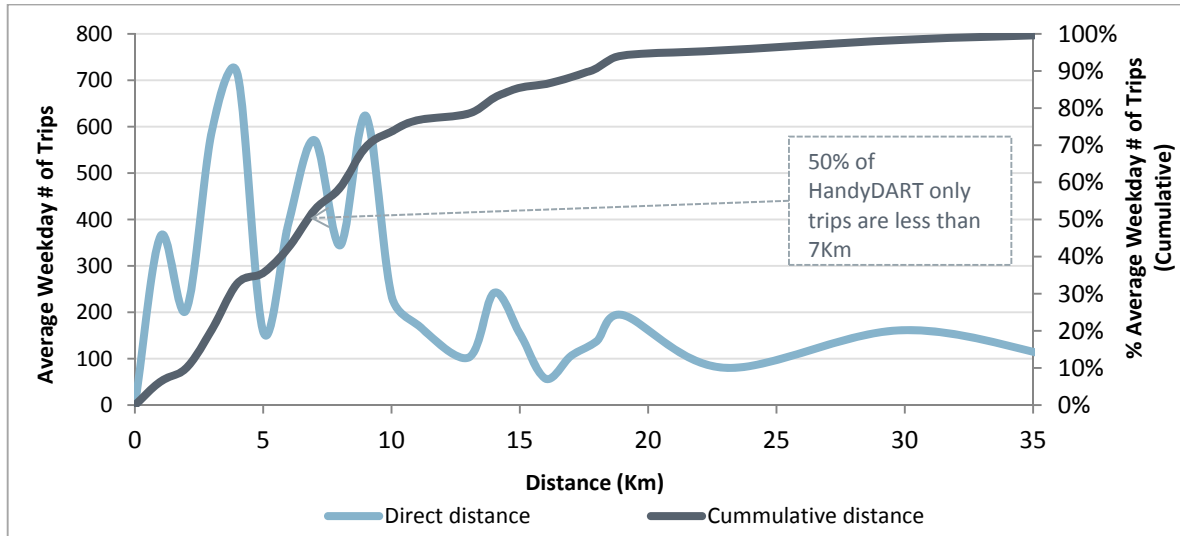
Table 4.22: HandyDART bus and Taxi Trips Delivered (2009 – 2015)

Year	Total trips	HandyDART bus trips delivered	%	Taxi trips delivered	%
2009	1,010,000	988,600	98%	21,400	2%
2010	1,281,000	1,255,600	98%	25,400	2%
2011	1,337,500	1,320,300	99%	17,200	1%
2012	1,208,900	1,187,400	98%	21,500	2%
2013	1,181,400	1,137,500	96%	43,900	4%
2014	1,168,900	1,094,500	94%	74,400	6%
2015	1,204,800	1,104,900	92%	99,900	8%

Source: TransLink

Figure 4.37 presents the direct and cumulative distance distribution for HandyDART only trips within the region. Most trips by this service have a trip distance in the region of 4 km. Trips of this distance account for more than 700 trips per day, and 50% of the trips are completed in 7 km or less. Approximately 82% of the trips are completed within each sub-region.

Figure 4.37: Distance and Cumulative Distance Distribution for HandyDART only Trips, 2011 (Per Km)



Source: 2011 Trip Diary data adjusted

Data on fares purchased between January and September 2015, presented in Table 4.23, indicates that virtually all HandyDART trips were for one- or two- HandyDART zone travel (99.30%). Unlike the conventional system, the equivalent of a one-zone fare is valid for either one- or two-zone travel (HandyDART zones). This finding may contrast findings from the 2011 Trip Diary.

Table 4.23: HandyDART Fare Purchases, January to September, 2015

Zones Travelled	Number of Fares Purchases (January to September, 2015)	% of Fares Purchased
One or two HandyDART Zones (One Zone Adult Fare)	807,659	99.30%
Three HandyDART Zones (Two Zone Adult Fare)	4,854	0.60%
Four or more HandyDART zones (Three Zone Adult Fare)	875	0.11%
Total	813,388	100%

Source: TransLink

As mentioned in Section 3.3.2, the HandyDART fare became a one-zone adult fare regardless of distance travelled since October 2015, which is a significant change compared to the 10-zone fare system in place during 2011. An adult fare and U-Pass BC are the only valid fares on HandyDART for HandyDART customers. Concession tickets, provincial BC Bus Pass and CNIB passes are not

valid on HandyDART service. Given the social purpose of this service, further and individual analysis would be needed.

4.6.2 SeaBus

As shown previously in Table 4.5, trips using only SeaBus represent 3,400 average weekday trips. However, when combined with other modes, SeaBus accounts for 17,800 weekday trips. Therefore, 80% (14,400) of SeaBus trips are multimodal.

SeaBus connects Downtown Vancouver with the City of North Vancouver in 12 minutes, making a fixed distance trip of 3.2 km over the Burrard Inlet. It also works as a connecting transportation mode, for bus services at Lonsdale Quay (Bus Exchange in North Vancouver); and rapid transit, WCE and bus services at Waterfront Station. There are currently 3 vessels available (but only 2 vessels currently in service at any one time) providing a capacity of almost 400 passengers per direction per trip.

Customers pay a two-zone fare on this service on weekdays before 6:30 pm. They also have the alternative option of connecting between North Vancouver and Downtown Vancouver via bus services on the Lions Gate Bridge or Second Narrows Bridge, by paying a one-zone fare as of October 5, 2015, when the Bus Anywhere on a One Zone Fare came into effect. However, the travel time may be higher by using bus services compared to the fixed time and reliability of SeaBus services but it depends on the specific origin, destination and time of travel.

5 Further Areas for Analysis

The analysis presented in this document is part of the “Discover” work phase – Phase 1 out of 4 phases within the Transit Fare Review project – which intends to understand transit travel patterns, as well as issues and opportunities to take into account in the development of a future transit fare structure that adjusts to the needs of Metro Vancouver’s residents. The analysis and insights from this work will help inform subsequent phases of the project.

Further Areas for Analysis

The analysis conducted in this phase, “Discover” (Phase 1), is primarily based on the 2011 Trip Diary Survey, which may not provide high-quality data for certain variables associated to Metro Vancouver residents’ current travel patterns. Unfortunately, this data does not allow determining exact points of boarding and alighting in multimodal trips, which have an important share in the total transit trips, including park/kiss and ride trips. Park/kiss and ride trips require a special analysis, as there are other aspects such as parking infrastructure close to transit hubs and costs of parking that also affect the decision of taking public transit as a complementary transportation mode. These could be analyzed in the next phase of the project.

The implementation of the Compass system allows the collection of current and exact travel patterns except for the alighting point of bus trips since there is no requirement to tap off the vehicle. Therefore this information would have to be inferred and not fully know. TransLink currently is undertaking a project to infer trip origins and destinations using Compass data. Since the Compass system was implemented with temporary changes to the fare structure (for example, bus and HandyDART services as a one-zone fare for travel throughout the region), there will be impacts on customers’ decision making and travel patterns changes that are worth analysing and comparing with the travel patterns recorded in the 2011 Trip Diary. Compass data will also provide information about methods of payment that should be used in the fare products and fare programs analysis and modeling.

In addition to Compass Data, the Regional Transport Model (RTM) is also relevant for the Transit Fare Review project. The RTM is a four-stage EMME multi-modal forecasting model representing the Metro Vancouver region and is TransLink’s transportation analysis tool for all major transportation projects in the region. It is a 24-hour model with AM (7:30 am-8:30 am) and

Midday (12:00 am-1:00 pm)⁹ Peak hour scenarios, calibrated to 2011 Trip Diary and regional screen line data with 2030 and 2045 forecast years. Because changes to fares will impact customer demand distribution and mode choice, demand models play a critical role in evaluating and planning fare structures. The re-calibration of the RTM is an ongoing project. Therefore this model could be used in further stages of the Fare Review to provide distributions of trips between origins and destinations, by journey purpose and to calibrate any further revenue and ridership models developed.

⁹ Note that the AM and Midday time frames used for the RTM varies from the time frames included in Section 4.4 of this report.

