Transit-Oriented Communities Design Guidelines

Creating more livable places around transit in Metro Vancouver

TRANSLINK

Cover image

The inclusion of a wide variety of ground-level retail and service uses – such as grocery stores, shops, and restaurants – in Burnaby Heights has created a more pedestrian-scale, livable, and complete community around frequent transit.

Burnaby Heights, Burnaby, BC.

Version 1.0

Transit-Oriented Communities Design Guidelines

Creating more livable places around transit in Metro Vancouver

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Foreword

In Metro Vancouver we have grown accustomed in recent years to hearing the international press call us one of the most livable, sustainable, and economically vibrant regions in the world. We owe our success to many things – our diverse culture, our location as a gateway to the Pacific, and the natural beauty of our setting, to name a few – but our real strength lies in our ability to develop a broad consensus around a shared vision for the region and to work together to put that vision into practice.

The partnership of Metro Vancouver, TransLink, local municipalities, the Province of British Columbia and other stakeholders is particularly evident in matters of shared interest, including growth management, regional transportation, and air quality and greenhouse gas management. The region's vision for managing growth is expressed through Metro Vancouver's Regional Growth Strategy, which serves as the "game plan" for how our region will grow and change in the coming decades and how we can collectively work toward achieving our goals of livable, sustainable, and safe communities. Similarly, our shared vision for a sustainable regional transportation system is articulated in TransLink's Regional Transportation Strategy.

We know from research and experience that how we plan and design our communities has a profound impact on travel behaviour, just as how we invest in transportation helps shape the market for new development. We also know that transit-oriented community design fosters transit use and supports other key goals of our region, such as increased walking and cycling. Communities shaped by these approaches, which we call transit-oriented communities, lend themselves to cost-effective transportation networks and services, allowing our region to move people and goods more efficiently and to produce more value for each transportation dollar we invest.

We offer this document to our partners around the region as a handbook of ideas and strategies for making all of our communities more walkable, bikable, and transit-oriented.

Contents


endure. believe. be free.

Introduction

1

Transit-oriented communities are places that, by their design, allow people to drive less and walk, cycle, and take transit more. In practice, this means they concentrate higher-density, mixed-use, human-scale development around frequent transit stops and stations. They also provide well-connected and well-designed networks of streets, creating walking- and cycling-friendly communities focused around frequent transit. Communities built in this way have proven to be particularly livable, sustainable, and resilient places. Transit-oriented communities also make it possible to operate efficient, cost-effective transit service. Because of these benefits, making communities more transit-oriented is one of the key goals of land use and transportation plans in Metro Vancouver.

In order to further the development of more transit-oriented communities in Metro Vancouver, this document provides guidance for community planning and design – based on best practices – in the areas surrounding transit stations, exchanges, and stops. In support of TransLink's Transit-Oriented Communities: A Primer on Key Concepts, these Transit-Oriented Communities Design Guidelines provide a more detailed resource for municipalities and other stakeholders involved in community planning processes across the region. As experience is gained with implementing the Design Guidelines, and as new best practices emerge, this document will be reviewed and updated accordingly.

Transit-oriented communities in Metro Vancouver are places that make walking, cycling, and transit use convenient and desirable and that maximize the efficiency of existing transit services by focusing development around transit stations, stops, and exchanges.

TRANSIT-ORIENTED COMMUNITIES PRIMER

TransLink has developed a supporting document entitled Transit-Oriented Communities: A Primer on Key Concepts, which is written for a broad audience, including the general public, elected officials, and other non-technical parties. The Primer also serves as a brief introduction to the more detailed material presented in this document.

West 4th Avenue, Vancouver, BC.

1.1 Why Transit-Oriented Communities?

TRANSIT-ORIENTED COMMUNITIES VS. TRANSIT-ORIENTED DEVELOPMENT

The term 'transit-oriented' refers to planning and design that facilitates a decreased reliance on the automobile through the provision of convenient access to transit, walking and cycling, and supportive infrastructure and amenities. The main difference between transit-oriented communities and transit-oriented development is that of scale:

- transit-oriented communities are places that take access to and support for transit into account when planning and designing at a neighbourhood, corridor, municipal, or regional scale; whereas,
- transit-oriented development projects are site-specific projects that are fundamentally shaped by their close proximity to rapid transit.

The focus on transit-oriented communities in this document was necessary to broaden the scope of transit-oriented development, acknowledging that not all communities and neighbourhoods in Metro Vancouver will be shaped by their proximity to rapid transit. There are many steps that can be taken to increase the use of sustainable modes of travel around frequent transit and active travel networks on a community-wide basis.

Extensive research and experience have shown that transit-oriented communities can promote many of the region's greatest shared values, including livability; environmental, social, and economic sustainability; and resiliency in the face of change. Transit-oriented communities support better transit service, make places more conducive to walking and cycling, and provide a number of key benefits to communities.

Increased Livability

Transit-oriented communities are intended to foster an improved urban environment and to be safe and enjoyable places to walk, cycle, and spend time outdoors for people of all ages and abilities. As a result, they have also proven to be livable and healthy places where walking and cycling are fun and easy. Transit-oriented communities support healthy lifestyles and reduce rates of obesity, heart disease, and diabetes.

Improved Sustainability

Environmentally

Transit-oriented communities contribute to improved environmental sustainability primarily through reduced energy consumption and fewer and shorter automobile trips. With reduced fossil fuel consumption, transportation in transit-oriented communities produces fewer greenhouse gas emissions and improves air quality. Careful design of streets and public spaces can reduce the amount of impervious surfaces, thereby reducing volumes of storm water runoff and lessening the negative impacts on local watersheds.

Socially

Transit-oriented communities provide high quality transportation options for all community members, including those who cannot or do not drive, such as seniors, young people, and people with disabilities and/or low incomes. By reducing household transportation costs through less driving and potentially lower automobile ownership rates, transit-oriented communities reduce the cost of living and increase overall affordability for households. They also incorporate the principles of universal design so that all streets, public spaces, and other transportation facilities are accessible to people with varying levels of mobility.

1.1 Why Transit-Oriented Communities?

Economically
Transit-oriented communities help TransLink to provide high-quality transit services at a reasonable cost. Efficient, cost-effective, and high-quality transit, in turn, promotes a strong regional economy by providing workers and residents with access to places of employment, shopping, and other activities. Moving more people by sustainable transportation modes reduces roadway congestion and improves goods movement, which also results in economic benefits to the region. In addition, it is often more cost-effective to meet the region's mobility needs by supporting infrastructure investment in walking, cycling, and transit rather than other measures such as widening roads or building new parking facilities. Similarly, providing more compact and complete communities can enable more efficient use of infrastructure and scarce land.

Enhanced Resiliency

Transit-oriented communities are adaptable and retain their value as great places to live, work, and visit, even as the surrounding urban environment and the needs of residents change. When communities provide high-quality transportation choices for people of all physical abilities, for example, they become resilient in the face of changing demographics, such as an aging population. When the less energy-intensive modes of transportation are well utilized – notably walking, cycling and transit – communities are more resilient in the face of changes in energy prices.

West 4th Avenue in Vancouver has a vibrant street life along a busy transit corridor, creating a good environment for a transit-oriented community.

HOUSING AND TRANSPORTATION AFFORDABILITY

Housing and transportation are typically the two largest expenditure items in the annual budget of most households. These costs are often interdependent and are impacted by housing location (e.g., suburban households may pay less for housing but more for transportation than in a more urban location).

The Center for Neighborhood Technology's Housing and Transportation Affordability Index takes both costs into consideration and has demonstrated that, across North America, "household transportation costs are highly correlated with urban environment characteristics, when controlling for household characteristics."

This view means that, for some households, the higher housing costs that may occur in some transit-oriented communities can be offset partially or completely by transportation cost savings (resulting from fewer vehicles owned by a household and less distance travelled annually by private automobile). Considering transportation and housing expenditures together can provide a better sense of the true affordability of a housing location.

Center for Neighborhood Technology: (2010). Housing and Transportation Affordability Index. www.cnt.org/tcd/ht
(2010). Pound Wise, Penny Fuelish. www.cnt.org/repository/pwpf.pdf

1.2 Document Purpose and Scope

TRANSIT PASSENGER FACILITY DESIGN GUIDELINES

TransLink's TPF Design Guidelines serve as a companion to these Design Guidelines. The TPF Design Guidelines focus on transit passenger facilities and their immediate surroundings (i.e., within a one block radius) and provide process and design guidance to professionals involved in the design, construction, and operation of new or existing TransLink transit passenger facilities.

1.2.1 Purpose of the Guidelines

These Transit-Oriented Communities Design Guidelines are a tool and a resource to aid in the development of transit-oriented land use plans, projects, streetscapes, and transportation network designs, with a focus on those attributes of community design that most strongly influence travel behaviour. Though non-prescriptive in nature, the Guidelines aim to offer advice and suggestions for consideration in the design of both new and retrofitted communities.

To accomplish this purpose, the Guidelines:

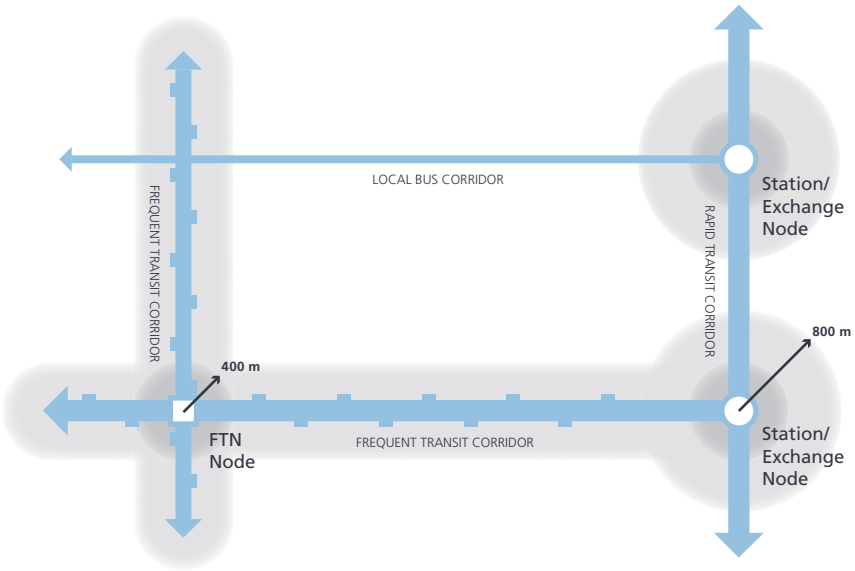
- serve as a companion to TransLink's Transit Passenger Facility (TPF) Design Guidelines with additional community-related design guidance;
- provide planning and design ideas and showcase best practices that inspire transit-oriented communities;
- provide planning and design guidance that supports future transportation investment;
- present neighbourhood design considerations that balance transit, walking, cycling, and neighbourhood livabilty; and
- identify strategies for creating transit-oriented communities while enhancing the livability and unique characteristics of different neighbourhoods.

1.2.2 Geographic Extent of the Guidelines

TransLink has developed Transit Passenger Facility (TPF) Design Guidelines that provide guidance on designing transit passenger facilities and their immediate context (i.e., within a one block radius). This document provides guidance on transit-oriented planning and design for the wider neighbourhoods around transit passenger facilities and on facilitating the relationship between transportation and land use planning on a municipal or regional scale.

1.2 Document Purpose and Scope

At the wider scale, these Design Guidelines are most applicable in frequent transit station and stop nodes and along frequent transit corridors.

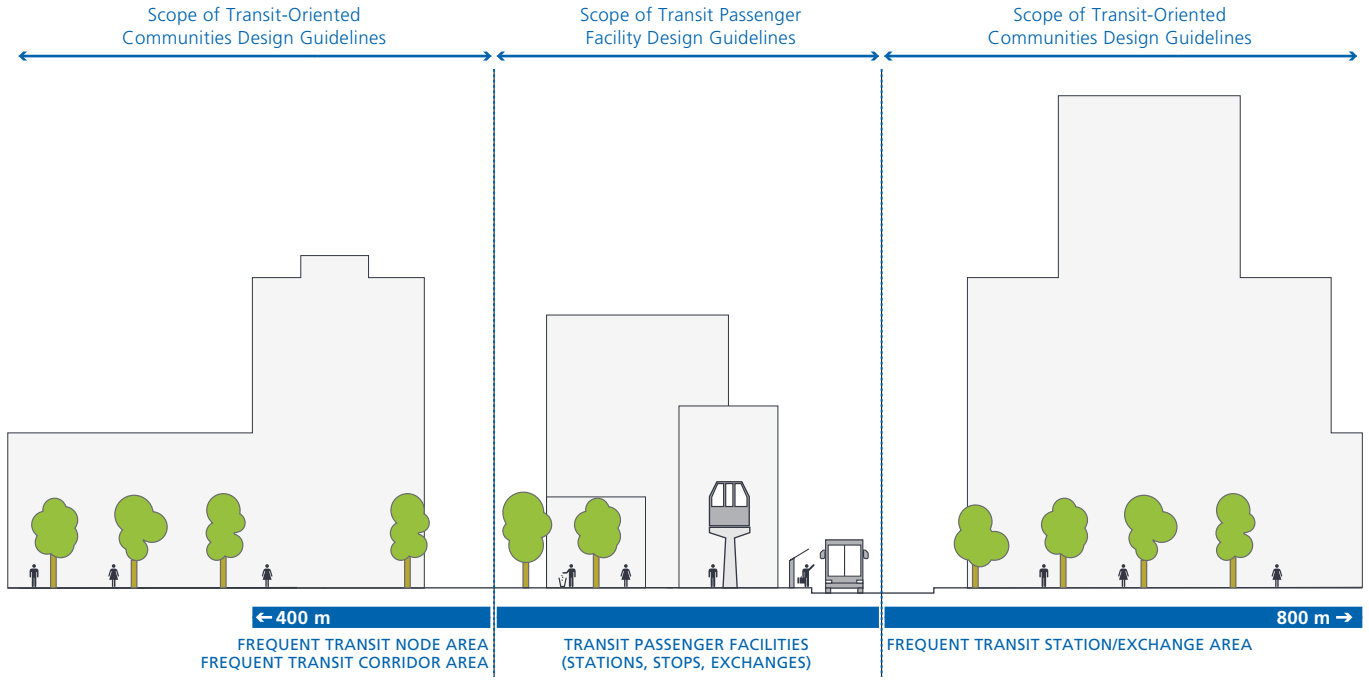


FACILITY TYPES AND NODES AND CORRIDORS

TransLink has three transit facility types: stations (serving high-capacity and rapid transit), exchanges (serving multiple bus routes, including bus layover space), and stops (serving one or more on-street bus routes).

Nodes and corridors are the areas around transit facilities where people can be expected to access frequent transit by walking. Frequent Transit Network (FTN) nodes and corridors have a 400 m catchment area, and rapid transit stations and exchanges have an 800 m catchment area. See **Transit Passenger Facility Design Guidelines, 2.3** for more detail.

Within station and stop areas, these Transit-Oriented Communities Design Guidelines are most applicable beyond the transit passenger facility area and within 400 m of frequent transit corridors and stop nodes and within 800 m of frequent transit station and exchange areas.



1.2 Document Purpose and Scope

1.2.3 Intended Audience and Roles

Creating transit-oriented communities requires the active participation of a broad range of public and private stakeholders. These Design Guidelines are intended to be available to and used by several audiences, including those listed below.

Community development is primarily managed by municipalities; as such, the key audience for these Design Guidelines are:

- urban planners;
- architects and engineers; and
- others involved in the land use, development, and transportation decision-making processes.

See **3.4 Collaboration and Roles** for a more detailed examination of the roles of different stakeholders in the planning process.

INTENDED AUDIENCE	ROLE
Municipalities	Apply best practices in transit-oriented design for streets, transportation networks, and land use plans, zoning, and regulations
Regional stakeholders such as YVR, Port Metro Vancouver, First Nations, non-governmental organizations, and post-secondary institutions	Apply best practices in transit-oriented design for major projects and development plans
Land development industry	Apply best practices in transit-oriented design for buildings, site access, and large-scale development projects
Metro Vancouver	Provide a regional land use framework for transit-oriented growth management
Province of British Columbia	Support transit-oriented design for major infrastructure and development projects in Metro Vancouver
TransLink	Plan, design, and deliver a regional transportation system that is sustainable and that supports regional growth management objectives

1.3 Coordinating Land Use and Transportation

Building more transit-oriented communities requires coordinated action by citizens, municipalities, and regional agencies. This effort to coordinate local and regional land use and transportation planning is not a new direction but, rather, a continuation of the planning and partnerships our region has pursued over many decades. Metro Vancouver adopted the Livable Region Plan in 1975, which envisioned a transit-oriented region of compact urban centres linked by high-quality transit. This approach was reaffirmed in the 1996 Livable Region Strategic Plan. Today, regional growth and development are guided by a closely coordinated set of plans, including:

- **Metro Vancouver's Regional Growth Strategy:** The region's plan for managing growth is the new Regional Growth Strategy (RGS), adopted by the Metro Vancouver Board in July 2011. All five goals in the RGS are relevant to the planning and delivery of a sustainable regional transportation system. Two of the RGS goals – 'create a compact urban area' and 'support sustainable transportation choices' – are particularly applicable, together with the identified network of Urban Centres and other concentrations of growth and activity supported by the Frequent Transit Network (FTN).
- **TransLink's Regional Transportation Strategy:** In 2008 TransLink published its long-term regional transportation strategy called Transport 2040, which sets out the vision for the regional transportation system over the next 30 years. Transport 2040 is designed to support the goals for managing regional growth; as such, the two regional strategies are compatible and mutually reinforcing. An update to the regional transportation strategy is underway and is expected to be completed in 2013.

A SAMPLE OF REGIONAL TARGETS IN METRO VANCOUVER

TransLink, by 2040:

- Most trips are by transit, walking, and cycling;
- the majority of jobs and housing in the region are located along the FTN; and
- 15% of all trips less than 8 km are made by bicycle.

Metro Vancouver (GVRD), by 2041:

- At least 31% of regional dwelling units and 43% of regional jobs are located in Urban Centres;
- at least 27% of regional dwelling units and 24% of regional jobs are located in Frequent Transit Development Areas (conceptual targets); and
- regional greenhouse gas emissions are reduced by at least 33% below 2007 levels by 2020 and 80% below 2007 levels by 2050.

1.3 Coordinating Land Use and Transportation

FREQUENT TRANSIT NETWORK (FTN)

The FTN is a network of corridors where transit service is provided every 15 minutes or better from morning to evening, every day of the week. By working with municipalities to better coordinate land use and transportation, the FTN is intended to attract a large portion of the population, influence their choices in home and job location, and encourage the creation of complete communities within the region.

In 2012, 66% of the region's jobs and 54% of the region's dwelling units were located within walking distance of the FTN. These percentages have increased from 51% of the region's jobs and 41% of the region's dwelling units being located along the FTN when it was introduced in 2007, primarily through expansion of the FTN during this time period.

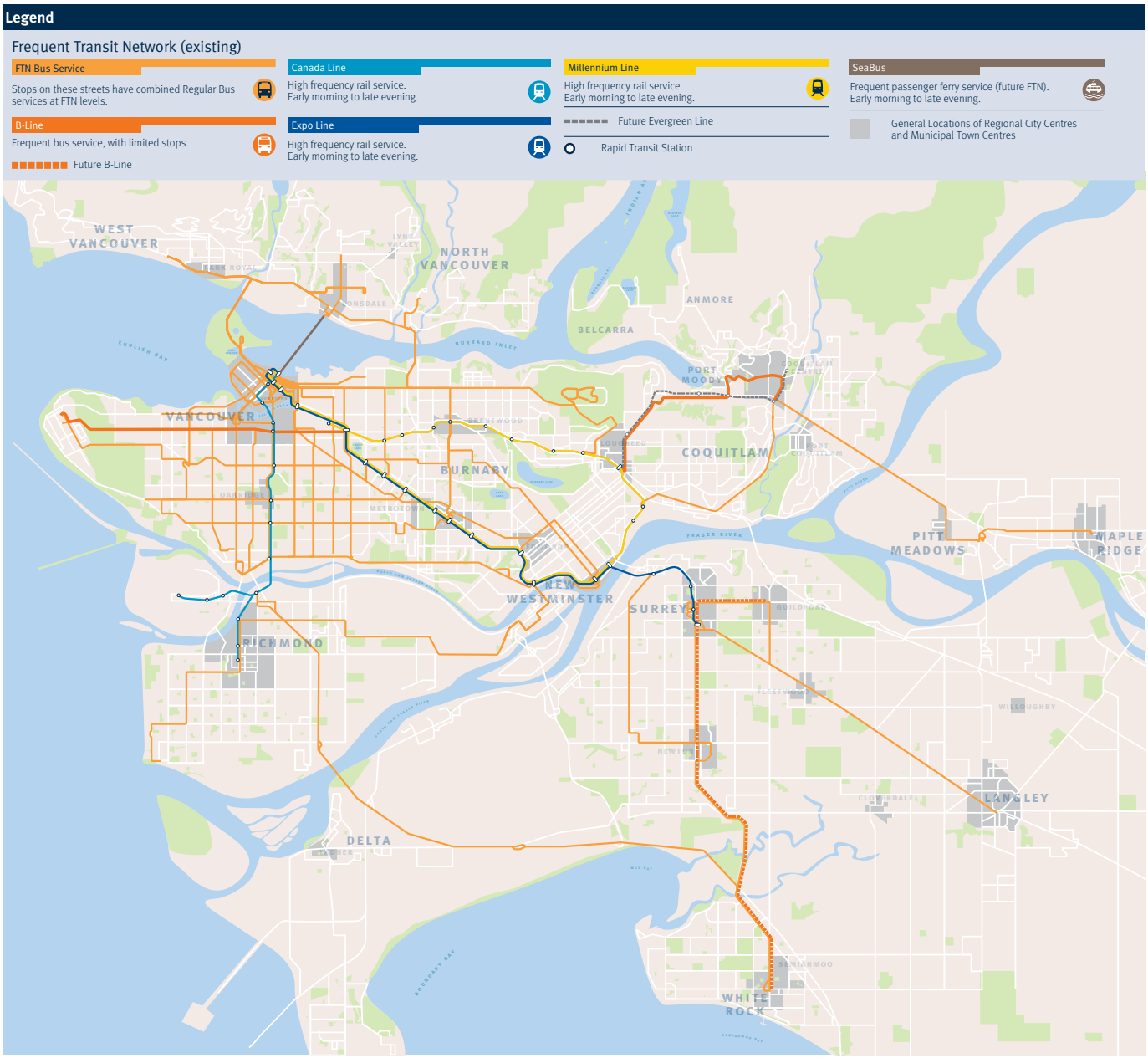
- **Official Community Plans:** Within the framework of the RGS, each municipality is responsible for developing a Regional Context Statement that indicates how its Official Community Plan (OCP) is, or will become, consistent over time with the RGS; therefore, the OCP and Regional Context Statement are important for enabling the development of transit-oriented communities.

A key transportation concept that carries through both of these regional strategies and many municipal OCPs in the region is the FTN. The FTN is a concept that identifies corridors linking Urban Centres and other key activity areas with high-frequency, high-quality service. Whether served by bus, rail, or ferry, FTN corridors – and especially the nodes where these corridors intersect – are important places for the region to direct growth and development. As a result, the FTN has become an important organizing framework in the region for coordinating land use and transportation and it is referred to throughout these guidelines.

The Frequent Transit Network provides a level of service that makes transit an attractive mode of travel and that connects key destinations within the region.

1.3 Coordinating Land Use and Transportation

Urban Centres and the Frequent Transit Network (FTN) form the organizing framework for land use and transportation planning in Metro Vancouver.



1.4 The 6 Ds of Transit-Oriented Communities

HOW THE 6 DS RELATE TO TRANSPORTATION OUTCOMES

A large and growing body of research demonstrates how community form shapes travel behaviour. Ewing and Cervero (2010) summarized the research on how vehicle kilometres travelled (VKT), transit use, and walking vary with respect to differences in community form.

For a summary of the evidence from the research on the relationship between the 6 Ds and transportationh outcomes, see **Appendix A2**.

The potential to influence travel patterns by changing the built environment is a frequently researched subject in the land use and transportation planning fields. Over the last two decades a growing body of research has demonstrated clear links between the built environment and travel behaviour, including mode choice and trip length. This document summarizes these links through a concept called the '6 Ds of transit-oriented communities', where each of the Ds refers to different elements of the built environment or to transportation demand management (TDM). The 6 Ds serve as the framework for the Design Guidelines provided in Chapter 2. The 6 Ds are:

D1 Destinations: Coordinate land use and transportation

When land use and transportation are well coordinated, transit can provide fast, direct, and cost-effective access to more destinations for more people. Transit-oriented communities coordinate land use and transportation in two important ways: At the neighbourhood scale they locate most new development along reasonably direct corridors so that most destinations are 'on the way' to other destinations. At the regional scale they locate the highest densities of development and the most important destinations at the intersection of several frequent transit corridors.

D2 Distance: Create a well-connected street network

A well-connected street network shortens travel distances, making it possible for people to quickly and conveniently walk or cycle to where they want to go, or to easily connect with transit en route to their destination.

1.4 The 6 Ds of Transit-Oriented Communities

D3 Design: Create places for people

Transit-oriented communities are carefully designed with the needs of people in mind. Whether walking, cycling, pushing a stroller, catching a bus, or using a mobility device, people of all ages and abilities should be able to access and enjoy a comfortable, safe, delightful, and inviting public realm.

D4 Density: Concentrate and intensify activities near frequent transit

Transit-oriented communities concentrate most growth and development within a short walk of frequent transit stops and stations. A higher density of homes, jobs, and other activities creates a market for transit, allowing frequent service to operate efficiently. The form of development varies from community to community based on local goals, character, and needs, and there is no 'one-size-fits-all' approach to achieving an appropriate level of density to support transit.

D5 Diversity: Encourage a mix of uses

A vibrant mix of land uses helps to create complete, walkable neighbourhoods around transit stations and stops, and supports a transit system that is well-utilized throughout the day. Transit-oriented communities encourage a mix of land uses at both the neighbourhood and corridor scales.

D6 Demand Management: Discourage unnecessary driving

Transit-oriented communities use TDM strategies to discourage unnecessary driving and to promote walking, cycling, and transit. TDM provides incentives for travelers to shift automobile trips to other modes in a number of ways, including increasing travel options, setting appropriate prices for parking or road usage, providing information and marketing, and allocating more road space to transit, cycling, and pedestrian uses.

THE 6 DS PROMOTE TRANSIT AND WALKABILITY

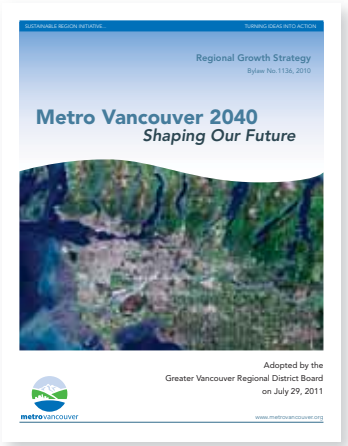
Transit and walkability are mutually supported by many of the same land use and built environment factors, such as a well-designed public realm, higher-density homes located near commercial uses, a diversity of land uses, and well-connected streets that reduce walking distances. Walkability is among the best predictors of demand for transit, while transit use is predictive of physical activity levels – transit users are more than three times as likely than non-users to achieve recommended levels of daily physical activity.

This relationship between transit, walkability, and active and healthy lifestyles suggests that combining the benefits of walkable neighbourhood design with a broader focus on how transit connects our region will realize the most benefits for communities and the environment.

To find more research on health and community design, visit www.health-design.spph.ubc.ca.

Lachapelle, U and L.D. Frank (2008). "Transit and Health: Mode of transport, employer sponsored public transit pass programs, and physical activity". *Journal of Public Health Policy*, 30(S1), 73-94.

1.4 The 6 Ds of Transit-Oriented Communities



REFERENCE

Metro Vancouver (2011). Metro Vancouver 2040: Shaping Our Future. www.metrovancouver.org/planning/development/strategy/Pages/default.aspx

1.4.1 Regional Application

In order to understand how the 6 Ds can be applied in the Metro Vancouver region, it is important to recognize the regional land use context. The Regional Growth Strategy (RGS) identifies 26 Urban Centres throughout the region, which are intended to serve as activity hubs at the regional, sub-regional, and municipal scale. They are also intended to be places where new growth will be concentrated and that are well-served by the region's transportation system. There are two further areas identified in the RGS that will attract growth in the future and that will be key nodes of activity along the region's FTN:

- **Frequent Transit Development Areas (FTDAs)**: These areas, to be located at appropriate locations along the FTN, are intended to be additional priority locations for accommodating concentrated growth in higher-density forms of development.
- **Special Employment Areas**: These four region-serving facilities include the largest post-secondary institutions and the international airport.

As a result, the 6 Ds are particularly important in these places and along the corridors that connect them. In order to maximize the effectiveness and cost-efficiency of the transit and transportation network, implementation of the 6 Ds should focus on areas near frequent transit. It is generally accepted that most people will walk roughly 10–12 minutes (800 m) to access limited-stop rapid transit and 5–6 minutes (400 m) to access frequent local transit. The areas within these distances of FTN corridors (see map in 1.2), therefore, are most applicable for the 6 Ds within the regional context.

At the local level, the 6Ds will be applicable on different levels to the various communities across the region. The Design Guidelines in Chapter 2 are intended to be used and adapted by municipalities and other stakeholders, where applicable, to respond to local needs and requirements.

1.4 The 6 Ds of Transit-Oriented Communities

1.4.2 Considering Scale

To be effective, the 6 Ds must all work together. Each of the Ds are best implemented at multiple levels of geography, including at the regional, corridor, neighbourhood, and site scale. For example:

- at the regional scale, Urban Centres, FTDAs, and the FTN are used as the organizing framework to coordinate land use and transportation;
- at the corridor and neighbourhood scales, frequent transit facilities provide the focus around which to foster higher-density, mixed-use, walkable neighbourhoods; and
- at the site scale, buildings are oriented toward transit facilities and FTN corridors, as well as the wider public realm, to enhance the pedestrian experience and create more convenient walking and cycling connections.

The 6 Ds each have a different level of relative influence on transportation outcomes at the various scales of geography, which should be recognized during community design.

	DESTINATIONS	DISTANCE	DESIGN	DENSITY	DIVERSITY	DEMAND MANAGEMENT
CORRIDOR	●●●	●	●	●●	●●●	●●
NEIGHBOURHOOD	●●	●●●	●●	●●●	●●●	●●●
SITE	●	●●	●●●	●●	●●	●●

Level of Influence on transportation outcomes

- ●●● high
- ●● medium
- ● low

Design Guidelines

2

This section presents strategies, case studies, and resources for creating more transit-oriented communities. The Design Guidelines were developed through stakeholder consultation and are presented within a framework of the 6 Ds of transit-oriented communities, as described in Chapter 1 and in TransLink's Transit-Oriented Communities: A Primer on Key Concepts (2010).

The 6 Ds design framework supports the multi-modal needs of pedestrians, cyclists, transit users, and other road users at all scales of development – site, neighbourhood, corridor, municipal, and regional – and is meant to provide an integrated set of guidelines that supports walkable, transit-oriented, sustainable, and vibrant places.

The Design Guidelines are applicable to all stages of the planning and design process, and they aim to provide a comprehensive and coordinated approach to community design in Metro Vancouver that will help achieve the shared vision of a more sustainable and livable region.

Recognizing the varied nature of communities across the region, it is expected that these guidelines will be adapted to suit the local context and situation of each unique place.

Overview

OVERVIEW TO THE DESIGN GUIDELINES

This section is structured according to the 6 Ds. A goal statement is provided for each D, indicating what it is intended to achieve. Under each D, a set of strategies is provided to present ideas on how to achieve the goal.

Sidebars throughout the Design Guidelines provide recommended resources for additional information, and illustrative examples from around the region and elsewhere provide some real world context.

At the end of each D section a set of case studies from around the region is included to illustrate a variety of key points and to allow readers to learn from the experiences of others.

D1: DESTINATIONS Coordinate land use and transportation

- D1.1 Ensure that major destinations are lined up along a reasonably direct corridor so they can be served by frequent transit
- D1.2 Encourage the highest intensity of development in Urban Centres and at frequent transit nodes
- D1.3 Focus additional growth toward existing and planned frequent transit corridors

D2: DISTANCE Create a well-connected street network

- D2.1 Provide fine-grained street networks
- D2.2 Make walking and cycling access to frequent transit as direct as possible
- D2.3 Plan for coordinated, multi-modal transportation networks
- D2.4 Locate frequent transit passenger facilities at accessible places on the street network

D3: DESIGN Create places for people

- D3.1 Design multi-modal streets
- D3.2 Design great public spaces
- D3.3 Seamlessly integrate development with frequent transit and the public realm
- D3.4 Design parking to support a pedestrian-oriented urban realm

D4: DENSITY Concentrate and intensify activities near frequent transit

- D4.1 Focus density in Urban Centres and around frequent transit corridors and nodes to support a strong demand for transit service
- D4.2 Plan for density that supports community character and promotes quality of life

D5: DIVERSITY Encourage a mix of uses

- D5.1 Encourage a mix of land uses immediately adjacent to frequent transit passenger facilities
- D5.2 Encourage a mix of uses around frequent transit nodes to create complete neighbourhoods
- D5.3 Provide a mix of uses along frequent transit corridors to reduce peak crowding and spread travel demand throughout the day
- D5.4 Provide a mix of housing types near frequent transit passenger facilities to create inclusive communities and promote equitable access to transportation

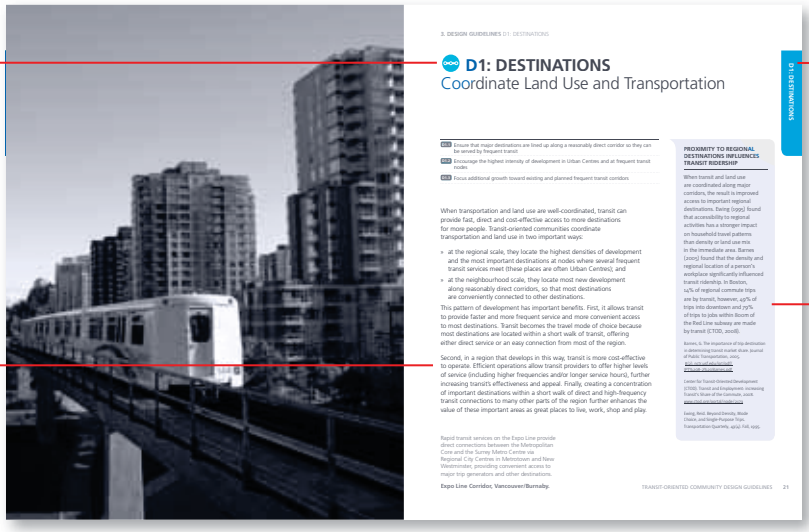
D6: DEMAND MANAGEMENT Discourage unnecessary driving

- D6.1 Manage parking supply and demand
- D6.2 Use TDM measures to encourage sustainable modes of travel

Layout and Organization

SECTION TITLE
presents the D, its associated goal statement, and its coloured icon

SECTION INTRODUCTION
provides an overview of the importance of the D



COLOURED TABS
correspond to the colour of the icon and allows easy navigation of the different D sections

EVIDENCE SIDEBAR
provides insight into relevant research about the D

STRATEGY TITLE
presents the strategy within the D

SIDEBARS
provide pertinent supporting information related to the adjacent guidelines

GUIDELINES
present the applicable guidelines within the strategy

SUMMARY PARAGRAPH
introduces the strategy and provides the context for the guidelines within it

REFERENCE AND RESOURCE BUBBLES
highlight relevant documents and research

PHOTOS AND ILLUSTRATIONS
provide supporting context to the guidelines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D1: DESTINATIONS
Coordinate land use and transportation

D1.1 Ensure that major destinations are lined up along a reasonably direct corridor so they can be served by frequent transit

D1.2 Encourage the highest intensity of development in Urban Centres and at frequent transit nodes

D1.3 Focus additional growth toward existing and planned frequent transit corridors

When land use and transportation are well-coordinated, transit can provide fast, direct, and cost-effective access to more destinations for more people. Transit-oriented communities coordinate land use and transportation in two important ways:

- at the regional scale, they locate the highest densities of development and the most important destinations at nodes where several frequent transit services meet (these places are often Urban Centres); and
- at the neighbourhood scale, they locate most new development along reasonably direct corridors so that most destinations are conveniently connected to other destinations.

This pattern of development has important benefits. First, it allows transit to provide faster and more frequent service and more convenient access to most destinations. Transit becomes the travel mode of choice because most destinations are located within a short walk of passenger facilities, offering either direct service or an easy connection from most of the region.

Second, transit is more cost-effective to operate in a region that develops in this way. Efficient operations allow transit providers to offer higher levels of service (including higher frequencies and/or longer service hours), further increasing transit's appeal and effectiveness. Finally, creating a concentration of important destinations within a short walk of direct and high-frequency transit connections to many other parts of the region further enhances the value of these important areas as great places to live, work, shop, and play.

PROXIMITY TO REGIONAL DESTINATIONS INFLUENCES TRANSIT RIDERSHIP

When transit and land use are coordinated along major corridors, the result is improved access to important regional destinations. Ewing (1995) found that accessibility to regional activities has a strong impact on household travel patterns, while Barnes (2005) found that the density and regional location of a person's workplace significantly influenced transit ridership. In Boston, 14% of regional commute trips are by transit; however, 49% of trips into downtown and 79% of trips to jobs within 800 m of the Red Line subway are made by transit (CTOD, 2008).

Barnes, G. (2005). "The Importance of Trip Destination in Determining Transit Market Share." *Journal of Public Transportation*, 8(2), 1-15. www.nctr.usf.edu/jpt/pdf/JPT%208-2%20Barnes.pdf

Center for Transit-Oriented Development (2008). Transit and Employment: Increasing Transit's Share of the Commute. www.ctod.org/portal/node/2179

Ewing, R. (1995). "Beyond Density, Mode Choice, and Single-Purpose Trips." *Transportation Quarterly*, 49(4), 15-24.

Rapid transit services on the Expo Line provide direct connections between the Metropolitan Core and the Surrey Metro Centre via Regional City Centres in Metrotown and New Westminster, providing convenient access to major trip generators and other destinations.

Expo Line Corridor, Vancouver/Burnaby, BC.

D1.1 Ensure that major destinations are lined up along a reasonably direct corridor so they can be served by frequent transit

Transit can most efficiently serve destinations that are along the same corridor as other destinations. When destinations are located outside of a frequent transit corridor, transit service must either deviate from the corridor – costing passengers time and costing the transit service money – or not serve the destination at all. To help create an environment where transit is cost-effective and convenient, it is best if destinations are aligned in a relatively continuous linear corridor.

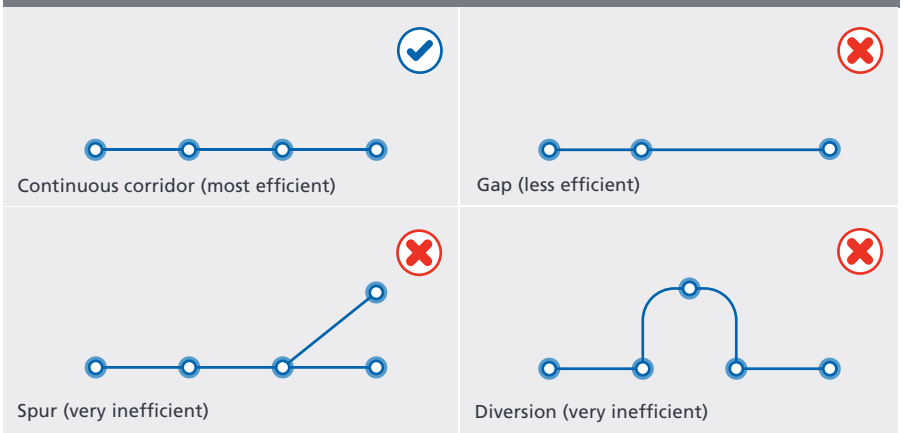
- Locate major trip generating uses in Urban Centres and frequent transit nodes to reduce the length of trips to access them.
- Locate major trip generating uses of region-wide interest within 800 m of the existing or planned rapid transit network to ensure convenient access by transit over longer trip distances.
- Avoid long gaps between destinations within the region's Urban Containment Boundary by discouraging 'leap frog' development or development far from established developed areas.
- Where there are unavoidable gaps between destinations (e.g., between communities bounded by the Agricultural Land Reserve), plan carefully at the corridor level to ensure FTN service is viable.
- To support transit as a convenient travel mode, locate major trip generating uses as close as possible to frequent transit corridors.
- Encourage infill development in Urban Centres and frequent transit nodes and along frequent transit corridors. See **Density D4.1**.

ESTABLISHING STRONG ANCHORS

Transit is most cost-effective when services are well used along the entire length of a corridor in both directions. To encourage a more efficient pattern of usage, TransLink and municipalities can work together to ensure that frequent transit corridors, particularly those with rapid transit, have major destinations (or anchors) at or near both ends.

Without anchors, transit ridership is likely to be low at either end, which reduces transit efficiency. The strongest anchors include major institutions such as colleges and universities, shopping centres, and large mixed-use developments. Major employment districts are also strong anchors and should be located in Urban Centres.

Locating destinations appropriately will improve the efficiency of transit corridors.



Ensure that major destinations are lined up along a reasonably direct corridor so they can be served by frequent transit

- Locate major destinations as anchors at or near both ends of frequent transit corridors, particularly rapid transit lines, to better utilize transit capacity and balance ridership in both directions.
- Locate major destinations at mid-points along frequent transit corridors, particularly where they intersect with other frequent transit corridors, to promote shorter trips, passenger turnover, and better-utilized transit capacity.
- Avoid spurs, which make the provision of frequent transit service more difficult, by locating destinations along a direct corridor.

Simon Fraser University, Surrey campus

Rendering of the proposed public plaza outside of the future new Surrey City Hall.

The Simon Fraser University Surrey Campus and planned new Surrey City Hall in the Surrey Metro Centre will serve as effective anchors for the King George Boulevard and 104th St corridors.

LOCATE MAJOR TRIP GENERATING USES IN URBAN CENTRES

Locating buildings and facilities that draw large numbers of trips in transit accessible nodes helps to reduce the burden on the road network and supports the use of sustainable modes for every day travel. Such attractors may include:

- public buildings (such as city halls, central libraries and community centres),
- post-secondary institutions,
- major commercial and retail areas,
- entertainment facilities (theatres, sports venues and leisure centres),
- large multi-family residential developments, and
- large office developments.

D1.2 Encourage the highest intensity of development in Urban Centres and at frequent transit nodes

West Broadway, Vancouver, BC

Destinations are best connected to the rest of the region when they are located in Urban Centres or at frequent transit nodes along frequent transit corridors. Encouraging development in Urban Centres and Frequent Transit Development Areas (FTDAs) is a priority for focusing growth across the region. It also serves to increase their attractiveness for office, commercial, retail, leisure, and entertainment activity, which in turn increases the demand for and the effectiveness of transit services.

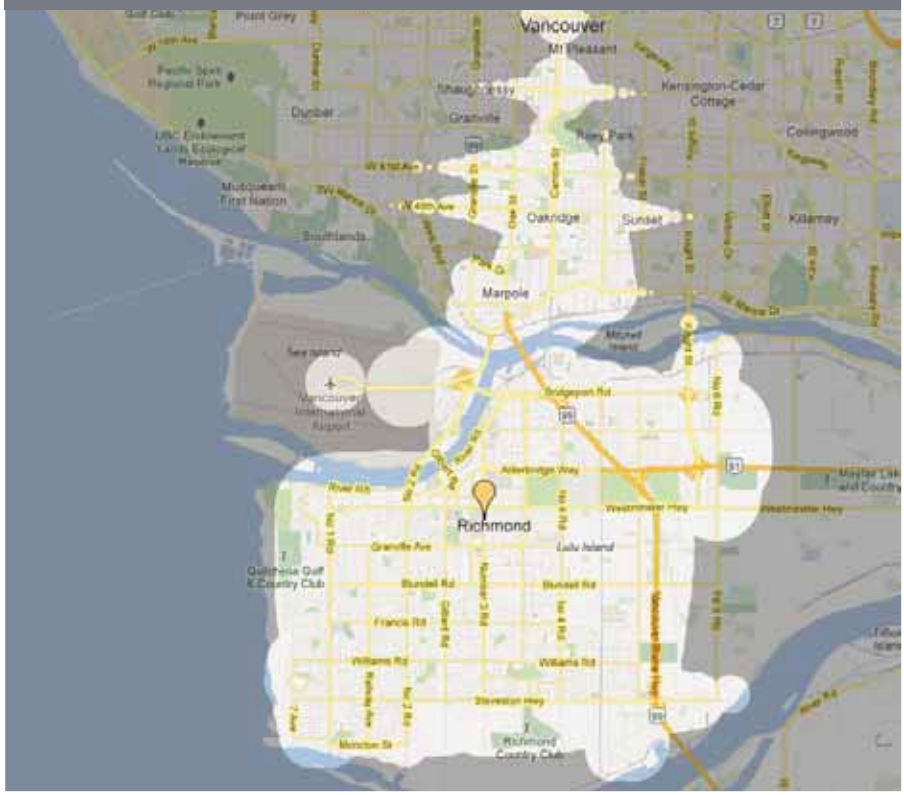
- Focus development in Urban Centres, FTDAs, and at the best connected frequent transit nodes, providing a large share of homes and workplaces with convenient transit access across the region.
- Provide higher densities in Urban Centres and at frequent transit nodes to support frequent transit services. See **Density D4.1**.

DEFINING FREQUENT TRANSIT NODES AND CORRIDORS IN OFFICIAL COMMUNITY PLANS (OCPs) AND OTHER POLICY DOCUMENTS

Recognizing existing and planned frequent transit nodes and corridors in OCPs, neighbourhood plans, and other transportation plans will enable TransLink, municipalities, and stakeholders to clearly understand and plan for future transit-oriented growth and transit service.

Nodes and corridors outside of Urban Centres that are targeted for future growth should be considered for designation as FTDAs.

Richmond-Brighouse Station (orange pin) on the Canada Line is highly transit accessible, as all of urban Richmond, the Cambie corridor, and Downtown Vancouver are within a 30-minute trip.

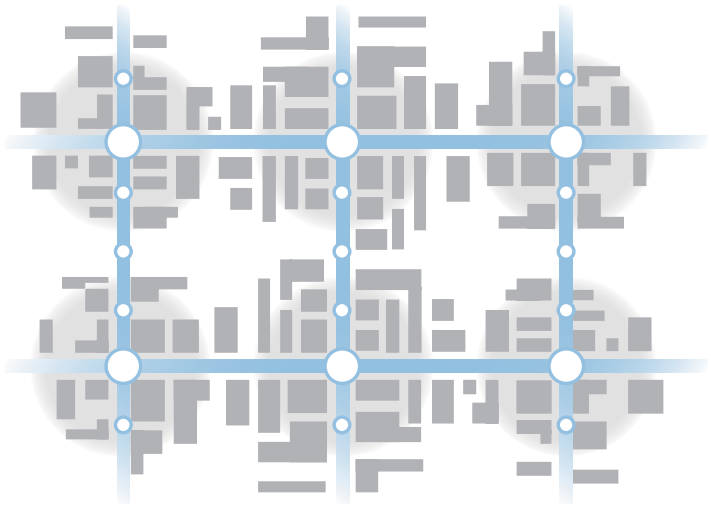


Source: www.mapnificent.net

Encourage the highest intensity of development in Urban Centres and at frequent transit nodes

- Where possible, locate development at frequent transit nodes to improve local connections and provide direct access to a wider range of destinations in multiple directions.
- Support the development of recreational facilities and the location of popular events in Urban Centres.
- Ensure a mix of land uses – including active uses such as retail, restaurants, and entertainment – at transit nodes to reduce walking distances between destinations and to promote pedestrian activity. See **Diversity D5.2**.
- Work with TransLink to locate transit stations and exchanges adjacent to, or integrated into, major destinations. See **Transit Passenger Facility Design Guidelines, P2.1**.
- Create land use and transportation plans that take into account and integrate the needs of transit passenger facilities in these plans. See **Transit Passenger Facility Design Guidelines P2.3**.

By focusing density around frequent transit nodes, more people will be within walking distance of frequent transit services.



Metrotown, Burnaby, BC

OFFICE BUILDINGS BENEFIT FROM TRANSIT ACCESSIBILITY

Jones Lang LaSalle, a financial and professional services firm specializing in real estate services and investment management, developed the Rapid Transit Office Index for Metro Vancouver. The Index shows that commercial office space located near rapid transit stations has lower vacancy rates and attracts higher rents than office space that is not accessible to rapid transit. This pattern is particularly evident in suburban areas outside of the Metropolitan Core.

Jones Lang LaSalle (2011). Rapid Transit Office Index for Metro Vancouver. www.joneslanglasalle.ca/canada/en-ca/Pages/NewsItem.aspx?ItemID=23223 Transit Office Index&TopicName=

D1.3 Focus additional growth toward existing and planned frequent transit corridors

In addition to Urban Centres, communities can focus growth toward established and planned frequent transit corridors to maximize the effectiveness of the region's transit investments. Concentrating residential and employment activity in Frequent Transit Development Areas is a secondary priority area within the Regional Growth Strategy (RGS). Providing optimal access to transit for those living and working in these areas will increase the demand for transit services and improve access to Urban Centres and frequent transit nodes. Major employment, business and service centres that serve the region or sub-regions should be prioritized within Urban Centres. For more on targeting growth, see **3.2.5 Market Readiness and Potential**.

- Use land use policies and regulations to promote higher densities and foster public investment to encourage development along existing or planned frequent transit corridors.
- Support future frequent transit service by strategically directing and phasing development toward a limited number of the most feasible frequent transit corridors first.
- Support transit use and efficiency by focusing development within a 5–10 minute walk (400–800 m) from transit stops and stations, respectively.
- To increase the attractiveness of transit, locate major trip generating uses as close as possible to frequent transit corridors, ideally within 400 m of transit passenger facilities. See **Distance D2.2**.
- Plan for a development density that is appropriate for the type and frequency of transit service planned for each corridor. See **Density D4.2**.
- Orient buildings along frequent transit corridors toward the street and toward transit passenger facilities to provide the most convenient access to transit services. See **Distance D2.4**.

DEVELOPMENT STRATEGIES TO FOCUS GROWTH

Strategies to focus growth toward Urban Centres and frequent transit corridors may include:

- adjusting land use designations and zoning to permit higher-intensity, mixed-use development;
- building community facilities, schools, post-secondary institutions, and other civic buildings at strategic locations along the FTN;
- investing in the public realm to help catalyze development and promote walking and cycling (see **Design D3.3**); and
- limiting increases to allowable density when designating or zoning areas outside existing and planned Urban Centres or frequent transit corridors (see **Density D4.1**).

For more about development strategies, see Metro Vancouver's RGS.

Focus additional growth toward existing and planned frequent transit corridors

The City of Toronto, ON, aims to reurbanize key arterials like St. Clair Ave. West by promoting mid-rise development, which will also support improved transit service along the corridor.

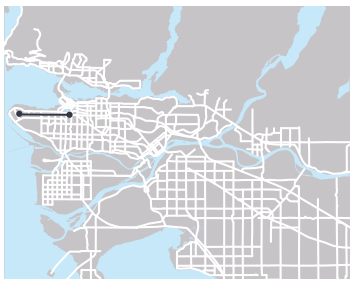
The area around Joyce-Collingwood Station in Vancouver has been a significant location for new residential growth along the Expo Line rapid transit corridor.

RESOURCES

Center for Transit-Oriented Development:
(2007). Planning for TOD at the Regional Scale: The Big Picture.
www.ctod.org/portal/TOD204
(2010). Performance-Based Transit-Oriented Development Typology Guidebook.
www.ctod.org/portal/node/2162
(2010). Transit Corridors and TOD: Connecting the Dots.
www.ctod.org/portal/node/2161

Mineta Transportation Institute
(2012). Understanding Transit Ridership Demand for a Multi-Destination, Multimodal Transit Network in an American Metropolitan Area.
www.transweb.sjsu.edu/project/1003.html

D1 Case Study



Municipality: City of Vancouver

Location: Broadway, between UBC and Commerical-Broadway Station

Key Design Elements:

- Strong corridor anchors such as UBC and Central Broadway
- High concentration of destinations
- Well-developed grid street network and high intersection density

Connecting Transit-Oriented Communities along the Broadway Corridor

The 11 km Broadway corridor in Vancouver is anchored by the University of British Columbia (UBC) main campus on the western end, while east end anchors include Vancouver Community College (VCC) and Commercial-Broadway Station. The station, one of the busiest interchanges on the transit network, connects the corridor to the entire eastern two-thirds of the region via two rapid transit lines (Expo and Millennium Lines).

The importance of the corridor as an east-west route across the city of Vancouver has made it an attractive place for higher-density, transit-oriented residential development, as well as commercial office employment, retail activity, and public services. The corridor passes through the Central Broadway area, which is part of the Metropolitan Core and includes many high-density residential and commercial buildings, Vancouver General Hospital (VGH), Vancouver City Hall, and connections to downtown Vancouver via the Canada Line. The corridor also touches the distinctive retail districts of Point Grey, South Granville, Main Street, and Commercial Drive.

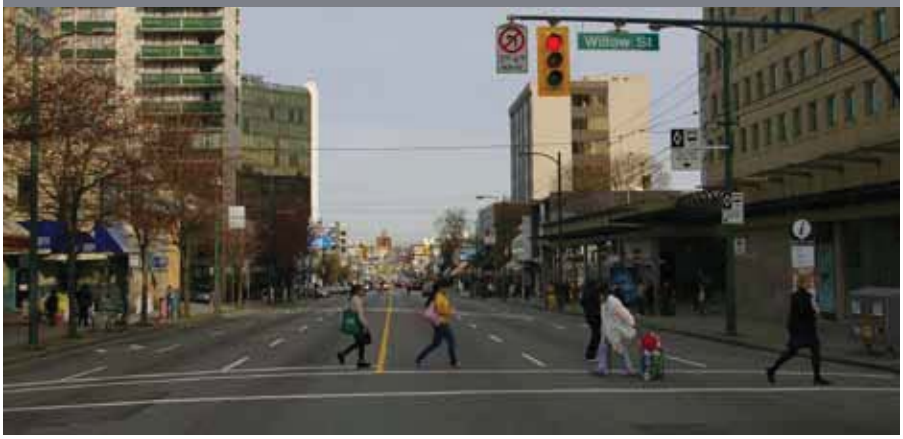
Significant retail activity is present along the majority of the corridor which, along with a grid-style street pattern and a high density of intersections, encourages local residents and employees to walk, cycle, and take transit to access goods and services nearby. The diversity of land uses along the corridor sustains a vibrant street life and supports transit ridership in both directions throughout the day and evening, seven days a week. The implementation of restricted and pay parking throughout much of the corridor – to support local business and encourage sustainable modes of travel – contributes to a daily mode share of 42% by walking, cycling, and transit.

Currently served by local bus services and the 99 B-Line (a high-frequency, limited-stop bus service), the corridor is one of the busiest bus-based transit corridors in North America, with over 100,0000 people using transit along the corridor on a typical weekday. A peak period bus priority lane also provides additional time savings and increased reliability for passengers along the corridor.

The growth of the corridor for residents, employees, and transit users has led TransLink and the Province, together with municipal and regional partners, to examine rapid transit options for the corridor as part of the UBC Line Rapid Transit Study.

D1 Case Study

Central Broadway includes a high density of employment around Vancouver City Hall and Vancouver General Hospital (VGH).

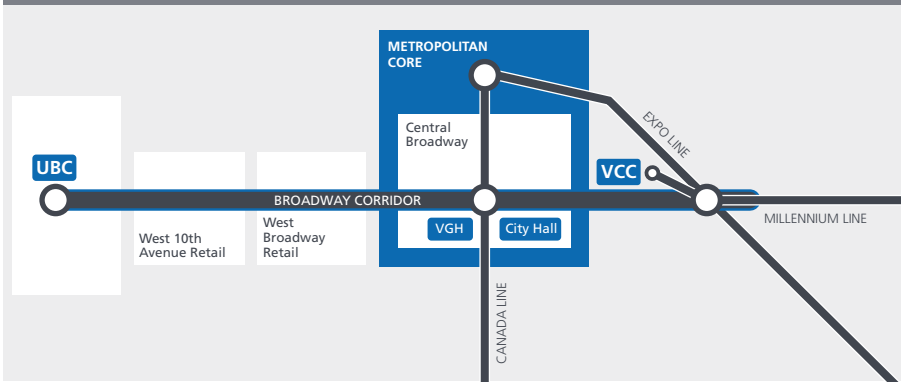


Local retail on West Broadway encourages local access by walking and cycling.

Commercial-Broadway Station is one of the busiest interchanges in the region.

City Hall, a major trip-generator, is located near the the Canada Line on Cambie Street.

The Broadway Corridor connects local and regional destinations along a direct corridor.



D2: DISTANCE
Create a well-connected street network

A well-connected street network provides shorter travel distances and makes it possible for people to walk or cycle to transit services quickly and conveniently from the places they live, work, shop, and play, while also supporting walking and cycling as everyday transportation options on their own.

When deciding whether to use transit, one of the most important factors people consider is the distance between their origin and a transit passenger facility (stop, exchange, or station) and again to their destination. What matters for the traveler is not the straight-line or 'as the crow flies' distance but, rather, the actual walking distance using the available streets and paths. In an area with long blocks and dead-end streets, the walking distance can be much further than the straight-line distance. Some destinations that are physically very close to a transit stop or station may still require a long walk.

In contrast, a network that offers many closely-spaced streets with good connections between them shortens the walk to transit by providing more direct routes. While cyclists are not as sensitive to distance as pedestrians because they move more quickly, they are more sensitive than vehicle drivers, and so a well-connected street network also promotes cycling as a means of access to transit.

Just as a well-connected street network shortens distances to transit, it also shortens distances for all other trips, supporting walking and cycling as attractive modes of transportation in their own right. In combination with a vibrant mix of land uses, a well-connected street network helps to create communities where many of the needs of daily life can be met within walking or cycling distance.

MORE STREET CONNECTIONS PROMOTE WALKING, CYCLING, AND TRANSIT

Many researchers have found that higher levels of intersection density (i.e., more intersections) result in lower levels of overall travel by automobile and higher likelihoods of travel by sustainable modes. Schlossberg et al. (2006) used a student travel mode to school survey to show that higher intersection densities increased students' likelihood of walking by up to five times. Research from Ozbil et al. (2009) highlights the importance of street connectivity for transit users, specifically at the 800 m distance from transit facilities, in increasing the likelihood of transit use.

Ozbil et al. (2009). "The Effects of Street Configuration on Transit Ridership." *Proceedings of the 7th International Space Syntax Symposium.* www.sss7.org/Proceedings/.../084_Ozbil_Peponis_Bafna.pdf

Schlossberg et al. (2006). "School Trips: Effects of Urban Form and Distance in Travel Mode." *Journal of American Planning Association*, 72(3), 337-346. www.pages.uoregon.edu/schlossb/articles/schlossberg_school_trips.pdf

A fine-grained street network around this mixed-use, mid-rise development – including short cuts for pedestrians and cyclists – make transit an attractive travel option in the Arbutus Walk neighbourhood.

Vancouver, BC.

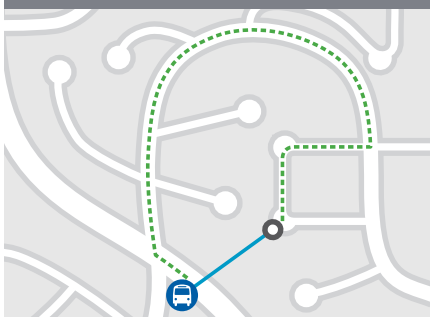
D2.1 Provide fine-grained street networks

Transit-oriented communities have a dense, coherent, and walkable network of streets, sidewalks, and off-street paths. A pattern of smaller blocks and connected streets makes it possible to travel along direct routes. A connected street network extends the reach of transit, walking, and cycling and closes the gap between destinations; it also brings origins and destinations closer together and makes access to everyday activities more convenient by sustainable modes of travel. Street connectivity may be of highest priority in established Urban Centres and is most critical near frequent transit stops or stations. For more on improving transit-orientation in existing communities, see **Distance D2.3.1**.

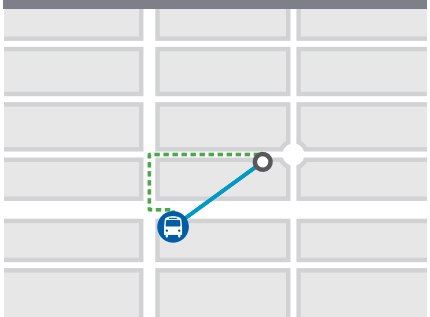
D2.1.1 New streets

- Design block patterns to create a connected grid of streets that minimizes travel distances between points.
- Plan for spacing in new developments of approximately 800 m between arterial streets, with local blocks no longer than 150 m.
- Ensure that large developments with internal streets provide strong connections to the existing street network.
- Ensure that internal streets for large development projects are accessible to the public and that the development is permeable for pedestrians, cyclists, and emergency vehicles.
- Plan for an intersection density where possible of between 0.4 and 0.6 intersections per hectare or more around rapid transit stations and high-frequency transit nodes.
- Connect new streets directly to existing streets and avoid dead-ends and cul-de-sacs.

A disconnected street network full of cul-de-sacs results in long walking distances, few route options, and less efficient transit operations.



A well-connected, fine-grained street network enables shorter and more direct walking connections, provides greater choice of routes, and is easier to serve with cost-effective transit.



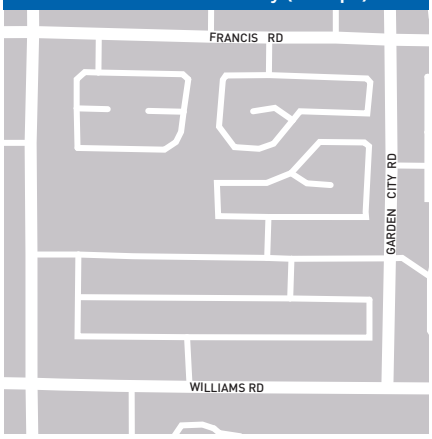
RESOURCES

Condon, P. (2010). "Cul-De-Sacs: Dead Ends in More Ways Than One." *The Tyee*. www.thetyee.ca/News/2010/09/22/CulDeSacDeadEnd/

Provide fine-grained street networks

These examples show the intersection density of various communities around Metro Vancouver and their associated average block size.

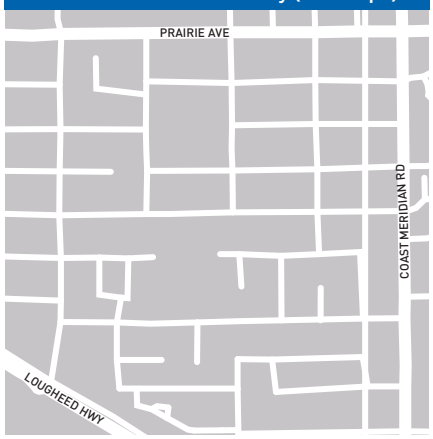
Low Intersection Density (<0.4 iph)



1. Broadmoor, Richmond (0.31)
Average block size = 160 m x 350 m

2. Cottonwood, Maple Ridge (0.31)
Average block size = 100 m x 300 m

Medium Intersection Density (0.4-0.6 iph)

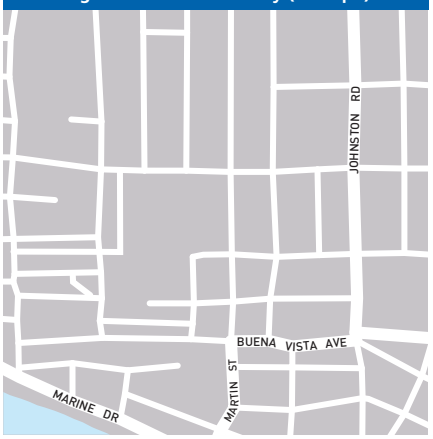


3. Imperial Park, Port Coquitlam (0.46)
Average block size = 100 m x 200 m

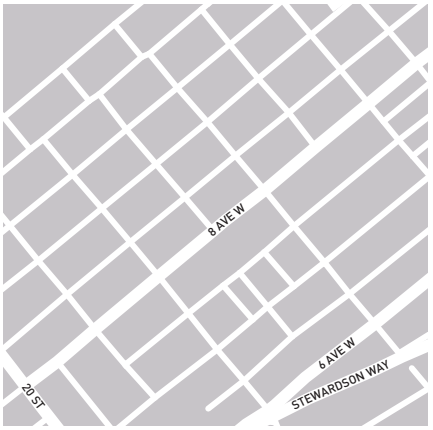
4. East Clayton, Surrey (0.54)
Average block size = 75 m x 200 m

5. Upper Lonsdale, North Vancouver (City) (0.55)
Average block size = 110 m x 230 m

High Intersection Density (>0.6 iph)



6. 152nd St/Johnson Rd, White Rock (0.81)
Average block size = 100 m x 150 m



7. West End, New Westminster (0.85)
Average block size = 100 m x 150 m

8. Mt. Pleasant, Vancouver (0.89)
Average block size = 80 m x 140 m

Regional Location Map

Provide fine-grained street networks

INCREASING CONNECTIVITY: NEW WESTMINSTER'S QUEENSBOROUGH PEDESTRIAN BRIDGE

New Westminster's Downtown Community Plan Update includes the Queensborough-Waterfront Pedestrian Bridge. The bridge will provide pedestrian and cycling connectivity between Downtown New Westminster and Queensborough, helping to reduce vehicle trips in that corridor. The longest span will be 120–160 m in length and 22 m in height above the river.

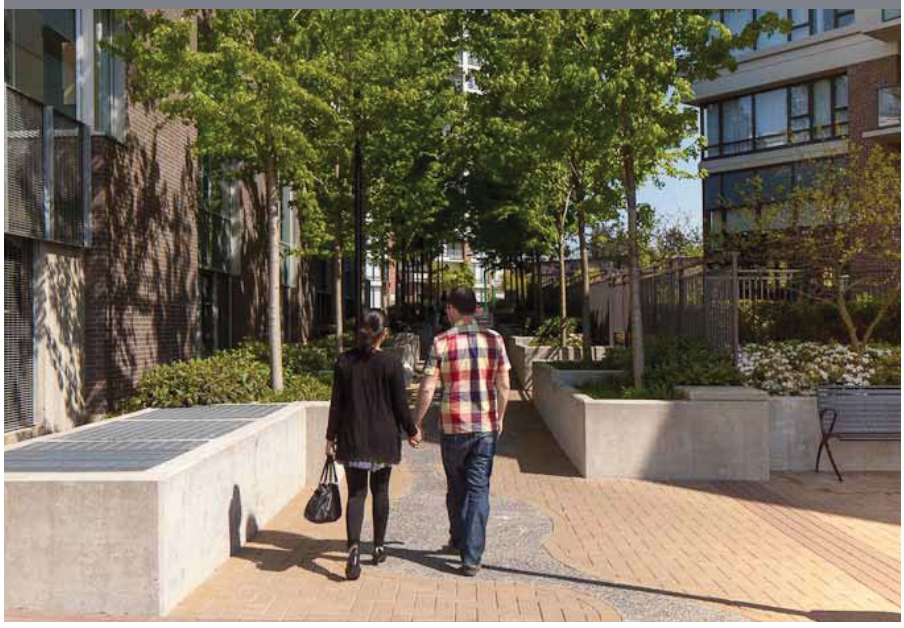
The project is expected to cost $10.3 million, with funding through Development Assistance Compensation (DAC) negotiated as part of the development of a new casino project.

New Westminster, City of (2011). New Westminster's Downtown Community Plan Update. www.newwestcity.ca/database/rte/Transportation Heritage.pdf

D2.1.2 Existing streets

- Use new multi-use pathways to improve walking and cycling access and to add permeability where long blocks currently exist and new streets cannot be added.
- Provide safe and convenient pedestrian crossings of arterial streets near transit passenger facilities.
- Where appropriate, provide closely-spaced pedestrian crossings of primary streets to improve access and convenience to both sides of the street (e.g., in Urban Centres).
- Provide at-grade pedestrian crossings of primary streets, rather than over- or under-passes, to avoid delaying pedestrian travel.
- Provide pedestrian-, cyclist-, and/or transit-only crossings along desire lines to increase the convenience and competitiveness of these modes and to help overcome physical barriers to movement, such as major highways and rivers.

New development at Highgate, Burnaby provided the opportunitiy to introduce walking and cycling paths to improve connectivity to transit and retail on Kingsway.



D2.2 Make walking and cycling access to frequent transit as direct as possible

The distances people are willing to walk to transit vary depending on length and purpose of the trip and quality of the pedestrian environment, as well as on weather, topography, and demographics. Generally, people will walk further to access limited-stop transit services than local services and further still for rapid transit services. Paths of travel to and from transit passenger facilities should be as direct as possible, both to minimize the distance people are required to walk to transit and to maximize the number of people who have convenient access to it.

- Provide direct, high-quality pedestrian and bicycle infrastructure to and from transit passenger facilities.
- Protect space along transit corridors for transit stops at key locations.
- Work with TransLink to consolidate and optimize transit passenger facility spacing and location for the fastest door-to-door travel times while still meeting the Transit Service Guidelines. See **Transit Passenger Facility Design Guidelines U1.1**.
- Provide the highest residential and employment densities along frequent transit streets to minimize transit access distances, consistent with the region's growth management goals for Urban Centres. See **Density D4.1**.
- Locate passenger facilities at intersecting frequent transit corridors as close as is practical to minimize walking distances for those transferring between them.
- Ensure there are safe and convenient pedestrian crossings at or near transit passenger facilities.
- Design access to passenger facilities that provides for the needs of pedestrians and users of wheelchairs and other mobility devices. See **Design D3.1**.
- Identify opportunities, through development planning or community planning, to create new publicly-accessible pedestrian and cyclist connections in existing communities that will improve access to transit.
- In communities with significant changes in topography (e.g., steep slopes) that may affect walking and cycling use, plan connections to transit that maximize the directness of travel to improve the attractiveness of these modes.

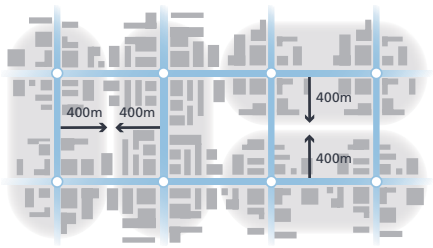
WALKING AND CYCLING ACCESS TO TRANSIT

Ultimately, all transit passengers are pedestrians – including those using mobility devices and those arriving by bicycle, car or another transit mode. Transit passenger facilities and access routes to and from them generate concentrated levels of activities by pedestrians and should, therefore, be designed to create an environment that is safe, accessible, easy to use, and secure and comfortable for all users – especially for these non-automobile modes.

Frank, L.D. et al. (2006) found that a 5% increase in walkability as measured by these traits was associated with a 32% increase in walking for transport. Walking and cycling trips on their own are also important for transit-oriented communities to enable short trips without an automobile, reduce peak hour crowding on transit, and reduce congestion on roads.

Frank, L.D. et al. (2006). "Many Pathways From Land Use to Health." *Journal of the American Planning Association*, 72(1), 75-87.

D2.3 Plan for coordinated, multi-modal transportation networks



A well-connected street network provides the foundation for direct travel at the neighbourhood scale. Building on this foundation, another important step for minimizing travel time and distance is to plan for complete, well-connected transportation networks for all modes at the local level. This approach recognizes that not every street will serve every mode of transportation in the same way. A multi-modal network will include different types of streets and pathways that combine to provide optimal connectivity for all modes within a community. This section provides high-level guidance on the design of local transportation networks that support improved pedestrian and cycling mobility and access to transit.

ARTERIAL STREET SPACING THAT SUPPORTS TRANSIT

Arterial street spacing of approximately 800 m and local blocks of no more than 150 m creates an effective street network providing for fine-grained pedestrian routes and efficient transit operations.

In Metro Vancouver, the traditional street network of the early 20th century had main streets spaced about 800 m apart, which effectively supported the streetcar system at that time. Providing transit services on most arterial streets will ensure that all dwellings and other facilities are located within a 5-minute walk (400 m) of transit.

D2.3.1 Street networks

- Designate a network of arterial streets that connect major destinations and provide direct paths of travel, avoiding unnecessary breaks and diversions to achieve more efficient and convenient transit corridors. See **Destinations D1.1**.
- Avoid concentrating vehicle traffic on only a few corridors by providing multiple, relatively even-spaced, and well-connected arterial streets.
- Arterial streets designated as transit corridors should ideally be spaced a maximum of 800 m apart to create a maximum walking distance of 400 m from the interior of each block.
- Classify arterial streets by their level of priority for vehicle, transit, and goods movement, and also for bicycle and pedestrian travel, and apply street design and performance standards to match these levels of priority.
- Plan for a well-connected network of complete streets that can move travellers safely, efficiently, and comfortably by all modes.

Plan for coordinated, multi-modal transportation networks

CLASSIFYING MULTI-MODAL STREETS

Under the conventional approach, or functional classification, streets are defined by the degree to which they emphasize through-movement versus local access. Arterial streets are designed primarily for through-movement, local streets are used primarily for local access to property, and collectors are used to connect them.

In cities that take a more multi-modal, 'complete streets' approach, streets have a bigger role than just moving traffic. In addition to providing for the movement of all road users – including pedestrians, bicycles, transit vehicles, and goods – such streets provide access to adjacent land uses, accommodate utilities, and serve as a vital part of the neighbourhood by offering open space for socializing and recreation.

There are four key elements of street design that are useful to understand and consider when classifying streets:

- land use context,
- priority for the movement of each mode,
- relationship to other streets in the network, and
- available right-of-way.

In places where the functional classification system still dominates, a simple way to transition toward a more multi-modal classification system is to identify how street types fit in with land uses. This approach can help to break down rigid street types such as arterials into the types of urban environments they are likely to pass through, and consideration can be given to customized treatment of the roads (e.g., through special overlay designations) within those particular contexts.

See **Design D3.1** for guidance on the design of multi-modal streets.

No. 3 Road, Richmond BC

RESOURCES

Florida Department of Transportation (2009). Quality/ Level of Service Handbook. www.dot.state.fl.us/planning/systems/sm/los/default.shtm

Institute of Transportation Engineers (2010). Designing Walkable Urban Throughfares: A Context Sensitive Approach. www.ite.org/emodules/scriptcontent/orders/ProductDetail.cfm?pc=RP-036A-E

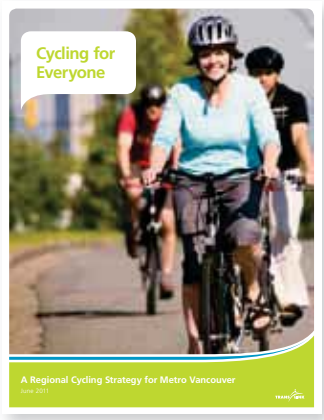
Jaskiewicz, F. (1999). "Pedestrian Level of Service Based on Trip Quality." *Transportation Research Board Circular E-C019: Urban Street Symposium*, 1-14. www.urbanstreet.info/1st_symp_proceedings/Ec019_g1.pdf

Mineta Transportation Institute (2007). How Far, By Which Route, and Why? A Spatial Analysis of Pedestrian Preference. www.transweb.sjsu.edu/mtiportal/research/publications/summary/0606.html

Plan for coordinated, multi-modal transportation networks

D2.3.2 Bicycle networks

- Designate a well-connected network of bicycle lanes, routes, and paths that provide direct connections to local destinations and transit passenger facilities. See **Design D3.2**.
- Provide a network of bicycle priority streets to enable a safer, more convenient environment for cycling. See **Design D3.1.2**.
- Select bicycle priority streets, where possible, that have low traffic volume and a fairly flat terrain to provide convenient connections to transit passenger facilities.
- Ensure that the bicycle network provides strong connections to important transit nodes.
- Even where facilities for cyclist through-movement are provided on low-volume streets adjacent to major arterials, design arterials for safe access by cyclists to destinations along those streets.
- Where a combination of high bicycle volumes and high traffic volumes are present, implementing separated bicycle facilities can improve safety and increase the attractiveness of cycling. See **Design D3.1.2**.
- Provide a variety of bicycle facilities that accommodate the needs of different types of cyclists. See **Design D3.1.2**.
- Provide additional connectivity by creating bicycle boulevards or neighbourhood greenways on streets with low traffic volumes. See **Design D3.1.2**.



TRANSLINK REFERENCE

Cycling for Everyone: A Regional Cycling Strategy for Metro Vancouver (2011). www.translink.ca/en/Cycling/Regional-Cycling-Strategy.aspx

The Cycle Superhighways in London UK use a network of segregated and unsegregated bike lanes marked by blue paint to create a safe and attractive foundation for increased cycling.

D2.4 Locate frequent transit passenger facilities at accessible places on the street network

Transit passenger facilities, such as bus exchanges and rapid transit stations, are important focal points for community and transportation activity. Wherever possible, facilities should be located where they provide convenient access to the pedestrian and cycling networks, enable efficient intermodal connections, and support the development of higher density, mixed-use development. Distances to surrounding uses may be reduced, not only by creating more connections, but also by locating transit facilities where existing connections intersect.

- Work with TransLink to site new transit passenger facilities along corridors with higher densities and trip-generating uses. See **Destinations D1.1**.
- Work with TransLink to use effective building orientation to improve the visibility and legibility of transit passenger facilities, including the use of distinctive design and the integration of art, signage, wayfinding, and other tools that reduce perceived distances to transit. See **Transit Passenger Facility Design Guidelines U1.2 and U1.3**.
- Support development that integrates transit passenger facilities into existing or planned sites on the most active and well-used streets. See **Transit Passenger Facility Design Guidelines P2**.
- Integrate transit facilities into the urban structure so they are included as an integral part of the urban environment and streetscape. See **Transit Passenger Facility Design Guidelines P2.1**.

The high-density Plaza 88 development is integrated into New Westminster SkyTrain Station and is oriented toward the street, providing convenient pedestrian and bicycle access.

D2 Case Study

Location: Surrey City Centre

Municipality: City of Surrey

Key Design Elements:

- Fine-grained street grid
- Direct pedestrian and cyclist connections to transit
- Public realm and new higher-density development oriented toward transit

Providing Fine-Grained Connections in Surrey City Centre

Surrey City Centre has been designated the Surrey Metro Centre in the Regional Growth Strategy and is expected to attract significant amounts of new development over the coming decades. The City of Surrey has been developing plans to enable the redevelopment of the City Centre as a more pedestrian- and transit-oriented urban community that acts as a hub of activity south of the Fraser River.

A key aspect of the planning framework is breaking down the current 'superblock' street pattern into a more fine-grained grid and reducing the average block size in the area from 400 m to a more pedestrian-oriented 150–200 m. This change will be accomplished by adding three new east-west streets and two new north-south streets, providing significant enhancements to pedestrian, cyclist, and vehicle circulation while also creating efficient and practical development parcels.

These new streets will be designed to have downtown-scaled sidewalks to support pedestrian movement. New signalized crosswalks will be added at existing and proposed intersections, and a minimum of one additional crossing of King George Boulevard will be added to improve access to retail services located on the east side of the main arterial. In addition, new pedestrian linkages will connect the Central City shopping and office tower with two key local destinations: a new civic plaza and the North Surrey Recreation Centre. Bicycle access will be provided through the City Centre by way of a greenway, which will connect to the existing bicycle network, rapid transit stations, and local destinations.

The City Centre Plan focuses growth and development around the Surrey Central SkyTrain Station and civic plaza (which incorporates bus interchange facilities) to optimize door-to-door travel times and provide a focal point for transportation and community activity. The orientation of the new City Hall and new library toward transit – in combination with the integration of signage, public art, and distinctive public realm design in the plaza – will contribute to reducing perceived distance to transit.

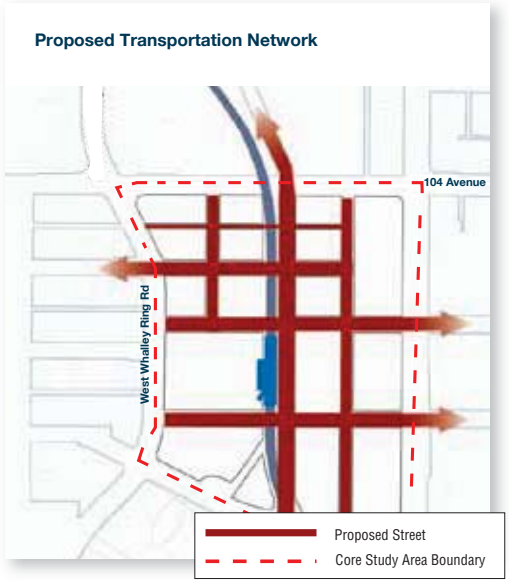
When the City Centre Plan is realized, Surrey City Centre will provide efficient multi-modal connections while supporting higher-density, mixed-use development. Public realm enhancement, together with the creation of a transit-, pedestrian-, and bicycle-friendly environment, will enable sustainable transportation choices.

D2 Case Study

Higher-density mixed-use development is supporting the revitalization of Surrey City Centre.

Plans aim to redevelop much of the existing land currently occupied by surface parking to support walkability.

New streets will connect adjacent street networks more directly to Surrey Central Station and the transit hub.



The land use plan includes new streets and pedestrian connections to support a finer-grained urban street grid and a more walkable City Centre.

D3: DESIGN
Create places for people

Creating places for people means designing the urban environment to accommodate their needs regardless of their chosen mode of transportation and to be accessible to individuals with a range of mobility needs and challenges. The public realm encompasses the areas in which people travel, and it should be a safe, comfortable, and inviting place that people want to use. At the same time, delight is at the essence of vibrant and engaging places for people, enabling users to appreciate and enjoy well-designed environments.

To meet these needs and aspirations, transit-oriented communities are built around a foundation of multi-modal, 'complete' streets that serve a range of users and that include attractive public spaces where people can relax, gather, or celebrate. These complete streets must be especially responsive to pedestrians as the primary and most vulnerable users of the public realm, while also balancing the needs of transit, bicycles, and automobiles to support a sustainable and efficient transportation network.

Transit-oriented communities encourage development that is carefully designed to reinforce the local character of communities, while supporting density and a mix of uses where appropriate. Development must also support a pedestrian-friendly environment and integrate with transit passenger facilities and services in a way that makes using transit convenient and attractive.

Creating places for people requires close coordination among TransLink, municipalities, developers, property owners, and residents to weave the various transportation, community, and placemaking elements into a coherent whole.

IMPROVING THE BUILT ENVIRONMENT CREATES PLACES FOR PEOPLE

The implementation of recommendations made in Melbourne's report on Places for People (1994) – including improving the pedestrian network, creating high-quality gathering spaces, and strengthening street activity – has resulted in significant improvements to the public realm. These improvements include a two-fold increase in outdoor seating at cafés (from 1,940 in 1992 to 5,380 in 2002); a 71% increase in public spaces such as malls, squares, and promenades, and the development of a 3.4 km network of active and accessible lanes, alleys, and arcades. As a result of these improvements, the 2004 update reported that daytime pedestrian volumes on weekdays increased by 39% and evening volumes doubled from 1993 to 2004.

Melbourne, City of. (1994, 2004). Places for People. www.melbourne.vic.gov.au/AboutCouncil/PlansandPublications/Pages/PlacesforPeople2004.aspx

The design of the public realm around the Dupont Metro Station supports a walkable urban neighbourhood and pedestrian-scale integration of the built environment that combine to promote transit, walking, and cycling.

Dupont Circle, Washington, DC.

D3.1 Design multi-modal streets

WHAT ARE COMPLETE STREETS?

Ritter (2007) defines complete streets as "roadways designed and operated to enable safe, attractive, and comfortable access and travel for all users, including pedestrians, bicyclists, motorists and public transport users of all ages and abilities."

The design of individual streets and wider street networks must work to balance the competing interests of different users. While most streets should ensure safety and provide basic facilities for all users, some streets should have greater transit priority than others, some greater cyclist provision, some greater prioritization of goods movement, and some a higher degree of pedestrian amenity. It is often helpful, therefore, to think not only in terms of complete streets, but also in terms of complete networks of streets that work together to provide excellent facilities for all modes.

Ritter, J. (2007). "'Complete Streets' Program Gives More Room for Pedestrians, Cyclists." *USA Today*. www.usatoday.com/news/nation/2007-07-29-complete-streets_N.htm

Every transit trip begins and ends as a pedestrian trip; therefore, the starting point for transit-oriented community design is the pedestrian. The following guidelines highlight some core best practices for designing pedestrian and transit-oriented environments that make walking safe, easy, convenient, and enjoyable. Best practices for pedestrian networks – minimizing travel distance to transit and encouraging walking at the neighbourhood level – are covered in **D2 Distance**. Many of the treatments discussed in this section also improve cyclist safety and comfort.

D3.1.1 Supporting pedestrians

Sidewalks

- As the entry to the transit system, design sidewalks with adequate space to allow seamless and comfortable access between the public realm and transit. See **Transit Passenger Facility Design Guidelines U2 and P2**.
- The most comfortable and functional sidewalks have five zones that vary according to the street's land uses and pedestrian volumes: frontage, throughway, furnishing, edge, and extension zones.
- Design sidewalks to accommodate existing and expected future pedestrian volumes.

Frontage zone:

- Commercial streets are ideal places for wide frontage zones to allow for café or restaurant seating, merchandise displays, plantings and benches, and such architectural elements as awnings, canopies, and marquees.
- On residential streets where buildings are near the street, frontage zones may be wider to accommodate front stoops and waiting areas at front doors.
- Street furnishings can be located in the frontage zone on sidewalks that are too narrow to accommodate a large furnishings zone in order to keep the throughway zone clear for pedestrians and wheelchair users.
- Use access or maintenance agreements with private landowners to enable seamless integration of the frontage zone with the sidewalk.

Throughway zone:

- Using walking surfaces that are safe, smooth, durable, and comfortable in all weather will ensure comfortable access for all pedestrians (including those in wheelchairs).
- Minimizing steep cross-slopes and running slopes will enhance the comfort level of wheelchair users and people with balance problems.

Design multi-modal streets

- The throughway zone should, at a minimum, be wide enough for a wheelchair to move unobstructed and widened occasionally to allow for passing.
- On many streets, 2.0 m is an appropriate width for the throughway zone, though it can be widened to allow for higher volumes of pedestrians near frequent transit nodes and other important destinations.

Furnishing zone:

- A furnishing zone of at least 1.5 m will provide pedestrians with a comfortable buffer from traffic. Where transit shelters are required, a more generous furnishing zone may be necessary.
- To help maintain pedestrian comfort when vehicle speeds on the adjacent street exceed 40 km/h, widen the furnishing zone beyond 1.5 m.
- Treat the furnishing zone with a surface material different from the throughway zone, where appropriate, to help identify it as a place for lingering outside of the pedestrian path of travel.
- The furnishing zone can also be treated as a planting zone or bioswale to enhance the streetscape and improve stormwater management.

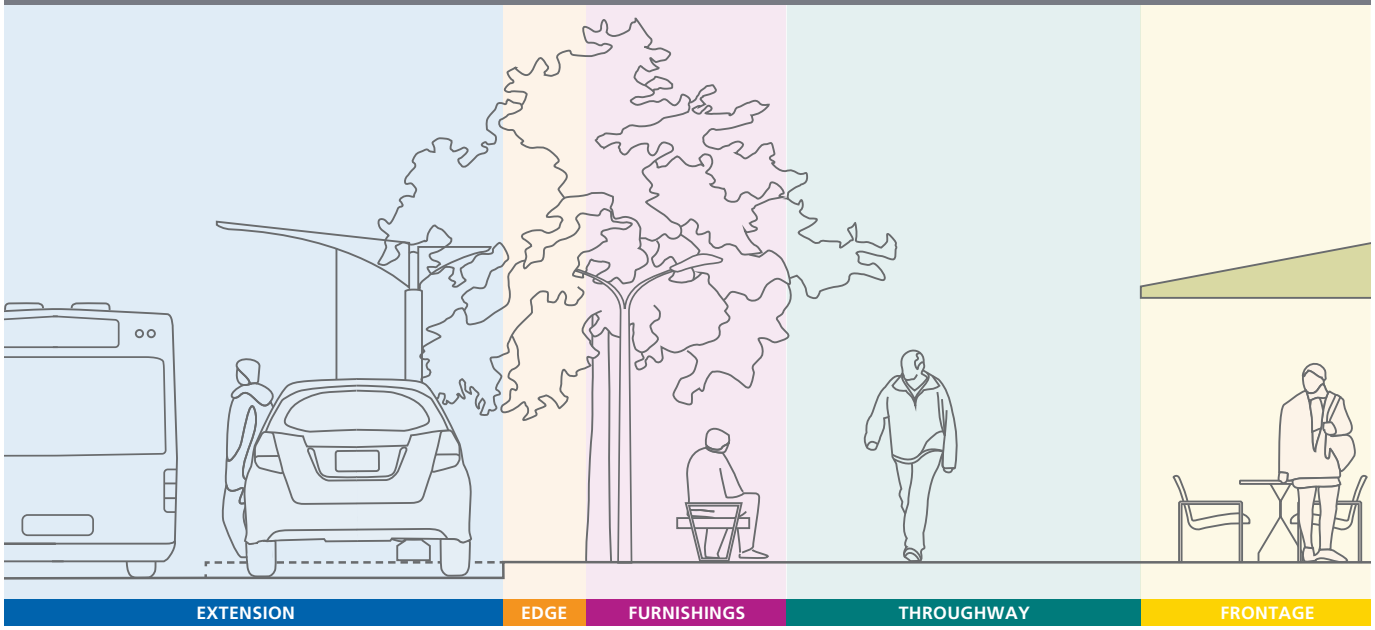
RESOURCES

British Columbia, Province of (2007). Building Access Handbook. www.housing.gov.bc.ca/pub/building_access_handbook_2007.pdf

LaPlante, J. (2007). "Retrofitting Urban Arterials into Complete Streets." *3rd Urban Street Symposium*. www.completestreets.org/complete-streetsfundamentals/resources/

Transportation Association of Canada (1999). Geometric Design Guide for Canadian Roads.

The five zones of the sidewalk each have a role to play in designing streets for people.



Design multi-modal streets

UNIVERSAL ACCESS

Designing streets and sidewalks to provide convenient access for all users, including those with reduced levels of mobility, will increase access to transit. TransLink's Access Transit program aims to create "a seamless and inclusive public transit system ... that is inviting, responsive, safe, comfortable and affordable; and that meets the needs of our customers to access transit vehicles, information, customer service, training and other programs." Making the public realm more universally accessible to all of the region's diverse communities will make using transit and sustainable modes of travel more attractive.

TransLink:
(2007)h. Access Transit.
www.translink.ca/en/Rider-Info/Accessible-Transit/Access-Transit.aspx
(2007). Universally Accessible Bus Stop Design Guidelines. www.translink.ca/~/media/Documents/rider_info/Access%20Transit/Universally%20Accessible%20Bus%20Stop%20Design%20Guidelines.ashx

Edge zone:

- An edge zone of at least 1.0 m on streets with parallel parking will ensure that motorists entering or exiting a vehicle do not impede pedestrians or interfere with landscaping or utilities in the furnishing zone.
- Design the edge zone on commercial streets to accommodate curbside freight loading.

Extension zone:

- Extension zones can widen the usable pedestrian space at mid-block and corners and can accommodate additional amenities such as bus shelters and other pedestrian features.
- Use curb extensions to consolidate elements typically found in the furnishings zone, where appropriate, to allow for a wider throughway zone.
- Where applicable, extend bus or pedestrian curb extensions the full width of the parking lane.

This curb extension in New Westminster uses an extension zone into the parking lane to improve pedestrian crossings.

This residential street in Vancouver provides a wide edge zone for people exiting vehicles.

Design multi-modal streets

Curb extensions

- Within the extension zone, extend the sidewalk into the parking lane at intersections, a transit stop, or a mid-block crossing to reduce pedestrian crossing distances and improve pedestrian visibility.
- Provide curb extensions on frequent transit corridors and streets with high vehicle or pedestrian volumes and long crossing distances to improve pedestrian safety.
- Where appropriate, extend a curb extension around a corner onto the cross street.
- Provide curb extensions only on streets with a parking lane or streets with pick-up and drop-off zones.
- Where transit stops are incorporated into curb extensions, ensure sufficient space is provided for shelters and other amenities, such as benches and bike racks.
- Use chicanes (alternating mid-block curb extensions) on local streets to reduce the effective width of the right-of-way, encouraging vehicles to slow down by forcing slight turning movements.

Curb ramps

- Provide curb ramps at all new street crossings and those undergoing renovation to improve mobility for wheelchair users.
- Design curb ramps to meet universal accessibility guidelines for perpendicular, cross and flared slopes.
- Incorporate tactile warning surfaces to aid navigation for the visually impaired.
- Ensure that curb ramps are aligned in the direction and in the centre of approaching crosswalks.

Curb radii

- Design curb radii that are as tight as possible, while still accommodating the turning movements of vehicles expected to use the street, to increase pedestrian safety.

Main Street, Vancouver, BC

'BUS BULGES': TRANSIT INTEGRATED CURB EXTENSIONS

As part of the joint TransLink and City of Vancouver plan for the Main Street corridor, 18 bus bulges were recommended to improve transit efficiency and the public realm environment. The plan states: "Buses stop in the travel lanes in order to pick-up and drop-off passengers, instead of weaving in and out of the parking-lane or curbside lane, thus reducing delays to buses and improving the quality of ride for customers. Bus bulges also increase the space available for pedestrians, street front shops, bus shelters, street furniture and landscape enhancements." Main Street's bus bulges also allow on-street parking to be retained in local commercial districts.

TransLink and City of Vancouver (2007). Main Street Transit and Pedestrian Priority Corridor Plan. www.translink.ca/en/Be-Part-of-the-Plan/Station-and-Exchange-Improvements/Main-Street-Upgrades.aspx

Design multi-modal streets

Crosswalks

- Well-designed street crossings allow pedestrians to travel in comfort and safety and reduce the potential for conflict with other modes of transportation.
- Crosswalks that are at least as wide as the sidewalks that approach them, especially at busy intersections, will improve pedestrian safety by reducing crowding and encouraging pedestrians to stay within the crosswalk while crossing.
- Maintain sight lines and visibility for pedestrians and motorists by ensuring that the approach to the crosswalk is free of such obstructions as signs, structures, or landscaping.
- Enhance the visibility of crosswalks through effective lighting to help alert motorists to the most important crossings and points of potential conflict.
- The location of bus stops should take into account the location of pedestrian crossings and seek to minimize crossing distances between transit connections.
- Restrict curbside parking within 3–5 m of intersections and mid-block crossings to improve pedestrian and motorist sight lines.
- Provide stop lines in advance of the crosswalk at signalized or stop-controlled intersections to help ensure that vehicles do not encroach upon the crosswalk and impede pedestrian flow.
- Provide yield lines in front of mid-block crosswalks to indicate where vehicles should stop so that vehicles approaching in adjacent lanes can better see a pedestrian in a crosswalk.
- To improve pedestrian visibility and reduce vehicle speeds, provide raised crosswalks.
- At intersections with high pedestrian volumes and where conditions are favourable, innovative solutions such as ‘pedestrian scrambles,’ which stop all vehicular traffic at an intersection and allow pedestrians to cross an intersection in every direction, including diagonally at the same time, may improve pedestrian movement.
- Provide safe crossings between pairs of bus stops on either side of the street to allow people to make round trips.

Design multi-modal streets

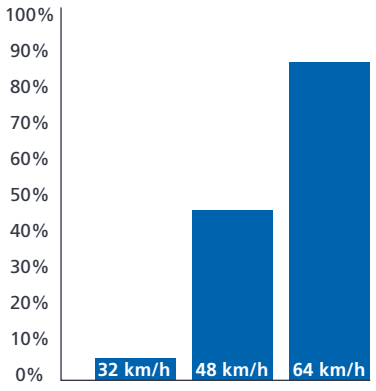
STREET DESIGN FOR SAFETY

Education, enforcement, engineering, and design all have a role to play in road safety. The design of transit-oriented communities can support road safety through measures primarily focused on the built environment. The following considerations are broadly relevant, but particularly so for pedestrians and cyclists who are most vulnerable to collisions.

Slower Speeds

Reducing vehicle speed is an important strategy for reducing both the frequency and the severity of pedestrian accidents. Because motorists travelling at higher speeds have less time to react to pedestrians, faster speeds increase the likelihood of collisions. Faster speeds also increase the severity of accidents. Strategies for reducing vehicles speeds are discussed in **Design D3.1.1** and in the resources below.

A pedestrian's chance of death if hit by a motor vehicle:



Source: US National Cooperative Highway Research Program (NCHRP).


Portland, OR

Safety in Numbers

The probability of an accident is lower for pedestrians and cyclists in areas where there are more people walking and cycling. This effect is likely due to motorists' greater anticipation of pedestrians and cyclists both in general and in specific locations. In addition, when large numbers of people walk and cycle, drivers are more likely to have experience as cyclists and pedestrians (i.e., they are more likely to understand how their driving may affect other road users).

Convenient Crossings

As most pedestrian collisions occur when pedestrians are crossing a road (AA Foundation, 1994 and Ghee et al., 1998), designing safe pedestrian crossings is an important element of road safety; for example, clear sightlines are an important contributor to collision reduction.

In order for crossings to be safe for pedestrians, they must also be convenient. When crossings require pedestrians to walk long distances or wait through long traffic signal cycles, they may attempt to cross mid-block or against the signal. Such actions can significantly increase collision risk, particularly at night. Increasing the number and convenience of pedestrian crossings can improve safety, but only if they are well designed.

Automobile Association Foundation for Road Safety Research (1995). Risk and safety on roads: the older pedestrian. University of Newcastle upon Tyne, Rees Jeffreys Road Fund and Ross Silcock Partnership. www.roadsafetyfoundation.org/media/14097/risk_and_safety_on_the_roads_-_the_older_pedestrian.pdf

Ghee, C.E. et al. (1998). Pedestrian Behaviour and Exposure to Risk. Ross Silcock Limited.

Jacobsen, P.L. (2003). "Safety in Numbers: More Walkers and Bicyclists, Safer Walking and Bicycling." *Injury Prevention*, 9(3), 205-209. www.injuryprevention.bmj.com/content/9/3/205.abstract

US Federal Highway Administration (2008). Pedestrian Safety Guide for Transit Agencies. safety.fhwa.dot.gov/ped_bike/ped_transit/ped_transguide/index.cfm

Design multi-modal streets

RESOURCES

America Walks (2012). Signalized Intersection Enhancements that Benefit Pedestrians. www.americawalks.org/wp-content/upload/America-Walks_Signalized_Intersections_Report_2012.pdf

US National Cooperative Highway Research Program (2007). Accessible Pedestrian Signals: A Guide to Best Practices. Transportation Research Board. www.apsguide.org/

Transportation Association of Canada (1998). Manual of Uniform Traffic Control Devices for Canada.

Medians and refuge islands

» Provide medians and refuge islands on wide streets to serve as a 'safe' area between lanes of traffic where pedestrians can wait to finish a crossing.

» Where it is necessary to maintain short signal cycles on wide arterial streets, comfortable median or refuge islands allow the slowest pedestrians to cross in two signal cycles.

» On the busiest streets, medians, or refuge islands should be designed to accommodate several walking adults plus a cyclist, a wheelchair user, and/or an adult pushing a stroller.

» Add landscaping to medians and refuges, where appropriate, to enhance the character of a street, while still maintaining sightlines between pedestrians and approaching vehicles.

» On wide streets with pedestrian-actuated signals, provide a button that allows pedestrians to actuate the signal from the median.

Signals

» Signal cycles should be timed to allow the slowest range of pedestrians to cross the intersection in one movement.

» Install pedestrian countdown signals at wide intersections, allowing pedestrians to better judge their crossings.

» Time signals to allow for anticipated volumes of pedestrians crossing the street, especially near rapid transit stations where large volumes may cross as services arrive and depart.

» Provide a pedestrian head-start signal at intersections with large numbers of right-turning vehicles to give pedestrians time to enter the crosswalk before the vehicle signal turns green.

» Provide pedestrian-actuated signals at mid-block crossings, allowing pedestrians to call for a walking phase. See **Distance D2.2**.

» Locate pedestrian-activated signal buttons at an appropriate location for easy access from the sidewalk and at an appropriate height for those in wheelchairs.

» Install audible "Walk/Don't Walk" indicators for visually-impaired pedestrians.

» Time-synchronize traffic lights to encourage vehicles to travel at a speed that maintains a safe and comfortable environment for pedestrians.

Design multi-modal streets

All of the pedestrian elements of the streetscape combine to create a safe, welcoming, and comfortable environment that encourages walking.

Sidewalks

Great sidewalks are the starting point for transit-oriented communities.

Curb extensions

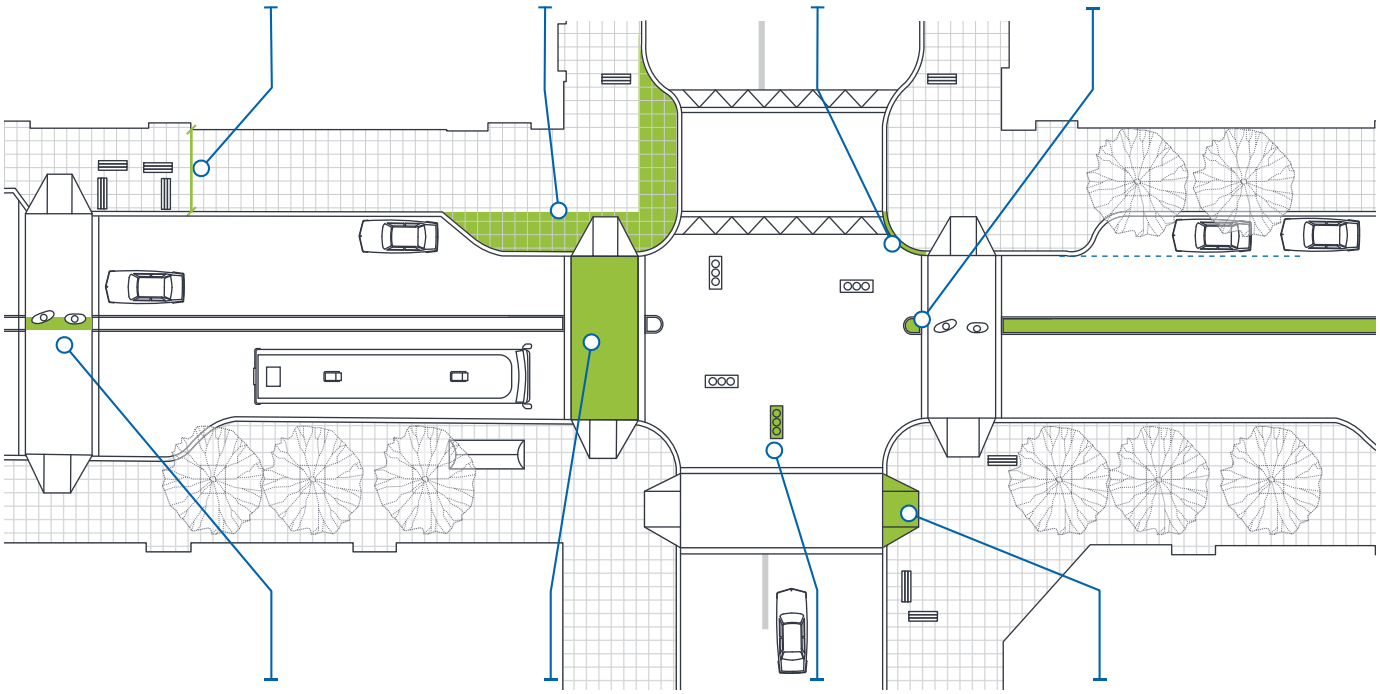
Curb extensions continue the sidewalk into the parking lane – usually at intersections, transit stops, or mid-block crossings – to increase pedestrian safety.

Curb radii

Tight turning radii force drivers to turn at lower speeds and increase the amount of space available to pedestrians.

Refuge islands

Refuge islands provide medians at intersections to increase pedestrian safety on busy streets.



Medians

Medians are used to separate opposing directions of vehicle traffic, creating a safe area for pedestrians crossing the street.

Crosswalks

Well-designed street crossings allow pedestrians to travel in safety and comfort.

Signals

Traffic signals control the movement of vehicles and pedestrians at intersections and/or mid-block crossings.

Curb ramps

Curb ramps enable convenient crossing points for wheelchair users and those with other mobility impairments.

Design multi-modal streets

DEDICATED BICYCLE ROUTES MAKE CYCLING MORE ATTRACTIVE

UBC's Cycling in Cities research team found that high-quality cycling facilities are attractive and people will go out of their way to use designated routes with specialized infrastructure. The research findings suggest that cyclists are only likely to detour up to 400 m beyond the shortest route to their destination to use designated bicycle facilities; therefore, bicycle networks should ensure that facilities are spaced a minimum of every 500 m in urban areas where increasing cycling is an objective.

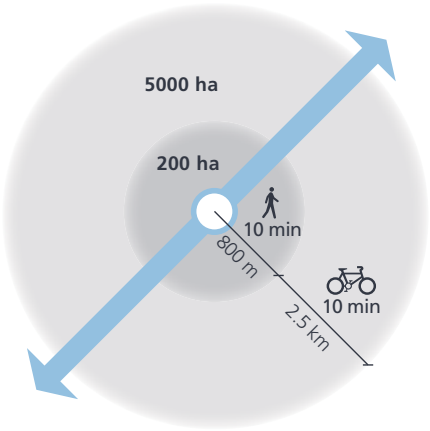
University of British Columbia. Cycling in Cities Research Program. www.cyclingincities.spph.ubc.ca

Winters, M. et al. (2011). "How Far Out of the Way Will We Travel? Built Environment Influences on Route Selection for Bicycle and Car Travel." *Transportation Research Record*, 2190, 1-10.

3.1.2 Supporting cyclists

Bicycle travel supports transit-oriented communities by extending the reach of the transit system; while few passengers will walk more than 800 m to reach transit, cyclists might travel up to 5 km to reach high-frequency transit services. This section provides a basic overview to designing appropriate facilities that promote cycling both as an everyday travel mode and as a means of accessing transit. Detailed guidance for designing bicycle facilities is provided by such agencies as the US National Association of City Transportation Officials (NACTO).

A 10-minute cycling catchment for transit facilities is 25 times the walking catchment, illustrating the importance of supporting the mobility of cyclists.



Bicycle Facility Planning

- Select the type of on-street bicycle facilities according to context, taking into account roadway characteristics, intersection geometries, and adjacent land uses; vehicle speeds, collision histories, and vehicle and bicycle volumes; and major destinations and trip generators.
- Coordinate the bicycle network with the type of facility provided to reflect the level of demand and priority for each segment of the network.
- When planning for bicycle access to transit, coordinate the type of bicycle facility with the existing and forecast demand at the transit facility.
- At transit stations where high volumes of cyclists are expected, provide a sufficient number of bike racks and include higher-quality bicycle facilities.
- Promote the incorporation of appropriate amounts of end-of-trip cycling amenities (e.g., parking, showers, and changing facilities) into new and existing development, especially those near high-quality bicycle facilities.

Design multi-modal streets

Bicycle Facility Design

Off-Street Paths and Trails

- Off-street paths should be at least 3.0 m wide so that two cyclists can ride comfortably together and pass another cyclist or pedestrian.
- Where high volumes of pedestrians and cyclists are expected, providing separate lanes for cyclists and pedestrians increases the safety of all users.
- Provide traffic signals where off-street paths cross major roads.

Separated Bicycle Lanes

- Separate bicycle lanes from traffic by using raised curbs, bollards, and landscaping/planters or by locating bicycle lanes on the sidewalk side of auto parking, as appropriate to the context.
- Provide one-way lanes of at least 2.0 m in width where possible, especially on streets with steep grades or high volumes of cyclists.
- At pinch points or constrained intersections, provide at least 1.5 m for a one-way lane.
- Provide at least 3.5 m for two-way lanes, where possible, or at least 2.5 m at pinch points.
- Where appopriate, provide wider bicycle lanes on streets with high volumes of cyclists.
- Carefully design intersections that include segregated bike lanes – with special attention paid to signal timing and turning movements – to avoid vehicle conflicts.

Bicycle Lanes and Shared-Use Lanes

- Use in-road markings to show cyclists where to position themselves on a street with shared lanes and to indicate to drivers that cyclists will be present.
- For optimal safety, provide a minimum dimension of 4.0 m between the curb and the inside bike lane stripe wherever there is parallel parking to reduce the risk of car doors striking an approaching cyclist and to protect drivers and passengers exiting the vehicle.
- Where angled parking is provided adjacent to bike lanes, use back-in angled parking to improve visibility and reduce the risk of collisions.
- To increase motorist awareness and cyclist safety, use solid-coloured pavement (such as green) to demarcate bike lanes.

RESOURCES

US National Association of City Transportation Officials (2011). Urban Bikeway Design Guide. www.nacto.org/print-guide/

Mineta Transportation Institute (2011). Bicycling Access and Egress to Transit: Informing the Possibilities. www.transweb.sjsu.edu/project/2825.htmlproject/2825.htm

Design multi-modal streets

INTEGRATING BICYCLE FACILITIES

Bicycle facilities should be coordinated across the transportation network to enable cyclists of all abilities to get to their destinations. The level of separation required between cyclists and motorists depends primarily on vehicle speed and volume.

Coordinating the type of bicycle facility with infrastructure such as bike parking is also important because the more segregated the facility, the more likely it is that people will be encouraged to use it and, therefore, require more and better quality infrastructure. A bicycle wayfinding strategy can be another important aspect of successfully implementing bicycle facilities, which can help cyclists better plan trips and gain confidence in getting to unfamiliar destinations.

On major streets and in some Urban Centres, separated bike lanes will provide comfort for all cyclists, while bike lanes will provide comfort for most cyclists. Shared-use lanes are most appropriate on local streets, but such routes should include traffic calming and crossings at major roads to provide comfort to all cyclists. Where parks and open space offer opportunities for bicycle access, the use of well-lit and paved off-street paths and trails provide comfort for all cyclists.

Burnaby BC

Off-street paths include paths along rivers, through parks, and under SkyTrain guideways. These paths are often used by both pedestrians and cyclists; in places with high volumes of both modes, dedicated space for cyclists can be provided. Off-street paths can be effective where the street network is discontinuous or where alternative routes are not available.

Vancouver BC

Separated bicycle lanes are provided within the street right-of-way, but are physically separated from vehicle traffic, parked vehicles, and pedestrian activity either by using raised curbs, bollards, and landscaping/planters or by locating bicycle lanes on the sidewalk side of auto parking, as appropriate to the context.

Richmond BC

A **bicycle lane** is a designated travel lane for bicycles, using painted lines within the street right-of-way designated only for cyclists. Bicycle lanes improve cyclist safety, especially on streets where the speed differential between cyclists and vehicles is between 20–30 km/h.

Richmond BC

Shared-use bicycle lanes are facilities shared by motorists and cyclists. These facilities can include signed routes, wider curb lanes, bicycle boulevards, and lanes with in-road bicycle markings. These facilities make clear to motorists that the street has a dual function and to be aware that cyclists may be present.

Design multi-modal streets

Bicycle Crossings

- Design intersections to reduce the incidence and potential severity of collisions between cyclists and other road users.
- Design turn lanes, medians, and refuge islands to break down wide or complex intersections into smaller parts that cyclists can navigate sequentially.
- Provide intersection-only bike lanes and 'bike boxes' at intersections with high volumes of cyclists, or at intersections where cyclist left turns may be expected.
- At complex intersections and where separated bicycle facilities are present, providing cyclists with their own signal phase can reduce conflicts between cyclists and right-turning vehicles.

Bicycle Parking

- Provide an appropriate amount of bicycle parking to meet demand, and vary the amount provided according to land use and destination.
- Bicycle parking should be secure, abundant, and located to ensure easy access to important destinations.
- As smaller residential units may not have bicycle storage space, and as bicycles may not be allowed inside buildings, sufficient bicycle parking for residents should be provided in multi-family buildings.
- Locate bicycle parking as close as possible to transit stations, stops, and building entrances (in areas of good natural surveillance) without obstructing pedestrian flow. See **Transit Passenger Facility Design Guidelines O2.1.3**.
- Where appropriate in development planning, reduce automobile parking ratios in exchange for increases in bicycle parking.

The separated bicycle lanes on Hornby Street in Vancouver use dedicated bike signals to improve cyclist safety and clarify priority for motorists.

Design multi-modal streets

3.1.3 Supporting transit

Much of the transit service in Metro Vancouver consists of buses operating on streets and roads in mixed traffic. Building a street network that allows for faster and more efficient movement of transit vehicles has two key benefits: first, quicker journey times attract more passengers and, second, higher vehicle speeds mean lower operating costs because most transit operating costs vary with time, not distance. Transit priority measures can also manage demand for vehicle trips by providing a fast and reliable alternative to the private automobile.

- Increase transit speed and reliability on arterials by designing for transit priority.
- On streets where transit operates in mixed-flow conditions, provide transit 'queue-jumper' bypass lanes at congested intersections to reduce transit delays.
- Design streets so the lanes where transit vehicles operate are at least 3.5 m wide to ensure safe and efficient transit service.
- On streets where frequent transit services experience delays due to traffic congestion, provide continuous transit-only lanes all day, or during peak periods if there are two or more lanes in each direction, to improve transit reliability and attractiveness.
- Where appropriate, provide signal priority for transit vehicles at traffic signals.
- If transit service is operating in mixed-flow traffic adjacent to a parking lane, provide sidewalk curb extensions (i.e. bus bulges), which eliminate the need for transit vehicles to pull out of and merge back into traffic. See **Design D3.1.1**.
- Where appropriate and at appropriate times of the day, consider removing curb-side parking to support transit priority.

The Georgia Street bus lane in downtown Vancouver increases transit reliability at peak hours.

D3.2 Design great public spaces

To support transit-oriented communities, the public realm should be both functional and attractive, and it should be inviting for those walking, cycling, or lingering. High-quality public spaces can take on many different forms: from small, intimate spaces between buildings, to niches or steps that allow pedestrians to pause along a busy commercial corridor, to larger open plazas that can accommodate public gatherings and events and have convenient access to public transit. Creating great public spaces supports the interrelationship between placemaking, good design, and the experience of delight in the urban environment.

Portland, OR

D3.2.1 Human-scale design

Creating spaces at a human scale will ensure that pedestrians feel protected and part of the urban fabric, thus freeing them to relax, observe, and engage in the public realm.

- Choose the scale of new public spaces to ensure that the space fits the people and the functions it will serve.
- Include elements such as benches, low walls, bike racks, and landscaping in large public open spaces to address a range of user needs and to create a sense of scale and enclosure.
- Incorporate elements such as cafés, kiosks, market stalls, and trees to help articulate pedestrian areas and encourage activity throughout the day and evening and to delineate spaces.
- Use a variety of surface materials or textures to break up larger spaces and to provide zones that accommodate varying activities.
- Ensure that the needs of individuals using wheelchairs and mobility devices are reflected in the design of surfaces.

PUBLIC PLAZAS: DELIGHTFUL CITY SPACES

Plazas with retail-facing and integrated transit facilities, and/or that provide space for community events, can also be places for people to enjoy their community, activate the public realm, and contribute to more livable and transit-oriented communities. Jan Gehl's *Cities for People* suggests that a good standard for a neighbourhood plaza is 40 m x 80 m, a size at which people can take in the entire scene and not feel too exposed. One of Portland's newest urban plazas, the Simon and Helen Director Park is 40 m x 70 m.

Gehl, J. (2010). *Cities for People*. Island Press.

Design great public spaces

D3.2.2 Amenities

Providing a range of amenities such as seating, public art, landscaping, pedestrian-scale lighting, and protection from the elements can help create an inviting and comfortable space where people can stop and linger.

- Provide protection from the sun, wind, and rain with trees, awnings, umbrellas, colonnades, archways, or overhangs.
- Integrate public art where feasible to enhance people's journeys, to bring a sense of liveliness to public space, and to express the unique character or cultural history of a place.
- Place pedestrian-scale lighting in areas with high pedestrian volumes, retail and commercial corridors, freeway underpasses, and elevated transit corridors.
- Place lighting to illuminate points on the street where there is a high potential for conflict, such as driveways and intersections.
- In very high-volume pedestrian areas, dedicate public space for other amenities such as restrooms, drinking fountains, food vendors, and others as appropriate to the context.
- Utilize active programming such as theatre, concerts, markets, and children's events to help bring public spaces to life and encourage a variety of uses.

The Pearl Street Mall in Boulder, CO, provides many pedestrian amenities, including seating, landscaping, food vendors, public art, and street performers.

Design great public spaces

D3.2.3 Trees and landscaping

Street trees and landscaping are vital components of the public realm and can enhance the pedestrian environment socially, aesthetically, and environmentally.

- Street trees and landscaping can offer shade, improve air quality, alleviate heat island effects, provide natural stormwater management, and serve as a habitat for wildlife.
- Use street trees and landscaping to create a visual buffer between the roadway and the sidewalk, providing a sense of enclosure and comfort for pedestrians.
- Locate street trees within the furnishing zone to define the pedestrian space in a way that maintains proper clearance and sightlines for all users of the street, especially at intersections. See **Sidewalks D3.1.1**.
- Use landscaping to delineate edges and boundaries that contribute to an area's sense of place.
- Select native and drought-tolerant species that can help to reduce long-term maintenance costs.
- Select and locate street trees to minimize future root damage and sidewalk maintenance.

The incorporation of trees, landscaping, and stormwater management treatments into this Bus Rapid Transit stop in Eugene, OR, creates an attractive public realm and transit facility.

Design great public spaces

D3.2.4 Wayfinding

Wayfinding is more than just signage; it is a system of information and design elements that support movement at all stages of one's journey. Effective wayfinding throughout a transit-oriented community will help pedestrians to easily access their final destination. Successful wayfinding strategies utilize and integrate signage, spatial planning, lighting, architecture, and surface finishes to create a coherent and legible public realm.

TRANSLINK REFERENCES

TransLink Wayfinding Standards Manual (2011).

Vancouver Way: Wayfinding in Metro Vancouver, A Multi-Modal Wayfinding Strategy (2008).

- Create a comprehensive plan that places signage only at strategic points so that it does not overwhelm the pedestrian or the streetscape.
- Within a transit facility area, use wayfinding to facilitate seamless transitions between transit services and from the transit facility to a passenger's final destination. See **TransLink Transit Passenger Facilities Guidelines U1.3**.
- Design wayfinding to be accessible and understandable by seniors, the visually or hearing impaired, and non-English-speaking users. Where necessary, signs should be illuminated to aid in visibility for all users.
- Ensure that the design and location of pedestrian wayfinding are distinct from that of advertising.
- Place signage within the sidewalk furnishing zone to minimize disruption to pedestrian movement. See **Sidewalks D3.1.1**.
- Work with TransLink to integrate transit facility wayfinding with local area wayfinding.

The City of Vancouver's wayfinding markers are located near many transit passenger facilities throughout the city to help transit users navigate to their destinations with ease.

3.2.5 Protection from the elements

Designing the public realm to contend with rain and other inclement weather is an important step toward building a transit-oriented community. Pedestrians, particularly those travelling to and from or waiting for transit, must be offered adaquate shelter from inclement weather to promote the use of transit services.

- Use treatments such as awnings, arcades, and galleries to protect pedestrians from the weather and to add visual interest to the streetscape.
- Pursue continuous weather protection on streets with high volumes of pedestrians, especially on key pedestrian routes to transit stations and exchanges.
- Use clear or translucent materials for building overhangs, where appropriate, to provide shelter while still maintaining natural light on the sidewalk.
- Provide bus shelters or integrated building coverage at transit stops to protect waiting passengers from wind and rain. See **Transit Passenger Facility Design Guidelines U4.1**.
- Ensure that shelter size and placement are sufficient to accommodate projected volumes of waiting passengers without impeding pedestrian movement.
- Use trees to form canopies over pedestrian walkways and sidewalks to add shading as well as protection from rain and wind. See **Trees and landscaping D3.2.3**.

Continuous sidewalk coverage using translucent materials provides rain protection for pedestrians while still maintaining natural light on the sidewalk. Vancouver, BC.

The Tommy Douglas public library on Kingsway in Burnaby has artistically incorporated pedestrian weather protection into the façade of the building.

Design great public spaces

3.2.6 Safety and security

A person must feel safe and secure in the public realm before walking becomes an attractive transportation option. Good design can help to enhance safety and security through the principles of natural surveillance and territorial reinforcement. This type of design is often referred to as Crime Prevention Through Environmental Design (CPTED). The guidelines in this section outline ways to address personal security, with attention to real and perceived risk of criminal activity. Pedestrian and cyclist safety, in terms of collision reduction, is addressed through the design elements in **D3.1** and **D3.2**.

RESOURCES

American Public Transportation Association Standards Development Program (2010). Crime Prevention Through Environmental Design for Transit Facilities. www.aptastandards.com/Documents/PublishedStandards/Security/tabid/329/language/en-US/Default.aspx

Natural surveillance

- Encourage natural surveillance or 'eyes on the street' to enable active spaces where people are able and willing to watch public activity and to create a safer and more secure public realm.
- Orient buildings and windows toward streets, plazas, station areas, parking lots, and other public spaces, and maximize the use of ground-floor retail to bring activity to street level.
- Orient lighting to maximize lighting efficiency and eliminate blind spots or dead zones.
- Avoid lighting that is too bright or out of character with the rest of an area, as it can undermine natural surveillance through excess glare.
- Maintain adequate sightlines with transparent materials in key design features such as fences.
- Maximize visibility between streets, sidewalks, and buildings by encouraging windows on the ground floor of street-facing buildings.

Design great public spaces

Territorial reinforcement

- Help define boundaries and ownership within a space by providing clear transitions between public, semi-public, and private space that indicate to users what activities are appropriate in which locations.
- Use benches, seating, plazas, or other amenities to attract people and establish public ownership of public and semi-private spaces.
- Place trees and landscaping to define the transition between public and private space.
- Use fencing types that both reinforce the character of an area and visually distinguish between public and private space.
- Use signage to communicate ownership and to indicate the rules of use.
- Ensure basic upkeep of buildings, lighting, landscaping, and other streetscape amenities, demonstrating to users that a space is being maintained.

The provision of ground-floor retail, formal and informal outdoor seating, and a coordinated lighting strategy support natural surveillance and improve safety and security. University of British Columbia, Vancouver, BC.

Clear glass LRT stops in Lyon, France, provide a comfortable and attractive place to wait for transit while clearly reinforcing which spaces are for transit users and pedestrians.

D3.3 Seamlessly integrate development with frequent transit and the public realm

Burnaby BC

NEW SCHOOL ORIENTED TOWARD THE STREET GETS STUDENTS ON TRANSIT

Burnaby Central High School, recently redeveloped for earthquake-proofing, took advantage of the redevelopment to orient the building toward the main transit-serving streets, Canada Way and Deer Lake Parkway. The former school building was surrounded by large parking lots, faced into the site toward a running track and sports field, and was 150 m from the nearest bus stop. The new orientation has brought the school entrance 50% closer to the nearest bus stop, which serves four routes in Burnaby, and provides a much more accessible and safe environment for students. Students have responded to the new orientation by increasing their use of transit, walking, and cycling.

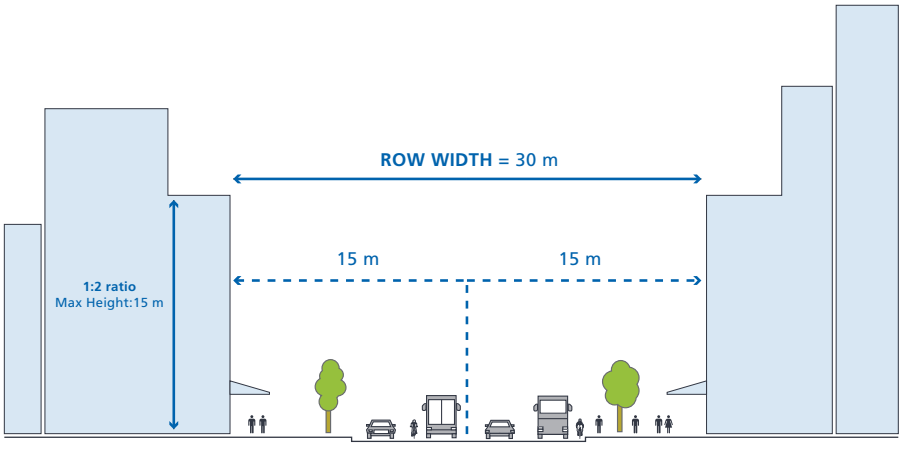
Building design that deliberately shapes and animates the public realm will encourage use of the street by pedestrians and cyclists, thereby supporting transit use.

D3.3.1 Building form and orientation

The form and orientation of a building, regardless of its size and mass, can create a space that is interesting and comfortable on a human scale while still relating to the surrounding context.

- Using cornice lines and building setbacks can define a comfortable public realm where building heights are more than twice the width of the street.
- Establishing build-to lines, minimum building heights, and minimum front façade lot coverage standards can also help to define the street edge.

A comfortable development height to right-of-way width ratio for pedestrians is 1:2, though there are many strategies to make tall buildings more pedestrian-oriented.



Seamlessly integrate development with frequent transit and the public realm

- Place lower buildings at the street edge, with taller buildings behind or set back, to enable higher-density development that maintains a human-scale frontage for pedestrians.
- Design clearly articulated buildings with setbacks and materials that minimize massing in order to break down the scale of buildings to a pedestrian level and provide visual interest from the street.
- Along busy urban arterials, support building design that incorporates measures to reduce the impact of noise and light pollution.
- Orient buildings toward the street and maintain sightlines toward local landmarks and public spaces to reinforce legibility and aid in pedestrian wayfinding.
- Place off-street parking either out of sight from the street or wrapped in active uses. See **Design D3.4.2**.
- Closely integrate transit stops and stations into building design, where possible, in ways that create a strong identity for transit and enhance the public realm. See **Transit Passenger Facility Design Guidelines P2**.

The Pearl District in Portland, OR, includes buildings with varied heights, setbacks, and building materials to create a pedestrian-oriented neighbourhood that supports the Portland Streetcar.

HEALTHY COMMUNITIES: MINIMIZING ADVERSE TRANSPORTATION IMPACTS

A major challenge for transit-oriented communities is minimizing the impact of airborne emissions. The health impacts of harmful emissions at high concentrations can be serious, particularly for children, the elderly, and people with respiratory or cardiovascular conditions. In addition to emissions from traffic, noise exposure and vibrations can also affect people living near streets with high vehicle volumes or near elevated transportation structures, such as overpasses and elevated transit lines.

Careful building siting, design, and landscaping can help minimize exposure to emissions and their potential health impacts, particularly for buildings facing arterial streets. Increased air filtration and the placement of air intakes for ventilation systems above street level and away from vehicle parking, loading, or circulation areas, for example, can help reduce emissions exposure. Noise impacts can also be minimized by orienting buildings away from noise sources and employing sound reducing windows and materials.

Seamlessly integrate development with frequent transit and the public realm

D3.3.2 Ground floors

Special attention should be given to the treatment of the ground floor, as this level is where pedestrians interact with buildings from the street. It also serves as a transition point between the public, semi-public, and private realms.

- Encourage mixed-use buildings with commercial space on the ground floor and residential space above to support pedestrian activity and to enhance the liveliness of the streetscape.
- Create more interesting and stimulating façades to improve the pedestrian experience by using different materials and varied setbacks and retail unit sizes to visually break up large-scale buildings.
- Encourage glazing and transparency on storefronts to create visual interest for people walking along commercial or mixed-use corridors.
- Provide vertical (rather than horizontal) openings or articulations to create greater visual interest and make walking distances seem shorter.
- Create frequent entry points to buildings so that pedestrians have numerous opportunities to interact with semi-public spaces.
- Locate primary entrances along front façades, and locate loading docks or service entries off of street-facing façades.
- Minimize curb cuts and parking garage portals, and locate parking garage entrances at the rear or side of buildings.

RESOURCES

Ewing, R. (1999). Pedestrian- and Transit-Friendly Design: A Primer for Smart Growth. Smart Growth Network. www.epa.gov/smartgrowth/pdf/ptfd_primer.pdf

The Crossroads development at Broadway and Cambie in Vancouver includes wider sidewalks to accomodate the busy 99 B-Line bus and the future potential for rapid transit.

D3.4 Design parking to support a pedestrian-oriented urban realm

Surface parking in high-density areas along commercial and mixed-use corridors can be reduced by placing parking underground, behind buildings, or in above-ground parking structures that are designed with architectural screening or that are wrapped with retail uses to animate the pedestrian realm. This approach will create a continuous street edge that is visually pleasing and that promotes interaction between the public and private realms. Similarly, on-street parking can enhance the pedestrian experience by serving as a buffer between sidewalks and vehicle travel lanes. For a discussion of strategies to manage the demand for on-and off-street parking, see **Demand Management D6.1**.

RESOURCES

US Environmental Protection Agency (2006). Parking Spaces/ Community Places: Finding the Balance Through Smart Growth Solutions. www.epa.gov/dced/parking.htm

D3.4.1 On-street parking

The presence of on-street parking, if well designed and managed, can serve to enhance the pedestrian environment by providing a buffer between pedestrians and traffic while also providing convenient access to adjacent businesses.

- Where appropriate for the context, place on-street parking to buffer pedestrians from traffic to create a more pleasant walking environment or to buffer cyclists from traffic on separated bicycle lanes.
- Implement market-based parking pricing to ensure an appropriate rate of on-street vacancy per block. See **Demand Management D6.1**.
- Manage spill-over parking at transit stations and major destinations through controlled parking and pricing mechanisms. See **Demand Management D6.1**.
- Ensure that on-street parking does not block cyclist, pedestrian, and automobile sightlines and does not interfere with transit operations.
- Repurposing some on-street parking spaces to provide additional space for café seating, bicycle parking, landscaping, and/ or stormwater management can support retrofits to existing streets that may be required to enhance the pedestrian experience.

Design parking to support a pedestrian-oriented urban realm

D3.4.2 Off-street parking

Careful attention to the design and placement of off-street parking facilities can reduce the visual impact of parking in the public realm and minimize conflicts between cars and cyclists, pedestrians, and wheelchair users.

- Provide shared parking facilities for uses that have peak demands at different times of the day and week, thereby minimizing the number of parking structures and reducing their impact on the urban form.
- Place off-street parking out of sight from the street – below grade or to the rear of the building – to maintain a continuous edge between the public, semi-public, and private realms of the streetscape and to provide direct pedestrian access to buildings.
- Screen at-grade parking lots along the street with landscaping or architectural elements to reduce their visual impact.
- Wrap multi-storey parking in active retail or commercial uses to screen parking from the street and to increase street-level activity.
- Ensure that parking spaces designated for drivers with disabilities are located on the shortest accessible route of travel to an accessible entrance.
- Establish maximum curb cut widths for driveways and parking facility entrances to minimize the impacts to the pedestrian realm and to create more consistent walking paths.
- Orient parking garage access points toward side streets or alleys to reduce the potential for conflict between cars and pedestrians on busy streets.
- Design surface parking lots to include dedicated provisions for safe and direct pedestrian circulation, including adequate lighting, internal walkways, and pedestrian-priority paving treatments.
- Where larger areas of surface parking exist, introduce a street and block pattern within parking lots to enhance pedestrian access and enable the introduction of streetscape treatments.

Design parking to support a pedestrian-oriented urban realm

The 'Grass Blades' by John Fleming were installed across from the Experience Music Project and Memorial Stadium in Seattle, WA, to screen the parking lot from the streetscape.

This mixed-use development in Richmond, BC, uses retail frontage and architectural screening to conceal the residential parking garage and provide a high-quality pedestrian experience.

D3 Case Studies

1. From parking-oriented to transit-oriented at HighGate Village

Municipality: City of Burnaby

Location: Kingsway, Edmonds

Key Elements:

- Discreet underground parking enhances pedestrian environment
- Cohesive urban realm defines neighbourhood
- Oriented toward transit

HighGate Village, on Kingsway near Edmonds SkyTrain Station, was redeveloped on the site of a former strip mall as an 'urban village' that provides a range of amenities, including 2.5 acres of green space, a large grocery store, a public library, and other shops and services for residents of four high-rise residential towers. This transformation has reduced the mall's setback from the street from 100 m to 8 m and reduced the number of surface parking spaces from approximately 600 (consuming 1.5 ha of land) to 60 short-term angled spaces along a local street within the development. Locating the development's additional 460 parking spaces for these services underground has ensured that this pedestrian-oriented, street-facing development animates the local area and provides walkable destinations for the area's diverse mix of housing.

2. Catering to pedestrian comfort creates a great neighbourhood at Newport Village

Municipality: City of Port Moody

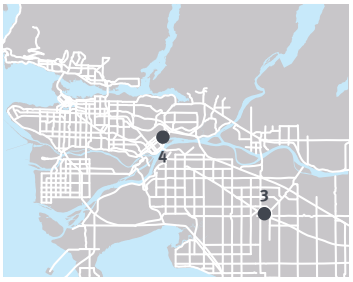
Location: Newport Village

Key Elements:

- Ample sidewalks and streetscaping prioritize pedestrians
- Bicycle routes and facilities support cycling

Newport Village in Port Moody is a mixed-use urban neighbourhood designed as a pedestrian-oriented community that features mid- and high-rise residential development (gross FAR of 2.1) in addition to low-rise and ground level commercial uses. Ground-level retail activates the street and ample sidewalks draw activity into the public realm, providing a safe, walkable, and convenient amenity for local residents and employees. The narrow (12 m) street width, including on-street parking, provides vehicle access to shops and services while reducing crossing distances and vehicle speeds to improve pedestrian safety. Newport Village is located on the Frequent Transit Network and is currently served by the 97 B-Line, with plans for the Evergreen Line SkyTrain to provide rapid transit access within walking distance of the neighbourhood starting in 2016.

D3 Case Studies



3. Multi-modal streets for a walkable Downtown Langley

The Downtown Master Plan details how the City of Langley envisions its core commercial area growing into a pedestrian- and transit-oriented neighbourhood within this Regional City Centre. The Plan aspires to high-quality urban design and a pedestrian-focused, barrier-free public realm that supports compact land uses and multi-modal streets. The multi-modal focus is emphasized through plans for a pedestrian-priority 'downtown core' served by a transit exchange near the downtown special-use districts. A street hierarchy is also defined to encourage and facilitate pedestrian and cyclist travel, identifying a 'realm of influence' around the downtown core, 'gateway streets' leading into it, and 'greenway streets' that connect to the Nicomekl River and existing residential areas. A parking strategy will ensure that supply is balanced to support local businesses while discouraging unnecessary driving.

Municipality: City of Langley

Location: Downtown Langley

Key Elements:

- High-quality urban design
- Traffic calming to create a safe and comfortable pedestrian environment
- Pedestrian-scale urban realm
- An 'eyes on the street' design approach to meet CPTED principles

4. Developing a transit-oriented revival in the Brewery District around Sapperton Station

This new mixed-use brownfield development is currently being developed adjacent to Sapperton Station on the Millennium Line in New Westminster. It will include approximately 500–750 residential units, retail and office space, and other community amenities. With over 30,000 sq.ft. of ground-floor retail – including a full-service grocery store, pharmacy, bank, café, and professional services and restaurants – the transit station area will become an animated local and regional destination. The development's prime transit-oriented location also includes higher-density development (net FSR of 3.6) that will improve transit demand at the currently underutilized station, which has average weekday boardings that are 70% lower than the average for all Millennium Line stations.

Municipality: City of New Westminster

Location: Sapperton SkyTrain Station area

Key Elements:

- Rapid transit orientation
- Active ground-floor uses
- Accessible public spaces

D4: DENSITY
Concentrate and intensify activities near frequent transit

D4.1 Focus density in Urban Centres and around frequent transit corridors and nodes to support a strong demand for transit service

D4.2 Plan for density that supports community character and promotes quality of life

Increasing and concentrating homes, workplaces, and other community activities and facilities within a short walk of frequent transit stops and stations creates a market that allows for more frequent and efficient transit service to be provided. The market for transit expands as density increases which, in turn, justifies more frequent service and makes transit a more attractive travel option.

By contrast, dense development beyond walking distance from transit does not support ridership and may actually detract from it if existing transit services are rerouted in an inefficient manner. The desired form of development varies from community to community based on local needs, aspirations, and character and there is no 'one-size-fits-all' approach to achieving an appropriate level of density to support transit.

Besides encouraging transit ridership, dense development near transit supports livable, walkable, and resilient neighbourhoods and the growth management goals of the Regional Growth Strategy. Density must work together with all of the other goals and strategies covered in these guidelines to create a compact community with a mix of land uses and a connected street network, as well as well-designed buildings and public spaces and managed demand for private vehicle travel.

INCREASES IN HOUSING AND EMPLOYMENT DENSITY IMPROVE TRANSIT RIDERSHIP

Research by Cervero (1998) shows that, when other factors are accounted for, every 10% increase in population and employment density results in a 5%–8% increase in transit ridership. A number of studies observe that the rate of increase in transit demand is highest when going from very low to moderate densities (e.g., from 10 to 40 dwelling units per hectare). In an analysis of transit demand in Portland OR, Nelson\Nygaard (1995) found that "of 40 land use and demographic variables studied, the most significant for determining transit demand are the overall housing density per hectare, overall employment density per hectare, and retail employment density."

Cervero, R. (1998). *The Transit Metropolis: A Global Inquiry*. Island Press.

Nelson\Nygaard Consulting Associates (1995). Land Use and Transit Demand: The Transit Orientation Index.

Tri-Met (1995). Community Transit Network Study (Draft), Chapter 3.

The development of low-rise residential apartment buildings within one block of the transit network and the nearby Lynn Valley Town Centre provide an appropriate higher density scale in this traditional single-family neighbourhood.

Lynn Valley, District of North Vancouver, BC.

D4.1 Focus density in Urban Centres and around frequent transit corridors and nodes to support a strong demand for transit service

DENSITY IS NOT THE SAME AS HEIGHT

While density is often associated with tall buildings, high-rise development is not required to achieve transit-oriented density levels. Areas that use land efficiently by having narrower streets, higher lot coverage, and relatively little surface parking, along with other strategies described in this section, can also achieve transit-supportive densities.

Each example below illustrates medium- to high-density development that can support the objectives of transit-oriented communities.

Langley, BC

Port Moody, BC

Vancouver, BC

TransLink and the municipalities can work both independently and in partnership to support sustainable modes of travel and minimize walking distances to and from transit by encouraging higher densities of homes, jobs, and services in Urban Centres and in areas nearest to frequent transit nodes and corridors. Increased mixed-use density provides residents, employees and visitors with more opportunities to satisfy the needs of daily life within an area that is accessible by transit, walking, and cycling. For more on successfully implementing density, see **3.3 Overcoming Challenges to Implementation**.

D4.1.1 Land use designations and zoning

Within Urban Centres and frequent transit corridors and nodes, communities can use land use designations and zoning bylaws to permit the highest appropriate level of density within the community context. As distances from Urban Centres and frequent transit corridors and nodes increase, permitted densities can be gradually lowered to transition to surrounding lower-density neighbourhoods.

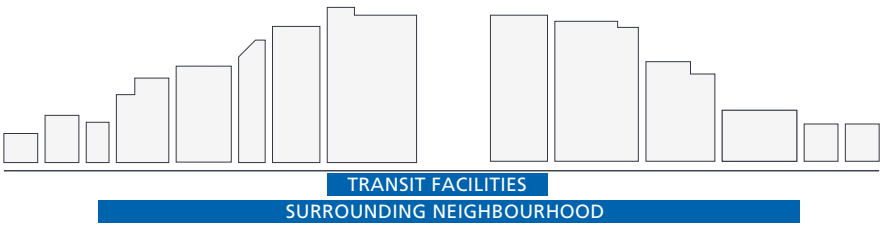
» Concentrate the highest density of homes, jobs, and services in Urban Centres and along frequent transit corridors. See **Distance D2.1**.

» As the distance from frequent transit increases, scale down from higher to lower residential and employment densities, including building height and massing, to match the character of the surrounding neighbourhoods.

» Reserve the highest densities for Urban Centres and well-connected frequent transit nodes, including rapid transit stations and nodes where two or more frequent transit corridors intersect. See **Destinations D1.2**.

» Establish minimum density standards, along with mixed-use requirements, in Urban Centres and transit nodes and corridors to support transit, walking, and cycling.

The highest densities should be reserved for those sites closest to frequent transit facilities.



Focus density in Urban Centres and around frequent transit corridors and nodes to support a strong demand for transit service

DENSITY RANGES THAT SUPPORT DIFFERENT LEVELS OF TRANSIT SERVICE

Transit-oriented density ranges can be used to ensure that new development near frequent transit is sufficient to provide an appropriate market for planned transit service. Ranges should be tailored to their context, taking into account such factors as site location, location within the regional structure (e.g., is it located in an Urban Centre), distance from the transit station or stop, type and frequency of existing and planned transit service, and acceptable levels of ridership.

- Residential density ranges (typically expressed in units per hectare) can be developed and applied to provide guidance for new development.
- Ranges can also be provided for retail, commercial, and employment densities (typically as a floor space ratio).

Density ranges should be set within the context of existing local and regional policy frameworks so they can support larger community objectives related to the function of the transportation network and the character of the public realm.

TransLink is currently conducting background work to support future development of land use and built environment guidelines, which will be developed in consultation with Metro Vancouver and municipalities. TransLink expects to incorporate these guidelines into this and other TransLink documents.

When working to encourage densities sufficient to create a market for frequent transit, it is important to recognize that a key variable is target level of ridership. Municipalities should work with TransLink to understand the target ridership and desired level of performance for each type of service.

Coordinating development density and transit service type creates higher efficiencies.

RESOURCES

Canada Mortgage and Housing Corporation:
(2003). Residential Intensification Case Studies: Municipal Initiatives.
www.cmhc-schl.gc.ca/en/inpr/su/sucopl/sucopl_002.cfm
(2004). Residential Intensification Case Studies: Built Projects.
www.cmhc-schl.gc.ca/en/inpr/su/sucopl/sucopl_003.cfm

Focus density in Urban Centres and around frequent transit corridors and nodes to support a strong demand for transit service

D4.1.2 Efficient use of land

Density is often associated with tall buildings; however, height is not the only way, or even the most effective way, to increase density in many communities. Other strategies involve using the valuable land near high-demand transit facilities as efficiently as possible.

- Design roads in areas served by frequent transit only as wide as necessary to meet vehicle and transit circulation needs, increase developable land, and improve pedestrian travel.
- Use parking management and TDM measures to reduce auto demand and the necessity to build wide roads or expand existing roads. See **Demand Management D6.1 and D6.2**.
- Promote shared parking arrangements between adjacent uses, such as residential and commercial, to reduce the amount of land and space reserved for vehicles. See **Demand Management D6.1**.
- Efficiently manage off-street parking to provide additional land and floor space for a mix of active uses. See **Demand Management D6.1**.
- Prioritize smaller housing units near frequent transit to encourage higher densities and lower housing costs. See **Diversity D5.4**.
- Encourage affordable housing near frequent transit to increase the mobility options for residents of such housing types. See **Diversity D5.4**.
- Integrate mixed-used development into the design of transit station areas, where appropriate, to promote complete communities, higher transit ridership, and efficient use of transit services.
- Where appropriate, encourage more intensive use of existing lower-density residential areas near transit, such as permitting accessory units (i.e., laneway houses or secondary suites) or exploring more compact housing forms through neighbourhood planning processes.

Focus density in Urban Centres and around frequent transit corridors and nodes to support a strong demand for transit service

D4.1.3 Opportunity sites

For most of Metro Vancouver's municipalities, frequent transit services will only be viable in a limited number of corridors. By identifying opportunity sites for higher-density development in a limited number of existing or planned frequent transit corridors and the Urban Centres that connect them, a community can ensure that each parcel is maximizing its value and ultimately supporting the region's transit investments. These key sites may also act as catalysts in facilitating the creation of more transit-oriented communities.

- Prioritize the most promising transit nodes and corridors for densification in order to support higher-frequency transit service.
- Limit increases to allowable densities on sites that are outside of Urban Centres or existing or planned frequent transit corridors.
- Seek out vacant and underutilized parcels near frequent transit for redevelopment as a means to encourage transit-oriented infill development.
- Explore the potential of redeveloping existing surface parking lots near frequent transit to use land efficiently, increase transit ridership, and reduce automobile use.

Existing Oakridge Centre mall adjacent to the Canada Line in the Oakridge Municipal Town Centre is an important opportunity site.

Redevelopment potential of Oakridge Centre would support a higher-density, transit-oriented, and walkable Town Centre.

D4.2 Plan for density that supports community character and promotes quality of life

The Metro Vancouver region includes many different community types, each with its own history, character, and mix of land uses. When promoting density in Urban Centres and near frequent transit, it is important to integrate new development into the existing character of the community. For more on community-appropriate density, see **3.2.3 Making Density Work**.

- Design buildings to be compatible with existing structures in order to successfully integrate higher densities within livable, transit-oriented communities.
- Prioritize increased density in Urban Centres and along frequent transit corridors. See **Destinations D1.1**.
- Locate services and housing for seniors and people with disabilities near frequent transit stops and stations.
- Utilize a mix of land uses to reflect the character of the area, while also encouraging uses that support two-way transit demand. See **Diversity D5.1**.
- Promote family-friendly development near transit, such as larger units in multi-family housing, child care facilities in mixed-use development, close proximity of schools, and creation of park space.

RESOURCES

Mineta Transportation Institute (2004). Higher-Density Plans: Tools for Community Engagement. www.transweb.sjsu.edu/mtiportal/research/publications/summary/0302.html

US Environmental Protection Agency (2003). Creating Great Neighborhoods: Density in Your Community. www.epa.gov/smartgrowth/density.htm

Mid-rise residential buildings with ground-floor retail on Granville Street provides considerable density close to Downtown Vancouver, while still capturing the character of South Granville.

Plan for density that supports community character and promotes quality of life

DIFFERENT DEVELOPMENT CONTEXTS FOR TRANSIT-ORIENTED COMMUNITIES

Different development contexts present unique challenges and opportunities for creating transit-oriented communities.

Infill development

Redeveloping parcels near frequent transit in existing urban areas can help to maximize land efficiency and create transit-oriented development. A significant opportunity lies in single-family neighbourhoods where infill units such as laneway houses and secondary suites can increase density while retaining the character of the area. Creating infill units which are compatible with the neighbourhood context is a primary challenge, but well designed buildings that address the street are essential to successful integration.

Laneway house, Vancouver, BC

Brownfield development

Brownfield development refers to the redevelopment of former abandoned or underutilized industrial and commercial land. Brownfield developments on large parcels provide good opportunities to develop a fine-grained network of streets and other connections to surrounding travel networks. These large-scale sites also provide unique opportunities to create local mixed-use hubs not possible on a smaller site. Key considerations, especially on large sites, are creating varied urban form, visual interest, and public access.

Southeast False Creek, Vancouver, BC

Greenfield development

Greenfield development refers to new development planned for areas where there has previously been no urban development. It is important to develop and phase new sites adjacent to existing developed areas to facilitate the efficient provision of urban services, including transit. New street networks should be designed to extend existing networks and to support walking and cycling.

Significant challenges are providing appropriate density levels near transit, minimizing surface parking, and creating places for public activities.

For brownfield and greenfield projects, high-density development should only be considered in areas that are served by, or could efficiently be served by, frequent transit.

Morgan Crossing, Surrey, BC

D4 Case Study

Municipality: City of Richmond

Location: City Centre

Key Elements:

- Higher-density development in the City Centre near rapid transit
- Additional residential development near the City Centre
- Density appropriate to context to support the urban village network concept

Transit-Oriented Density arrives in Richmond City Centre

In 2009, the City of Richmond developed a comprehensive City Centre Area Plan, in tandem with a Transportation Plan, in advance of implementing the Canada Line rapid transit service that links this Regional City Centre to Downtown Vancouver and the Vancouver International Airport (YVR). The planning framework for the City Centre is based on three core principles:

- **Urban transect:** a pattern of development that transitions from natural areas to high-density urban areas through the prescription of land-use intensity and building scale and that applies a 'form-based code' approach to provide development flexibility and limit constraints to site-specific opportunities.
- **Transit-oriented development:** compact, walkable communities designed to maximize access to high-quality transit services, often incorporating features to encourage transit ridership.
- **Urban village network:** a series of unique, pedestrian-scale 'urban villages' centred around the five Canada Line rapid transit stations and the riverfront development near the Olympic Oval.

This framework creates the foundation for a higher-density, mixed-use community that is oriented toward rapid transit, while also including services and amenities that provide for the needs of daily life within walking and cycling distance of transit. Several new mixed-use developments are planned adjacent to rapid transit stations, including the Mandarin Residences (350 units), Quintet (1,000+ units, new Kwantlen University campus and community centre), and Capstan Gateway (3,000+ units).

Planning for the City Centre has also included improved pedestrian and bicycle links and revised parking management policies. As set out in Section 7.4.4 of Municipal Zoning Bylaw 8500, minimum on-site parking requirements may be reduced by up to 10% in the City Centre when TDM measures are provided, including the provision of residents' transit passes, on-site carsharing vehicles, and end-of-trip cycling facilities.

Emphasizing densification around the Canada Line stations in the City Centre will increase the mobility of those living and working in the area, as they are on a direct high-frequency transit corridor to the Metropolitan Core (25–minute travel time) and the Oakridge Municipal Town Centre (15–minute travel time), in addition to other destinations along the corridor. See **Destinations D1.2**.

D4 Case Study

The high-density, mixed-use Quintet project in Richmond City Centre boasts convenient access just steps from the Canada Line (rendering).

Public realm upgrades are continually being made in Richmond City Centre.

Office development in Richmond City Centre supports transit use.

D5: DIVERSITY
Encourage a mix of uses

- D5.1 Encourage a mix of land uses immediately adjacent to frequent transit facilities
- D5.2 Encourage a mix of uses around transit nodes to create complete neighbourhoods
- D5.3 Provide a mix of uses along frequent transit corridors to reduce peak crowding and spread travel demand throughout the day
- D5.4 Provide a mix of housing types near frequent transit passenger facilities to create inclusive communities and promote equitable access to transportation

Encouraging a vibrant mix of land uses helps to create complete, walkable, and diverse neighbourhoods around transit stations and stops and to support the complete communities goal of the Regional Growth Strategy. Most of the traffic reduction benefits of transit-oriented communities occur not because of increased transit ridership but, rather, because of increased walking for the 80% of household travel that is not commute-related. Transit-oriented communities encourage a mix of land uses at both the neighbourhood and the corridor scale.

At the neighbourhood scale, a mix of land uses such as homes, offices, shops, parks, and entertainment in close proximity creates an environment where many needs of daily life can be met within a short walk from home, work, or transit. Such places feel safe and lively because different types of uses are active at different times of day. A built form that supports a mix of land uses can also allow a community to be more resilient over time, adapting to a changing economy and changing demographics.

At the transit corridor scale, a mix of uses encourages ridership in both directions throughout the day and evening, promoting better and more efficient use of transit service and capacity. In communities where most of the basic needs of daily life are available within walking distance, owning and using an automobile becomes an optional rather than a daily requirement.

The creation of a retail 'high street' with active ground-floor uses in a neighbourhood of medium and high density residential and other employment uses, all connected to transit, provides the opportunity to fulfill a range of daily needs within walking distance of homes and jobs.

Newport Village, Port Moody, BC.

COMMUNITY DIVERSITY INCREASES WALKING AND TRANSIT USE

Land-use diversity in a community can be evaluated in many ways. Two useful measures include 'entropy' (the probability of similar land uses on adjacent sites) and, 'balance of uses' (the ratio of jobs to housing units or the ratio of housing units to retail establishments). Frank et al. (2008) found that doubling a community's retail floor area ratio increased transit mode choice by 21% for work trips and 17% for non-work trips. The recent meta-analysis of literature on travel and the built environment by Ewing and Cervero (2010), however, indicates that "jobs-housing balance is a stronger predictor of walk mode choice than land use mix measures", illustrating the importance of employment uses as a key ingredient in mixed-use communities.

Ewing, R. and R. Cervero. (2010). "Travel and the Built Environment: A Meta-Analysis." *Journal of the American Planning Association*, 76(3), 265-294.

Frank, L.D. et al. (2008). "Urban Form, Travel Time and Cost Relationship with Tour Complexity and Mode Choice." *Transportation*, 35(1), 37-54.

D5.1 Encourage a mix of land uses immediately adjacent to frequent transit passenger facilities

LAND USES THAT SUPPORT TRANSIT

The following land uses and service types contribute positively to transit-oriented communities and should be located reasonably close to transit passenger facilities:

- convenience stores and pharmacies,
- grocery stores,
- child care facilities,
- fitness clubs,
- restaurants and fast-food outlets,
- medical services (e.g., dentists, doctors, and walk-in clinics),
- personal services (e.g., banks, post offices, and insurance agents), and
- other street-facing retail.

Areas within 200 m of transit facilities (especially stations and exchanges), are particularly valuable to encourage a mix of active land uses. People often like to combine tasks in one trip – such as picking up coffee on the way to work, getting groceries on the way home, or dining at a restaurant on the way to a night out – and, therefore, convenient access to goods and services makes transit much more attractive. Providing retail and community services near transit can also promote local business opportunities and can help to create a lively street life, a pleasant pedestrian environment, and a safe and secure public realm.

- Encourage retail and service uses in close proximity to transit, especially stations and exchanges, in order to put the most common needs of daily life in convenient locations for transit riders.
- Promote the most active uses, such as retail (including cafés and restaurants), on the ground floor facing the street to promote a safe and lively pedestrian environment near transit stops and stations. **See Design D3.4**.
- Encourage a diverse mix of land uses that are active at different times of the day to encourage a vibrant pedestrian environment and to maintain 'eyes on the street' throughout the day and evening.
- Promote the location of grocery stores (both large and small) near transit stations and/or at frequent transit nodes to support combined transit-shopping trips and walkability within higher density areas near transit.

Encourage a mix of land uses immediately adjacent to frequent transit facilities

A new public library in Lynn Valley, District of North Vancouver, provides space for a bus stop directly outside the entrance while also adding landscaping to improve the public realm.

The Portland Streetcar serves a grocery store along the transit corridor, enabling trips to be combined in the neighbourhood.

D5.2 Encourage a mix of uses around frequent transit nodes to create complete neighbourhoods

RESOURCES

Massachusetts, State of (2009). Transit-Oriented Development Overlay District: Model Bylaw. www.mass.gov/envir/smart_growth_toolkit/bylaws/TOD-Bylaw.pdf

Transit Cooperative Research Program (2008). Report 128: Effects of TOD ON Housing, Parking, and Travel. www.onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_128.pdf

Litman, T. (2011). Affordable-Accessible Housing in a Dynamic City. Victoria Transport Policy Institute. www.vtpi.org/aff_acc_hou.pdf

Encouraging a diverse mix of land uses (residential, commercial, recreational, and civic) – for the wider 400 m area around bus stops and frequent transit corridors and the 800 m area around rapid transit stations – can help create neighbourhoods where home, work, shopping, recreation, and transit services are within walking distance. Such neighbourhoods enable residents to meet many of their daily needs within walking distance and to combine several errands on the same trip. This strategy supports both a higher walk and transit mode share for trips as well as reduced vehicle kilometres travelled (VKT) per capita. For more on diversifying land use, see **3.2.4 Land Uses**.

- Encourage a mix of housing and employment types in neighbourhoods near frequent transit to reduce commute distances for some residents.
- Encourage a mix of retail, service, and commercial uses to ensure that residents, workers, and visitors are within walking distance of transit facilities.
- Encourage higher-density office uses as close to frequent transit passenger facilities as possible to support convenient access by transit for employees, consistent with local and regional goals for Urban Centres.
- Locate schools (particularly secondary schools and post-secondary institutions) near frequent transit nodes wherever possible to allow and encourage students to use transit.
- Invest in parks, plazas and other public spaces within walking distance of frequent transit nodes to ensure that residents, workers, and visitors have access to green space and associated recreation facilities. See **Design D3.3**.
- Orient ground-floor uses toward transit facilities to reduce walk distances between transit and services. See **Design D2.4**.
- Discourage lower-density and auto-oriented uses – such as gas stations, warehouses, storage facilities, vehicle services centres, and drive-through facilities – near frequent transit nodes.

Encourage a mix of uses around frequent transit nodes to create complete neighbourhoods

Local restaurants and shops support convenient access to goods and services within walking distance and provide pedestrian-oriented buildings that activate this street in Vancouver, BC.

This low-rise, mixed-use development faces St. Johns Street, the main transit corridor in Port Moody, BC.

MIXED USE AREAS IN MUNICIPAL ZONING

Revisions to zoning bylaws can help support more mixed-use, transit-oriented development.

Overlay districts are designated areas that establish alternative development requirements based on the area's unique characteristics. Cities such as Seattle, Portland, and Denver use overlay districts to specifically enable the development of mixed-use, transit-oriented, high density neighbourhoods around rapid transit stations and frequent transit nodes. An overlay district usually provides additional regulations to the existing zoning and enables a cohesive approach to development in the designated areas.

Alternatively, new zones in the zoning bylaw can be used, such as Comprehensive Development or Transit-Oriented Development zones, that provide a similar mixed-use approach but in a more direct manner. The City of Coquitlam, for example, created a Transit Village Commercial (C-7) zone that aims to "minimize the necessity for automobile transportation by providing integrated access to public transit and safe and convenient pedestrian and bicycle routes throughout the neighbourhood."

US Environmental Protection Agency (2009). Essential Smart Growth Fixes for Urban and Suburban Zoning Codes. www.epa.gov/smartgrowth/essential_fixes.htm

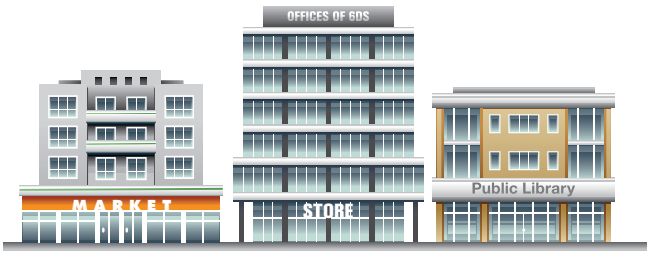
D5.3 Provide a mix of uses along frequent transit corridors to reduce peak crowding and spread travel demand throughout the day

Land use diversity within transit corridors can help to balance the timing and directionality of transit demand and more effectively utilize transit capacity. Balancing the distribution of homes, schools, and employment locations along a transit corridor will enable transit to be well-utilized in both directions during peak periods, rather than being overcrowded in one direction and underutilized in the other. Distributing other land uses with more variable travel demand – such as retail centres, civic institutions, and entertainment venues – along a transit corridor (preferably in Urban Centres along the corridor) can also help to ensure that transit demand is more evenly distributed throughout the day. Such distribution also generates transit demand on weekends.

- Encourage a mix of residential and employment uses in stop and station areas at various points along a corridor to encourage bi-directional demand during peak travel periods.
- Encourage a mix of land uses, such as retail, service, residential, entertainment, and visitor attractions, that generate demand during mid-day, evenings, and weekends throughout the year at multiple locations along a transit corridor.
- Locate major trip-generating uses at either end of frequent transit corridors to act as anchors and to sustain peak levels of ridership throughout the day and week. See **Destinations D1.1**.

A poor mix of housing and other uses along a corridor leads to low bi-directional transit productivity and inactive neighbourhoods.

A rich mix of pedestrian-friendly uses and housing types, tenures, and price points distributed along a corridor helps to optimize transit utilization.



D5.4 Provide a mix of housing types near frequent transit passenger facilities to create inclusive communities and promote equitable access to transportation

A mix of housing types and tenures at a variety of affordability levels located near transit passenger facilities can promote access for those segments of the population that are more likely to use or depend on transit to meet their transportation needs. Housing mix can also allow communities to support residents at different stages of their lives, including students, single adults, families with children, and seniors aging in place. Diverse residential populations support transit use and activate areas around transit stops at different times of the day and week. Communities can use land use designations, zoning, and other regulations to encourage a mix of building types and tenures.

- Encourage a mix of more affordable, transit-oriented housing types within 800 m of transit passenger facilities. See **Density D4.1 and D4.2**.
- Encourage a mix of unit sizes and price points to encourage a diversity of occupants.
- Encourage a mix of rental, strata, and freehold housing units in transit-oriented communities.
- Encourage the location of low income, affordable and seniors' housing units near frequent transit nodes and along frequent transit corridors to support transit-dependent individuals.
- Increase the total amount of housing available near frequent transit to allow more families to live in places where common services and activities can be accessed without a car.

SUPPORTING THE MOBILITY OF SENIORS

As people live longer lives and the share of the region's population of seniors increases, mobility issues will become an increasing challenge. Transit-oriented community design supports seniors' mobility by providing more services and activities within walking distance, facilitates 'aging in place', and provides frequent and accessible transit services. Enabling seniors to be active by increasing the walkability of their neighbourhoods and providing convenient access to the transit system greatly increases their level of mobility and independence, provides opportunities to stay active and involved in society, and improves the effectiveness of both fixed-route and customized transit services.

US Environmental Protection Agency (2009). Growing Smarter, Living Healthier. A Guide to Smart Growth and Active Aging. www.epa.gov/aging/bhc/guide/index.html

D5 Case Study

Municipality: City of Burnaby

Location: Simon Fraser University

Key Elements:

- Mixed use, higher density development
- Range of affordable and market housing types
- Range of tenures for varied needs on the campus

SFU's UniverCity Brings Diversity to Burnaby Mountain

UniverCity at Simon Fraser University (SFU) in Burnaby – a compact, mixed-use and transit-oriented community at SFU's main campus atop Burnaby Mountain – is designed to reflect the principles of sustainability. The university's official community plan calls for up to 4,500 units in two neighbourhoods adjacent to the university campus, including a mix of mid-rise towers and ground-oriented townhouse units and a village-style high street with shops, restaurants, and a full-service grocery store and pharmacy. Focused on building a complete community, the project also includes an elementary school and a community park. In addition, UniverCity residents are provided with a Community Card that provides access to SFU facilities and events that include the library, theatre, pool, and gym.

To ensure the community caters to a diverse range of income levels, the SFU Community Trust is promoting a variety of housing options. Given its location adjacent to a major university, UniverCity has taken care in providing a number of market rental housing units, such as purpose-built rental apartments and innovative secondary or 'flex suites' built into strata-titled apartments.

In partnership with VanCity Enterprises and reSource Rethinking Building, affordable ownership options have been provided within the 60-unit Verdant development. Designed for SFU faculty and staff, these family-oriented housing units are priced at 20% below market rates and will continue to be resold at the discounted rates, as covenants are tied to each title. This project was possible because the land was leased to developers at 30% below-market and, in turn, the developer opted for value-oriented interior finishes and a reduced marketing program.

UniverCity is currently connected to the transit network via two high frequency bus services, one of which connects to the Millennium Line SkyTrain. The development of a more transit-oriented community at SFU also improves transit network efficiency by creating bi-directional demand throughout the day; whereas, demand was more unbalanced in the past. An aerial gondola service from Production Way Station to the SFU campus is under consideration by TransLink to further increase the convenience and cost-effectiveness of transit service to the community.

D5 Case Study

Mixed-use development provides a focal point at the centre of Simon Fraser University's Burnaby Mountain campus, and its location near the transit exchange adds convenience.

A mix of housing types, such as this townhouse, are available at UniverCity.

Recent development at UniverCity includes this low-income, family-oriented complex that incorporates a child care facility.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Did you know?

D6:DEMAND MANAGEMENT
Discourage unnecessary driving

Demand management strategies that discourage unnecessary driving and promote sustainable modes of travel provide incentives for travelers to make the most effective use of all of our transportation networks, thereby shifting travel by mode and time of day to take advantage of available capacity and reducing crowding and congestion.

Car parking is not the highest and best use of land, especially in areas well served by transit, and it has a significant influence on driving habits as places with free and abundant parking will be convenient and attractive for automobile trips. Because transit-oriented communities rely on well-designed public spaces, pedestrian-friendly streetscapes, and buildings that face the street, a city's on- and off-street parking needs to be managed effectively, including the use of fees, restrictions, and enforcements. Municipalities can eliminate the problem of motorists circling for parking, for example, by setting the price of parking at a rate that ensures a few spaces are available at all times of day.

Parking is not the only way to manage demand; for example, incentives, education, and marketing can also influence travel behaviour to support more trips by walking, cycling, and transit. TransLink, municipalities, NGOs, employers, and institutions can all play a role in developing and promoting information and incentives to encourage more sustainable travel within the region. In many cases, a partnership approach can be the most effective way to maximize the impact and the cost-effectiveness of programs and initatives.

Demand management strategies are most effectively targeted to places that embody the other 5 Ds and provide reasonably attractive alternatives to the automobile. Demand management strategies are also a necessary component of any plan to reduce traffic congestion and maximize existing road and transit capacity.

COORDINATED DEMAND MANAGEMENT REDUCES VEHICLE TRIPS

Coordinated application of demand management strategies – including hard measures (e.g., transit improvements and parking measures) and soft measures (e.g., personal travel planning) – was found by Möser and Bamberg (2008) to reduce car trips by 8%–18% and increase non-car trips by 7%–34%, depending on the target market (workplace, school, or home) and the type of measure applied. Litman (2011) also shows that individual parking management strategies reduce parking requirements by 5%–15%, while a comprehensive parking management program can reduce necessary parking by 20%–40%.

Litman, T. (2011). Parking Management: Strategies, Evaluation and Planning. Victoria Transport Policy Institute. www.vtpi.org/documents/smart.php

Möser, G. and S. Bamberg (2008). "The Effectiveness of Soft Transport Policy Measures: a Critical Assessment and Meta-Analysis of Empirical Evidence." *Journal of Environmental Psychology*, 28, 10-26.

Pay parking near downtown Victoria manages the demand for automobile travel and encourages sustainable alternatives such as transit, walking, and cycling.

Victoria, BC.

D6.1 Manage parking supply and demand

Managing parking demand is one of the most effective strategies shifting travel demand away from single-occupancy vehicle use toward walking, cycling, and transit, especially as transit supply alone cannot meet the region's goals for sustainable travel mode share and emission reductions. Local governments can help foster this objective by coordinating the management of both on- and off-street parking through policies and pricing that together achieve transportation objectives. This coordination is vital to successful parking management strategies.

D6.1.1 On-street parking

Municipalities can better ensure parking availability at all times of the day by using appropriate prices, time restrictions, and other measures (e.g., resident only, carshare vehicle, and commercial loading) to manage the supply of on-street parking in areas with high levels of parking demand, such as Urban Centres and retail districts. This strategy promotes parking turnover and reduces the traffic congestion that results from drivers circling in search of on-street parking. When on-street parking is well-managed, the need to require developers to build off-street parking is reduced.

» In areas with high levels of parking demand, such as Urban Centres and retail districts, implement market-based parking pricing to ensure an on-street vacancy rate of about 15%.

PARKING MANAGEMENT

Parking management describes strategies or policies that are used to maximize the efficiency of parking resources and infrastructure. Transport Canada notes, "While conventional parking management in Canada has largely focused on increasing the supply of parking facilities, newer approaches are targeting parking demand to reduce the number of parking spaces required, encourage the use of more sustainable transportation options, and reduce the costs associated with automobile dependency." Parking management strategies can be applied to both on- and off-street parking and are especially effective when developed on an area-wide basis that includes both types.

Transport Canada (2008). Issue Paper 63: Parking Management in Canada. www.tc.gc.ca/eng/programs/environment-utsp-casestudylanduse-837.htm

Manage parking supply and demand

- Adjust on-street parking prices by time of day and day of week so that prices reflect demand and enable availability targets to be met.
- Periodically monitor and adjust parking prices to maintain the desired level of parking availability.
- Where necessary, manage spillover parking on residential streets within 400 m of transit stations (and major destinations) by using residential permit parking programs, short-term time restrictions, or pricing.
- Use time-restricted parking in lower-demand commercial zones to encourage turnover.
- Include off-street commercial loading facilities in new developments, when applicable, to reduce the demand for curbside commercial loading.
- In commercial districts that lack off-street loading facilities, the provision of dedicated curbside loading bays improves parking management.
- Explore design opportunities for angled or back-in angled parking to optimize the on-street parking supply and reduce conflicts between cyclists and parked cars.

Back-in, angled parking on Columbia Street in New Westminster provides an alternative to parallel parking and provides a wider buffer between pedestrians and traffic.

Manage parking supply and demand

UNBUNDLED PARKING

Parking spaces in medium- or high-density residential developments are often assigned to individual units when buyers purchase homes.

Unbundling parking is the practice of selling the units and the parking spaces separately, thereby giving buyers the option of purchasing at a discounted rate if they do not need a parking space, which can often cost over $20,000. This practice, which assumes that not every home buyer will buy a parking space, is often associated with lower parking provision.

D6.1.2 Off-street parking

An oversupply of free or under-priced off-street parking creates an implicit subsidy for drivers because it ensures cars have simple and convenient access to most destinations at the expense of similar access for walking, cycling, transit, and goods movement. By reducing off-street parking requirements and implementing such related strategies as shared parking arrangements or TDM initiatives, municipalities can reduce these subsidies and lower the costs to developers for expensive parking spaces. The result can be less driving and more walking, cycling, and transit, as well as higher-quality, transit-oriented design.

- Reduce or eliminate minimum parking requirements for new developments with good transit access, where appropriate.
- Provide incentives – such as reduced development fees or an expedited approvals process – for proposed developments that include reduced parking or that encourage the use of non-auto modes through TDM measures.
- Using a context-sensitive approach, establish a maximum number of parking spaces allowed (instead of a minimum number required) to reduce traffic congestion in high-density areas with good transit accessibility.
- Allow reduced parking requirements when carshare vehicles are located in a development or a TDM strategy is in place.
- Encourage shared parking arrangements that enable adjacent land uses that have peak demand at different times of the day or week to make use of the same parking facilities, thereby minimizing the space necessary for parking and reducing the need for direct or indirect parking subsidies.
- Encourage building owners to lease surplus private parking and make it available to the public when not needed by the owners.
- Encourage the use of hourly or daily parking rates for paid parking lots instead of discounted monthly or annual passes.
- Encourage or require developers and property managers to unbundle the cost of parking from rental housing, residential properties, and commercial leases.
- Where required, encourage multi-storey parking garages, as opposed to surface lots, that are well-integrated into building designs to reduce space requirements for parking and to provide a more pedestrian-friendly urban environment.

Manage parking supply and demand

SHARED PARKING AT LONSDALE QUAY

Located adjacent to the SeaBus terminal, Lonsdale Quay was developed on the North Vancouver waterfront in 1986 as a marketplace and an amenity for public enjoyment. The market is also adjacent to the headquarters of the Insurance Corporation of British Columbia (ICBC), which has over 1,000 employees.

ICBC's multi-storey parking lot provides over 500 car-parking spaces for employees, but the lot has considerable capacity in the evenings and on weekends because the majority of staff work between 8 a.m. and 5 p.m. on weekdays. As such, an agreement between the two landowners provides parking for the Quay in the ICBC parking lot outside of normal working hours and reduces the need for additional parking specific to the Quay.

Lonsdale Quay (foreground) is a busy public market adjacent to ICBC's head office (background) and shares the ICBC parking garage on evenings and weekends.

REDUCED PARKING REQUIREMENTS IN NEW DEVELOPMENTS

The greatest opportunities to reduce parking requirements in new developments are in areas that have both high walkability and high transit accessibility (i.e., jobs, shops, and services that can be accessed within a 30-minute transit travel time). Among the most transit-accessible locations in the region are the designated Urban Centres and other nodes along the FTN.

The City of Richmond has implemented reduced parking requirements in their City Centre because of its high transit accessibility with Canada Line stations (see **Destinations D1.2**). A minimum parking requirement for development in the Capstan Village neighbourhood, for example, is recommended to be reduced from 1.2 spaces/dwelling to 1.0.

Provincial Bill 27, which includes amendments to the Local Government Act, allows municipalities to accept cash from developers, in lieu of off-street parking spaces, in order to provide infrastructure that supports sustainable modes of travel.

D6.2 Use TDM measures to encourage sustainable modes of travel

TRANSLINK'S TRAVELSMART PROGRAM

TravelSmart is TransLink's travel awareness and education program, and the TravelSmart website is the hub for information, incentives, promotions, and ideas. Launched in 2011, the website now has almost 10,000 registered users and provides information about work commute trips, school trips, and leisure trips. By helping people to make informed decisions about their travel habits, TravelSmart aims to reduce the number of single-occupant vehicle trips and raise awareness about how people can incorporate more sustainable travel into their daily lives.

www.travelsmart.ca/

By offering tools, information, and a package of incentives and disincentives, TDM programs can encourage the use of transit along with other travel alternatives such as walking, cycling, and carpooling. These programs are usually targeted toward places of employment and education and other large trip-generating destinations (e.g., large, multi-unit residential developments). Local governments can work to establish TDM measures through regulations or voluntary agreements. While these guidelines provide an overview of the types of measures and strategies that can be implemented in order to support the development of transit-oriented communities, they only begin to cover the wide range of opportunities that TDM offers.

D6.2.1 Information and incentives

Employers, education providers, and property managers can share information, provide schedule flexibility, and provide a variety of supporting strategies to make it easier for employees and students to shift from driving to sustainable commute modes.

- Encourage employers to reduce or eliminate free parking for employees and to potentially use parking charges to fund incentives for or improvements to sustainable modes of travel. See **Demand Management D6.1**.
- Encourage employers to provide cash or other rewards to employees who do not utilize free employee parking.
- Encourage employers and education providers to provide free and easy-to-use rideshare-matching systems to assist employees with coordinating carpools.
- Encourage employers, education providers, and property managers to provide carpooling incentives, such as priority parking locations and reduced parking fees.
- Encourage employers to offer flexible start times, compressed work weeks, and teleworking or satellite working locations.
- Encourage developers and property managers to provide on-site amenities at or near work sites – such as child care, drugstores, coffee shops, fitness centres, dry cleaners, and post offices – to reduce the need for mid-day vehicle trips.
- To encourage and enable employers to implement TDM programs, TransLink and municipalities can develop and demonstrate the effectiveness of their own TDM programs as a model.

Use TDM measures to encourage sustainable modes of travel

D6.2.2 Transit

Organizations can promote transit ridership through programs and incentives.

- Encourage employers to offer discounted transit passes to employees through TransLink's Employer Pass Program (requiring at least 25 employees from the same company to participate in the program).
- Encourage employers to provide employees with maps and information about TransLink's transit system and FTN – and resources to determine travel time by walking, cycling, and transit) – when an employee is considering where to live.
- Encourage developers to provide free one-year transit passes to residents of new developments near frequent transit to encourage reductions in automobile use.

D6.2.3 Cycling and walking

Organizations can promote walking and cycling both in general and as a commute mode.

- Require larger residential development projects to provide secure long-term and short-term bicycle parking. See **Design D3.1.2**.
- Provide safe and comfortable walk and bike paths from transit passenger facilities to nearby retail and employment centres as well as to other large trip-generators.
- Implement 'safe routes to school' programs that encourage students to walk or bike to school.
- Provide free safe-riding skills classes and 'bike-buddy' programs to increase cyclist confidence and encourage further bicycle use.

IMPLEMENTING TDM REQUIREMENTS IN NEW DEVELOPMENTS

Requiring TDM measures or strategies in new developments can be managed through the development application process. As a condition of approval, a developer can be required to either create and implement a site-specific TDM strategy or join a Transportation Management Association (TMA). A TMA is an association of property owners or managers (commercial, residential, or other) that jointly develops TDM programs and provides ongoing monitoring of members' TDM efforts in order to realize cost or operational efficiencies.

Association for Commuter Transportation of Canada (2008). TDM Supportive Guidelines for Development Approvals. www.actcanada.com/ACTCanada/EN/Resources.aspx

School travel planning in Surrey encourages students to walk and cycle to school.

Use TDM measures to encourage sustainable modes of travel

RESOURCES

Association for Commuter Transportation of Canada (2008). The Case for TDM in Canada: Transportation demand management initiatives and their benefits. www.actcanada.com/ACTCanada/EN/Resources.aspx

Fraser Basin Council. (2009). Transportation Demand Management: A Small and Mid-Size Communities Toolkit. www.fraserbasin.bc.ca/publications/index.html

Shoup, D. (2005). *The High Cost of Free Parking.* Planners Press.

Transport Canada (2009). Compendium of Canadian Survey Research on Consumer Attitudes and Behavioural Influences Affecting Sustainable Transportation Options. www.tc.gc.ca/eng/programs/environment-urban-menu-eng-2084.htm

UK Department of Health (2011). Soft Measures – Hard Facts: The Value for Money of Transport Measures Which Change Transport Behaviour. www.erpho.org.uk/viewResource.aspx?id=21632

D6.2.4 Carsharing

By joining a carshare service, individuals have on-demand access to a shared fleet of vehicles on an as-needed basis. Carshare services reduce the need for households and businesses to own vehicles, and they reduce personal transportation costs and vehicle kilometres travelled.

Carsharing providers in Metro Vancouver include Car2Go, Zipcar, and Modo.

Vehicles available near a person's home can reduce the need for owning a vehicle, and vehicles available near a person's workplace or school will enable them to commute to work via transit or other means, knowing that a carshare vehicle will be available during the day if required for business or personal trips.

- Provide carshare companies with incentives to locate additional carshare vehicles, such as reduced off-street parking costs.
- Reserve a certain number and distribution of on-street parking spaces for carshare vehicles.
- Encourage large employers and residential developments to provide easily accessible carshare vehicles on-site through incentives or development application requirements.
- Reduce development fees or minimum parking requirements for new developments that provide carshare vehicles on-site.

Use TDM measures to encourage sustainable modes of travel

D6.2.5 Travel planning

Many travellers are unaware of their transportation options, and they automatically drive to their destination out of habit. Personalized travel planning targets individuals and provides tailored travel advice on a face-to-face basis.

- Implement a personal travel planning program that targets areas with high transit accessibility and good walk and bike networks.
- Provide targeted travel training to familiarize seniors and mobility-impaired individuals with transit service.
- Provide detailed transit route planning assistance – including maps of walking, cycling, and transit travel time contours from their home or destination, together with transit or active travel incentives (if feasible) – to those with the propensity to change their travel habits.
- Develop in-school programs that introduce children and youth to transit and active travel.
- Encourage employers to develop comprehensive TDM strategies, either voluntarily or through the development application process, to encourage more sustainable travel among employees and to support sustainability or Corporate Social Responsibility programs.

TransLink's federally-funded TravelSmart Personal Travel Planning (PTP) Pilot program in 2005–06 resulted in an 8% reduction in single-occupancy vehicle travel and 9%, 12%, and 33% increases in walking, transit, and cycling, respectively.

WORKPLACE AND SCHOOL TRAVEL PLANNING

TransLink's TravelSmart for Business program aims to provide one-to-one services to businesses – including presentations, marketing materials, and strategy development consultations – to help them support and encourage employees to travel to work by active and sustainable modes.

www.travelsmart.ca/en/Business.aspx

TransLink's TravelSmart for Schools program is expanding after a successful pilot in advance of the 2010 Winter Olympics. To date, five secondary schools and almost 30 elementary schools have participated in the program, which uses a student leadership model to raise awareness and educate staff, students, and parents about sustainable travel options for the school trip.

www.travelsmart.ca/en/School.aspxh

D6 Case Studies

1. The significant influence of effective parking management at UBC

Municipality: Electoral Area 'A'

Location: University of British Columbia, Point Grey Campus

Key Elements:

- Significant reduction in surface parking
- Increase in on- and off-street parking rates
- Development of surface parking into new pedestrian-oriented development

Over the past 15 years UBC has aimed to reduce automobile dependency and promote alternative modes such as walking, cycling, and transit with tremendous success. A key element of the program has been the management of surface parking, which included eliminating over 3,000 commuter parking stalls (25% of supply) and tripling parking rates. UBC's goal is to maintain a commuter parking supply ratio of 0.20 stalls/person. Their parking management strategy has also freed up scarce land for new development, providing opportunities for staff, faculty, students, and new residents to live on campus. UBC's wider TDM strategy includes the promotion of U-Pass BC, TransLink's Employer Pass Program, and sustainable travel events. The result of UBC's parking management and TDM programs, together with the U-Pass, has been a doubling of transit ridership (to 49% of all trips) and a 15% reduction in car trips since 1997. Emphasis on high-quality design of the public realm and the provision of a more diverse mix of land uses also aims to promote walking and cycling as the choice modes of travel within the community.

2. A coordinated approach to TDM and travel planning in New Westminster

Municipality: City of New Westminster

Location: Citywide

Key Elements:

- School travel planning for all elementary and middle schools
- Workplace travel planning for large employers
- Incentives and multi-modal support for municipal employees

By securing a 2.5 year grant via the federal government's EcoMOBILITY program, the City was able to hire a part-time TDM Coordinator to initiate a citywide TDM strategy. The strategy includes programs for staff trip reduction, major employer engagement, and school travel planning. The staff program focuses on increasing travel options for municipal staff and providing education and outreach activities to support behaviour change. The City also worked with four local employers (with over 100 staff each) to provide a range of TDM incentives to their employees. The school travel planning program has engaged all nine of the city's elementary schools and both middle schools over the past three years. Initiatives have included the creation of Best Routes to School maps, travel surveys and family feedback, infrastructure improvements, travel awareness events and promotions, sustainable travel lesson plans, and student bicycle training. Through this school engagement process, the City hopes to educate students and their parents and educators on how to make school trips – by way of walking, cycling, and transit – easier, safer, and more fun.

D6 Case Studies

UBC's parking management strategy significantly reduced surface parking to promote alternative modes and provided scarce land for new residential development.

New Westminster's school travel planning program encourages youth to walk and cycle.

Programs to encourage more walking and cycling included the creation of secure bicycle lockers around campus.

New Westminster's employer engagement program promotes sustainable travel options to large companies.


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Taking Action

3

The Design Guidelines presented in Chapter 2 outline the key elements necessary to design transit-oriented communities. This section aims to provide some context for how the Design Guidelines can be put into practice and how some common barriers can be overcome.

Much of the strength of our region lies in our shared vision and mutual goals, espoused through regional strategies and local plans. One point of consensus common to many of our plans is the value of transit-oriented communities as a tool for greater livability, resiliency, and sustainability, as well as a strategy for a more cost-effective transportation system.

The plans, policies, programs, and projects that each of our agencies conceive and implement every year can help move us closer to realizing this vision. Our planning processes require diverse stakeholders working together toward common objectives and using proven techniques. In addition, projects that make communities more transit-oriented often require a champion – one or more highly motivated stakeholders focused on seeing them through to completion. We hope readers of these guidelines will find such projects to champion in their own communities.

Lyon's modern tram network has helped to support a transit-oriented lifestyle for its citizens, with more sustainable travel in the city where walkable communities are created around transit.

Lyon, France.

3.1 When to Use the Guidelines

Working through existing planning processes, there are many opportunities to apply the principles in these guidelines and to take action toward creating more transit-oriented communities.

Potential uses for the guidelines include:

» *Developing and updating Official Community Plans and other area plans.* Municipal planners can refer to these guidelines when developing and updating land use and transportation plans and zoning standards. **Diversity D5** provides general guidance on promoting a transit-supportive mix of uses, **Density D4** provides guidance on promoting appropriate densities near transit while integrating development appropriately with existing development, **Demand Management D6.1** provides guidance for tailoring parking regulations, and **Destinations D1.2** can help guide the location of higher-density uses near transit or in Urban Centres.

» *Designing transportation networks.* Municipal transportation planners and engineers can consult these guidelines when designing transportation networks for their communities. **Distance D2** provides guidance on walking, cycling, and street networks that are transit-supportive, and **Destinations D1** provides background on the design of transit networks.

The District of North Vancouver is using transit-oriented community planning to support the Lower Lynn neighbourhood planning process (see 3.5 Creating a More Transit-Oriented Community in Lower Lynn).

Source: District of North Vancouver, Official Community Plan, 2011

3.1 When to Use the Guidelines

- **Creating street design standards.** Municipal planners and engineers may wish to consult these guidelines when developing or updating street design standards or developing FTN overlays in their street hierarchy. **Design D3.1** provides basic guidance about walkable, bikable, and transit-oriented streets, including sidewalks, street crossings, bicycle lanes, and landscaping, as well as references and examples from other municipalities in the region that may be helpful.
- *Implementing economic development strategies.* Successful community planning and design can be strengthened by coordinating land use and transportation plans with strategies focused on economic development as a key goal. **Destinations D1.2** and **Density D4.1** provide municipal planners with input on the most transit-supportive places to focus incentives for commercial and economic development.
- *Retrofitting streets in established neighbourhoods.* In established neighbourhoods, community groups and municipal planners may wish to consult **Distance D2.1** and **Design D3.1** when proposing projects to make existing development and facilities more transit-oriented.
- *Creating and reviewing development proposals.* Developers can consult these guidelines when planning development projects, particularly those near frequent transit, and municipal planners can use these as guidelines to review development proposals. The Transit-Oriented Communities Checklists in **Appendix A1** are intended to help think through the various transit-oriented considerations of proposals in a variety of local and regional contexts.
- *Designing transit facilities.* TransLink's **Transit Passenger Facility Design Guidelines** provide detailed guidance on the design of transit stations, stops, and exchanges and their immediate surroundings. They also provide guidance on how the size, scale, and design of facilities relate to the surrounding community and how community design may be best planned to capitalize on that transit investment.

TRANSIT-ORIENTED COMMUNITIES CHECKLISTS

To streamline the process, a set of Transit-Oriented Communities Checklists have been developed to simplify considerations for plans and the review of development applications. The Checklists are included in **Appendix A1** and are intended to assist land use and transportation planning at site, corridor, and neighbourhood scales.

3.2 Understanding Community Characteristics

TRANSIT SERVICE GUIDELINES AND MANAGING THE TRANSIT NETWORK: A PRIMER ON KEY CONCEPTS

Regular planning and management of the transit network is crucial to ensuring that an acceptable level of service quality is provided in a fair, consistent, and accountable manner to customers across the region. To support this process, TransLink is updating their Transit Service Guidelines, which provide guidance on appropriate levels of comfort, reliability, and convenience for each of TransLink's transit services.

In order to provide a more general and introductory overview, TransLink has also produced Managing the Transit Network: A Primer on Key Concepts which provides high-level concepts for developing an effective and efficient transit system. The primer can is available at www.translink.ca/networkmanagement.

While the strategies described in Chapter 3 are useful in making every community in the region more transit-oriented, each community is unique, and has different challenges and opportunities. This section provides guidance for how the guidelines might be adapted to the diverse needs of each place.

3.2.1 Transit Context

The type and quality of transit service at the local level influences how transit-oriented communities evolve.

Transit Service Types and Development Patterns

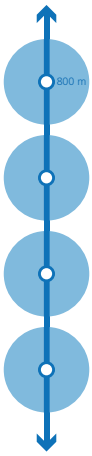
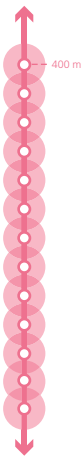
Regardless of infrastructure, transit service types can be defined based on speed, reliability, and local access – attributes that are primarily determined by the type of right-of-way and the station or stop spacing.

Rapid transit, with stations spaced every 1–1.5 km, tends to have faster journey times but less convenient local access (as there are fewer stops). The SkyTrain in Metro Vancouver currently provides limited-stop transit service in a dedicated right-of-way to 47 stations along three lines (additional stations will be added along the Evergreen Line when completed) with an average station spacing of 1.5 km. A similar type of service can be provided using other transit technologies that include Bus Rapid Transit (BRT) or Light Rail Transit (LRT). The West Coast Express commuter rail service provides a limited-stop service, but is not considered to be frequent transit due to lower frequency and shorter span of service.

The #20 trolley bus route on the FTN in Vancouver provides service – in a shared right-of-way – to more closely spaced local stops.

3.2 Understanding Community Characteristics

Frequent transit service characteristics and development patterns for Metro Vancouver.

SERVICE CHARACTERISTICS	Stop Spacing:	Limited-Stop (every 500–2,000 m)		Local Stop
	Right-of-Way:	Exclusive	Shared	Exclusive or Shared
	Examples:	Millennium Line, Canada Line	#99 B-Line (Broadway), #135 (Hastings)	#19 (Stanley Park/Metrotown), #106 (New West/Metrotown)
CATCHMENT AREA CHARACTERISTICS	Pattern:			

Limited-stop service in a shared right-of-way can also provide high-quality transit service. Metro Vancouver's B-Line and limited-stop express bus services can utilize transit priority measures and higher-quality stop infrastructure, while operating in mixed traffic, to minimize disruption to schedules. Communities along these corridors and at stop nodes provide opportunities for the introduction of more transit-oriented community design.

Frequent transit services with many local stops, spaced every 250 m to 400 m, have more convenient local access. Where frequent local stop transit services intersect, and particularly where they provide feeder service to rapid transit services, these points can be important development areas.

3.2 Understanding Community Characteristics

CONTRASTING STREET NETWORKS IN NEW WESTMINSTER

The Queensborough area of New Westminster faces unique challenges due to major spatial barriers (Highway 91A and the Fraser River) that hinder pedestrian connectivity and make servicing the area by transit difficult. Long blocks characterize some areas, and access to retail at Queensborough Landing is challenging for pedestrians. Demand for new affordable housing in the area has created opportunities to improve the street grid and pedestrian infrastructure (including a planned Queensborough-Waterfront Pedestrian Bridge linking to downtown New Westminster) and has begun to improve transit orientation in the community.

In contrast, New Westminster's downtown neighbourhood has a historic street grid with short block lengths and extensive sidewalk provision; and it is well served by rapid transit, with two SkyTrain stations that contribute to the area's 27% transit mode share. The City has promoted the development of higher densities to locate more people near transit, thereby creating a higher quality public realm and supporting livability through a mix of retail, commercial, and residential uses.

3.2.2 Street Networks

The character of existing street networks varies greatly among communities in Metro Vancouver, often related to the time when they were first developed. Some communities are more auto-oriented; their street networks and building patterns are typical of the suburban growth of the last quarter of the 20th century. Other parts of the region have a more transit- and pedestrian-oriented character. Places built before 1940 were mostly transit-oriented, as streetcars and public transit were the dominant mode of transportation in the pre-war era. Improving transit orientation is easier in places that were originally transit-oriented and based on a street grid pattern, but there are many useful tools that can be used in automobile-oriented places that are transitioning into more walkable and transit-oriented communities.

- Considerations for enhancing the transit orientation of higher-density areas include adding sidewalks and other pedestrian infrastructure (see **Design D3.1.1**), creating smaller block sizes or public pathways through large blocks of land (see **Distance D2.1**), and integrating mixed-use development in appropriate locations (see **Diversity D5**).
- Considerations for areas with more pedestrian-oriented street networks include reinforcing historic street grid patterns (see **Distance D2.1**), widening sidewalks on busy retail corridors or around important public spaces (see **Design D3.1** and **D3.2**), encouraging appropriate density focused in key locations (see **Density D4.1**), and parking pricing strategies (see **Demand Management D6.1**).

3.2 Understanding Community Characteristics

3.2.3 Making Density Work

There are significant variations in density among communities in Metro Vancouver. **D4 Density** presents guidelines for promoting transit-oriented densities.

- Considerations for making lower-density areas more transit-oriented include adding density that supports the existing character of the neighbourhood (see **Density D4.2**), encouraging a mix of land uses near transit nodes (see **Diversity D5.2**), and managing both on- and off-street parking (see **Demand Management D6.1**).
- Considerations for enhancing the transit-orientedness of higher-density areas include locating additional density in appropriate locations (see **Destinations D1.2** and **Density D4.1**), fostering well-connected streets (see **Distance D2.1**), ensuring high quality public realm design (see **Design D3**), and incorporating transit priority measures (see **Design D3.1.3**) and parking management (see **Demand Management D6.1**).

Medium-density residential development with ground-level retail around Fruitvale Station in Oakland, CA, creates a vibrant and active transit-oriented community at an appropriate scale for this suburban neighbourhood.

TRANSIT-ORIENTED DENSITY IN COQUITLAM

Coquitlam Centre is a Regional City Centre that has experienced substantial urban and residential growth in recent years due to significant investment in public facilities, parks and open spaces, pedestrian-oriented streetscapes, and high-density residential and mixed-use development. With completion of the Evergreen Rapid Transit Line expected in 2016, important next steps to developing the City Centre as the urban core of the region's Northeast Sector involve improving pedestrian connectivity, attracting employment to balance residential growth, and integrating transit into the community.

The Austin Heights neighbourhood in southwest Coquitlam is currently characterized by single-family homes on larger lots, with some medium density residential development near the small commercial shopping area along Austin Avenue. Promoting transit orientation in this neighbourhood is recognized within the Austin Heights Neighbourhood Plan, which aims to transition the neighbourhood commercial core to a higher-density, mixed-used area. The addition of medium-density residential uses is being used to buffer the core and adjacent residential areas, and secondary suites and home-based businesses are being allowed in select areas.

3.2 Understanding Community Characteristics

3.2.4 Land Uses

Another important factor affecting implementation of the Design Guidelines is primary, or predominant, land use. Transit in Metro Vancouver serves areas with land use patterns ranging from predominantly residential, to mostly retail, to professional offices, to entertainment and leisure, to fully mixed-use areas. Though a diverse mix of uses is a key factor in creating more transit-oriented communities, it is also possible for neighbourhoods dominated by a single land use to become more transit-oriented.

- Considerations for predominantly residential areas include providing for quality of life improvements to the public realm (see **Design D3.2**), integrating new land uses into development or along easily accessible corridors (see **Diversity D5**), and incorporating parking management (see **Demand Management D6.1**).
- Considerations for predominantly office areas include incorporating employer-based demand management and parking management (see **Demand Management D6**) and providing a mix of uses and services within walking distance for employees (see **Diversity D5**).
- Considerations for predominantly retail and service areas include providing pedestrian-oriented street design (see **Design D3.1**) and using parking management to both support businesses and promote sustainable travel (see **Demand Management D6.1**).

The long-term vision of the Newton Town Centre planning process aims for a wider variety of housing options in this part of Surrey – including medium and high densities – around a relocated transit exchange (parcel #8) to complement the existing primarily retail- and leisure-based uses.

Source: City of Surrey

3.2 Understanding Community Characteristics

3.2.5 Market Readiness and Potential

Market forces influence the pace of real estate development and, therefore, the rate at which changes leading to transit-oriented communities can occur. Municipalities with different levels of market readiness and potential can emphasize different market strategies to enable the highest level of success for their area.

» Considerations for areas with high market demand include using zoning and land use regulation to direct development toward areas that are well served or can be well served by frequent transit (see **Destinations D1** and **Density D4.1**) and by TDM measures and parking management (see **Demand Management D6**).

» Areas with lower market demand may require public realm improvements or other public investments to catalyze private investment. See **Design D3** and **Density D4.1**.

Planning around Dublin's LRT network took advantage of the market boom in the early 2000s and enabled transit-oriented residential and commercial development in several key areas of the city.

MAXIMIZING MARKET OPPORTUNITIES IN PORTLAND

Portland's achievements in transit-oriented communities have largely been limited to central Portland where infill, higher-density developments, and the creation of more transit-friendly, walkable communities are generally not accessible to medium- and lower-income families.

Metro Portland's Transit-Oriented Development Strategic Plan was created to guide investment in future development throughout the region, ensuring that opportunities for catalyzing transit-oriented development in all rapid transit station areas and frequent bus corridors are maximized and that resources are leveraged to support it. Metro uses a spreadsheet model as a decision-making tool to evaluate program effectiveness and determine the appropriate distribution of funding to individual projects.

Metro [Portland] (2011). TOD Strategic Plan. www.oregonmetro.gov/index.cfm/go/by.web/id=36197

3.3 Overcoming Challenges to Implementation

While the goals of transit-oriented communities are widely embraced in Metro Vancouver, there are a number of barriers that often stand in the way of implementation. Careful attention to these barriers can help municipalities create more transit-oriented communities in a timely and cost-effective way.

3.3.1 Planning and Coordination Barriers

Optimal transit-oriented design strategies are sometimes blocked because initiatives are not effectively coordinated or because land use and transportation planning are poorly integrated. Examples of strategies that can help to overcome these obstacles include:

» *Participate in regional planning and understand regional context.* Communities can minimize planning and coordination barriers by participating fully in the creation and implementation of regional strategies, such as TransLink's Regional Transportation Strategy and future updates to the Regional Growth Strategy. Community participation is particularly important for making sure these strategies are translatable at the municipal level. Being aware of and responsive to the regional context is important to ensure that local plans are broadly aligned with regional plans and strategies.

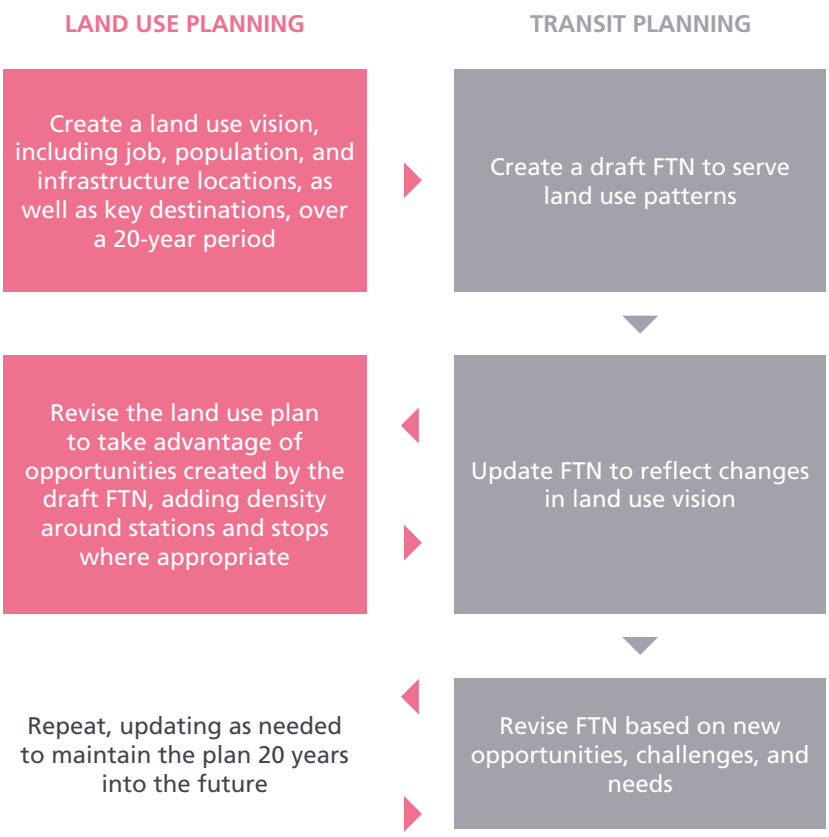
» *Coordinate across municipal boundaries.* Strong transportation network plans do not work effectively at times because they are not well-connected across municipal boundaries. Communities can help overcome this barrier when developing bicycle, pedestrian, and roadway plans by communicating frequently with staff and elected officials from neighbouring municipalities, as well as with TransLink where appropriate. Collaborating on such projects with neighbouring communities is another potential approach.

» *Communicate design expectations.* When developers and municipal planners are unclear on the community's overall vision and policy direction, they can miss opportunities for transit-oriented community design. Communities can overcome this barrier by establishing guidelines with clear expectations and priorities.

3.3 Overcoming Challenges to Implementation

» *Use the Frequent Transit Network as an organizing framework for coordinating land use and transportation.* In order to provide optimum transit service, land use and transit concepts are best developed together so they can reinforce one another; in particular, most of the higher density development from the land use plan is ideally located within a 5-minute walk (400 m) of a frequent transit corridor and within a 10-minute walk (800 m) of a rapid transit station. Municipalities are encouraged to discuss servicing of new areas by transit early in the land use planning process to ensure that the proposed higher-density locations can be well serviced by transit. TransLink can then further refine the transit network in response to emerging land use patterns and market trends. Over time, key items that reach consensus through these conversations can manifest in municipal and regional plans that will result in increased clarity on the location of future FTN and higher-density locations.

A healthy, long-range planning conversation (adapted from Human Transit by Jarrett Walker, 2012).



3.3 Overcoming Challenges to Implementation

3.3.2 Regulatory Barriers

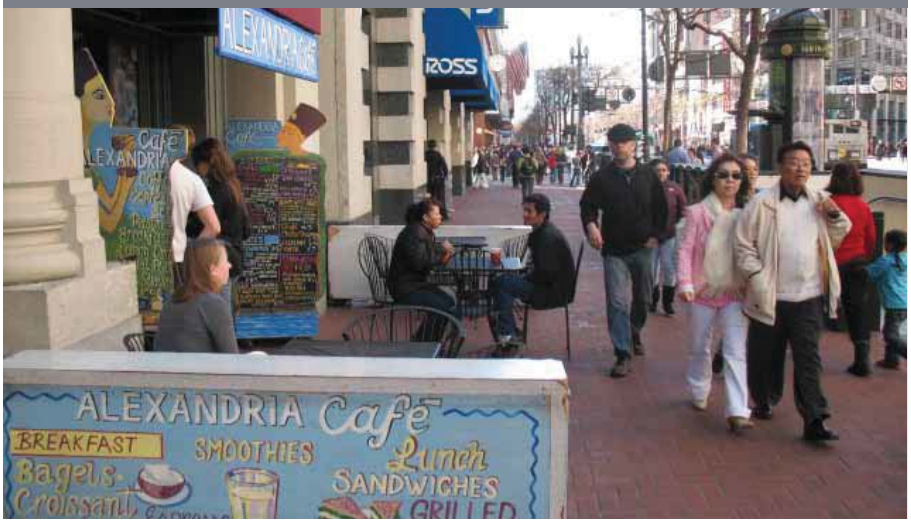
Even when developers, municipal planners, and regional and provincial planning agencies are all working together to create transit-oriented urban environments, existing regulations can sometimes prohibit optimal design. Overcoming these barriers requires attention to all aspects of transit-oriented design (all 6 Ds) at all levels of planning. Examples include:

- *Set transit-oriented street design standards.* Street design standards can hinder transit-oriented community planning when they require designs that prioritize private vehicle travel over pedestrians, cyclists, and transit vehicles. Communities can help overcome this barrier by reviewing street design standards and ensuring that specific design requirements are aligned with the community's policy priorities. Appropriate street design standards often require an interdisciplinary approach and should allow flexibility to tailor street designs to their context and desired function. It may be appropriate in transit-oriented communities to have wider sidewalks, connected bikeways, narrower travel lanes (while still accommodating buses), and greater attention to lighting and landscaping.
- *Set transit-oriented street performance measures.* Street performance standards can sometimes unnecessarily prohibit transit-oriented street design. For example, Level of Service standards that only measure performance for private vehicles can create a disadvantage for transit- and pedestrian-oriented designs. To help overcome this barrier, communities can develop performance criteria that recognize the needs of all modes, allow lower automobile Level of Service thresholds in transit-oriented areas, and provide quantitative guidance on balancing accommodation across all modes.
- *Create transit-oriented traffic analysis guidelines.* There is abundant research on how transit-oriented communities reduce vehicle trip generation, and all 6 Ds should be reflected in how municipalities calculate traffic impacts for new development.

3.3 Overcoming Challenges to Implementation

- *Set appropriate parking standards.* Similarly, land use regulations may sometimes prohibit transit-oriented building design. To overcome this barrier, communities can tailor off-street parking requirements to the local context, possibly lowering parking minimums or establishing parking maximums near frequent transit. Such requirements are particularly suitable in walkable areas with high levels of transit accessibility and where a large number of jobs, services, and destinations can be accessed in a reasonable 30-minute transit travel time.
- *Zone for walkable retail.* In transit-oriented communities, most of the needs of daily life should be within walking distance, which often means concentrating retail along a high street on a transit corridor. Too much retail zoning is as bad as too little, and retail studies should be undertaken to get the mix just right. Similarly, as too much retail parking is as bad as too little, ensure that parking is shared, well designed and managed, and appropriate to the level of transit service. In addition, parking should not separate retail stores or separate their front doors from the sidewalk.
- *Set appropriate density standards.* Many municipalities use density controls as a means of ensuring an appropriate scale of development and managing traffic. **Density D4** offers strategies and considerations for density, and **Demand Management D6.1** offers ideas for managing traffic directly by adjusting available parking and pricing. Building design controls – including bulk, height, and setback standards and form-based codes – are more effective tools for ensuring appropriate community character and allowing municipalities to relax or eliminate density controls. These controls are discussed in **Design D3.3**.

San Francisco adopted their Better Streets Plan in 2010, which clarifies how the city can make its streetscapes more pedestrian-oriented and more supportive of sustainable modes of travel.



3.3 Overcoming Challenges to Implementation

3.3.3 Building Community Support

As with all community planning work, public input is vitally important for creating transit-oriented communities, and there are several strategies that can help build public awareness and familiarity with the principles of transit-oriented communities. Pilot projects and demonstrations can help community members understand how projects will function in the local context. It is important once projects are implemented to return to the community and report the results. Did things work out as promised? Did something unforeseen arise that has now become an issue? What adjustments can be made to refine implementation?

3.3.4 Technical Challenges

Some transit-oriented community design approaches present difficult technical challenges. There are a number of ways to find and use the most up-to-date design approaches. If in-house expertise is not available, a municipality might wish to approach peer agencies that have implemented similar projects or consulting firms with expertise in relevant areas. Communities in the region can also overcome technical barriers by consulting with other municipalities or stakeholders or with TransLink. Finally, communities can help their neighbours learn about effective strategies and ongoing challenges by sharing their own success stories and lessons learned in transit-oriented community design.

3.4 Collaboration and Roles

Transit-oriented communities require coordination and collaboration among many stakeholders, including private developers and various local and regional public agencies and community groups across the region. There are many collaborative opportunities:

- Neighbouring municipalities can work together to establish integrated bicycle and pedestrian networks.
- Municipalities can work with TransLink to fully integrate transit passenger facilities with their surrounding context.
- Developers can work with municipalities to create development projects that satisfy community needs and meet or exceed design expectations.
- Metro Vancouver, TransLink, and municipalities can all work together to ensure that the Regional Growth Strategy, the Regional Transportation Strategy, the Frequent Transit Network, and municipal Official Community Plans and transportation plans are integrated and mutually beneficial to the greatest extent possible.
- Municipalities can work with community groups and local stakeholders to ensure that land use plans and street designs reflect local needs and aspirations.
- Municipal planning, engineering, and other departments can work together to ensure close alignment between land use and transportation plans and visions.

Many more collaborative opportunities exist in support of transit-oriented communities.

Section **1.2.3 Intended Audience and Roles** lists key stakeholders and general roles for the development of transit-oriented communities and can be used as a basic guide. The general public plays a role in implementing every strategy by participating in the public dialogue and by advocating for projects in which they believe.

Nearly every strategy requires participation from more than one type of stakeholder. Effective collaboration in these areas becomes crucial. In some cases, inter-agency collaboration can be formalized into structured partnerships through written agreements, with specific roles and responsibilities being assigned to each participant. Maintaining clear expectations can help to build effective partnerships that achieve the goals of all participants.

Working together with stakeholders in a collaborative environment is an important element of enabling the development of transit-oriented community design and developing innovative and creative solutions.

3.5 Creating a More Transit-Oriented Community in Lower Lynn, District of North Vancouver: An Illustrative Process

Many communities in Metro Vancouver are already working toward a vision for a more transit-oriented region. This section draws together all of the guidance in this document by presenting an example of one such process for the Lower Lynn Town Centre in the District of North Vancouver.

3.5.1 Context

Lower Lynn Town Centre is a newly designated Frequent Transit Development Area (FTDA) in the District of North Vancouver with a vision of being well-served by frequent transit in the future. This area was recently the subject of a design charette where ideas were generated about how to seamlessly integrate transit into the community as redevelopment occurs.

A number of concurrent planning initiatives that have been taking place since 2007 have focused on land use and transportation coordination in the area and have helped to align these efforts. In addition to port access studies, these studies include the District's Official Community Plan (OCP), draft Municipal Transportation Plan, and Lower Lynn Transportation Study, Metro Vancouver's Regional Growth Strategy, and the Ministry of Transportation and Infrastructure's ongoing design work for Highway 1 interchanges, as well as TransLink's North Shore Area Transit Plan (NSATP).

In December 2011 the District of North Vancouver engaged Nelson\ Nygaard Consulting Associates to work with them in identifying requirements for the integration of frequent transit into Lower Lynn Town Centre and other growth areas of the District. The sessions involved key staff from the District of North Vancouver, and from TransLink and the Ministry of Transportation and Infrastructure. This initiative has been a leading step toward achieving the OCP transit network goal of supporting the delivery of an enhanced and more integrated transit system across the community.

The NSATP envisions Lower Lynn Town Centre as continuing to be a significant node on the FTN. It is envisioned that several frequent transit corridors will converge in the Lower Lynn area. In accordance with the District's updated Official Community Plan (adopted in 2011) and in alignment with the community's vision as an FTDA, it is anticipated that this neighbourhood will experience the most growth of the District's four growth centres.

3.5 Creating a More Transit-Oriented Community in Lower Lynn, District of North Vancouver: An Illustrative Process

An aerial view shows the extent of the Lower Lynn neighbourhood in the District of North Vancouver.

Source: District of North Vancouver

COORDINATING LAND USE AND TRANSPORTATION PLANNING IN LOWER LYNN

The neighbourhood planning and design process in Lower Lynn was shaped by two important planning frameworks: the District of North Vancouver Official Community Plan (2011) and the NSATP.

The OCP designates Lower Lynn as a regional FTDA with a greater mix and density of housing, commercial, and other uses to support frequent transit. The OCP also has a target of 35% of trips being taken by walking, cycling, and transit by 2030, which this transit-oriented community will support. The NSATP process links into the OCP by planning for east-west and north-south FTN corridors through Lower Lynn, including the potential for rapid transit on Main Street in the future. This coordination has helped to build a clear foundation for transit-oriented neighbourhood planning.

North Vancouver, District of (2011). Official Community Plan. www.identity.dnv.org/

TransLink. North Shore Area Transit Planning Process (2011-ongoing). www.translink.ca/en/Be-Part-of-the-Plan/Area-Transit-Plans/North-Shore-Area-Transit-Plan.asp

3.5 Creating a More Transit-Oriented Community in Lower Lynn, District of North Vancouver: An Illustrative Process

In addition to the OCP goal of at least 35% of trips being made by walking, cycling, and transit by 2030, the NSATP has a long-term goal of at least a 15% all-day transit mode share by 2040. To achieve its goal, the OCP envisions a network of compact, higher-density centres located on major transit corridors where 75%–90% of the District's growth will occur through 2030. The Plan envisions 3,000 new housing units in Lower Lynn Town Centre over the next 20 years, along with a greater mix and higher density of uses.

Transit-oriented design principles have been taken into consideration in various forms throughout the planning process for Lower Lynn Town Centre to create conditions that will support the success of this transit-oriented community.

The land use and transportation planning framework in the District's OCP illustrates how the Lonsdale Regional City Centre will connect to the Lower Lynn FTDA (and other growth areas) by the FTN.

Map 1
Network of Centres Concept Map

Note: This map is conceptual in nature only

3.5 Creating a More Transit-Oriented Community in Lower Lynn, District of North Vancouver: An Illustrative Process

Existing Conditions

Lower Lynn Town Centre is a relatively low-density area of light industry, regional retail, parklands, and single-family homes. It is located at a major multi-modal transportation crossroads at the north end of the Ironworkers' Memorial (Second Narrows) Bridge. Looking at the neighbourhood from a regional scale, the neighbourhood has excellent connectivity for transit and driving, but can experience bridge-related congestion. Phibbs Exchange is a major transit hub for the entire North Vancouver transit network.

The destinations currently reachable by transit within 30 minutes from Lower Lynn (during weekdays) include the Vancouver Central Business District, Upper and Lower Lonsdale, Capilano University, Parkgate and Deep Cove, Lynn Valley Town Centre, and the Hastings Corridor in East Vancouver and Burnaby Heights. The area already has excellent accessibility by transit to important regional destinations and key areas on the North Shore.

At a neighbourhood and site scale, however, the existing transportation infrastructure poses major barriers to pedestrian movement, cycling and overall mode integration and is not conducive to a high quality urban character. Though it works well from a transit-operations perspective, Phibbs Exchange has minimal passenger amenities and poor pedestrian connectivity to the surrounding streets and neighbourhood. In addition, concerns about personal safety and crime are major issues at the exchange.

From a pedestrian standpoint, there are too few connections between the neighbourhood and the rest of North Vancouver because of spatial barriers formed by Lynn Creek to the west, the TransCanada Highway to the north and east, and by railroad tracks, Port lands and Burrard Inlet, and a major high-volume arterial road to the south. The area currently has an intersection density of 0.35 intersections per hectare, which is on the low end of a transit-oriented level of connectivity. Bicycling connections are even more challenging due to high traffic volumes and the poor quality and connectivity of facilities.

Lower Lynn is currently characterized by mostly auto-oriented uses.

3.5 Creating a More Transit-Oriented Community in Lower Lynn, District of North Vancouver: An Illustrative Process

The neighbourhood planning process for Lower Lynn is following five key steps from concept to implementation.

3.5.2 Process

Regional and Municipal Scale Planning

As discussed in **D1 Destinations** and **D4 Density**, transit nodes like Lower Lynn – that are located centrally within a region – are important sites for increasing the intensity of land use. Preparation of the District of North Vancouver's OCP was coordinated with the Regional Growth Strategy, the North Shore Area Transit Plan and the District of North Vancouver's proposed Transportation Plan to ensure that identified growth centres align with major transit investment plans and pedestrian and bicycle network plans.

During the OCP development process, District of North Vancouver residents identified Lower Lynn as a desirable growth area because of its high level of transit accessibility (destinations reachable in a reasonable amount of time), as well as because of a number of other supporting characteristics. Lower Lynn is already a mixed-use district containing some residential areas, a light-industrial employment hub, and a community centre that is a major North Shore youth destination. It also has easy access to nearby Capilano University by way of a short bus ride. As recommended in **D4 Density** and **D5 Diversity**, the OCP builds on these strengths by planning for the addition of residential, commercial, and other uses. Proactively encouraging diversity and density will support the planned frequent transit service by increasing the number and distribution of trips throughout the day and into the evening.

Lower Lynn has two additional major advantages as a growth area:

- It has active community support for the revitalization and redevelopment of the area.
- There is strong existing interest from the private development community, including a major development project well advanced in the approvals process: the high-density, mixed-use Seylynn Village, which is expected to include approximately 700 new residential units and around 25,000 to 45,000 sq. ft. of commercial space on a five-acre site.

Selection of an area that already has active market interest can allow for faster development of a transit-oriented community.

3.5 Creating a More Transit-Oriented Community in Lower Lynn, District of North Vancouver: An Illustrative Process

Neighbourhood Scale Planning

The OCP includes a vision for transportation in North Vancouver, including basic transportation networks for each growth centre and a land use concept. In preparation for articulating more specific design expectations for development proposals in this area, the District led an intensive one-day design session in December 2011 that involved consultants from Nelson\ Nygaard and staff from TransLink and the Ministry of Transportation and Infrastructure. The goal of the session was to plan for the effective integration of transit with development in the Town Centre.

At the session, the District was able to further develop design concepts for Lower Lynn Town Centre, including the improvement or implementation of:

- bus exchange conditions;
- bus stop locations and character;
- priority areas for pedestrian improvements;
- pedestrian-oriented design measures, such as public plazas which incorporate public art;
- transit supportive measures, like transit priority lanes and bus bulges;
- cycling facility design;
- seamless connections by walking, cycling, and transit within the neighbourhood;
- supportive land use concepts; and
- street cross-section and road right-of-way needs.

A charette was carried out with key stakeholders to advance the neighbourhood planning process.

3.5 Creating a More Transit-Oriented Community in Lower Lynn, District of North Vancouver: An Illustrative Process

Design Solutions for Lower Lynn

The following types of design solutions were developed during the design session:

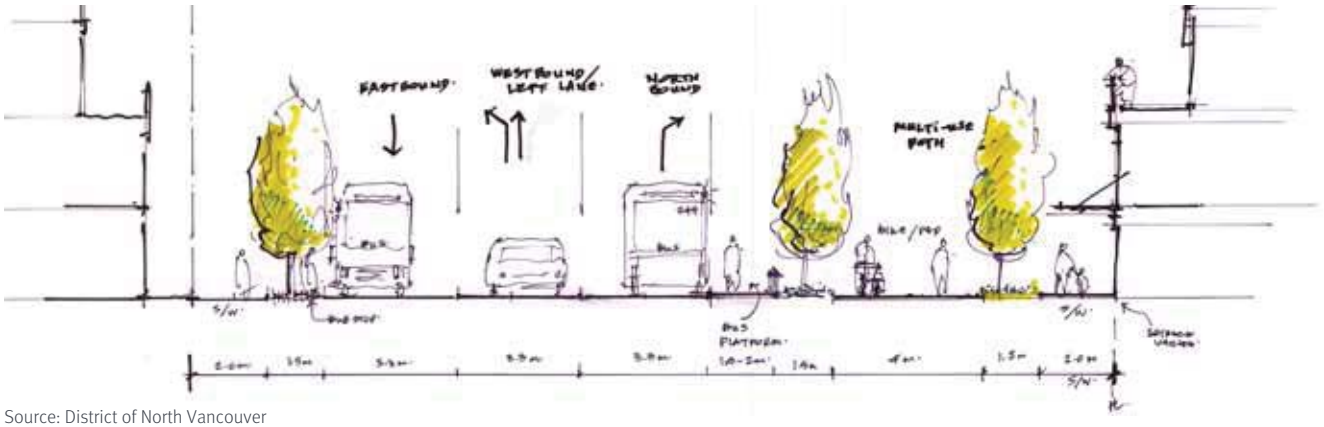
To improve conditions for walking:

- Work toward completing the sidewalk network in Lower Lynn.
- Provide safe, accessible, and comfortable sidewalks and crossings for pedestrians of all ages and abilities (e.g., approximately a 1.5 m landscaped buffer and a 2.0 m wide sidewalk on both sides of the street for the full length of the high street).
- Provide pedestrian-oriented design measures, such as weather-protection canopies and street-oriented retail.
- Integrate the pedestrian network with parks and urban trails such as the planned Sea-to-Sky and North Shore Spirit Trails to provide convenient and comfortable routes for walking.

To improve conditions for cycling:

- Improve on-street cycling connections between Lower Lynn Town Centre and other key local and regional destinations.
- Accommodate cyclists of all skill levels with off-street cycling routes and urban trails like the planned Spirit and Sea-to-Sky Trails.
- Improve cycling routes to high-quality transit services in Lower Lynn and at Phibbs Exchange and make bike-to-transit integration convenient and intuitive.
- Make connections between discontinuous streets.

Concepts and criteria for street design were developed to balance priority among transit, bicycle, pedestrian, automobiles, and other road users.



Source: District of North Vancouver

3.5 Creating a More Transit-Oriented Community in Lower Lynn, District of North Vancouver: An Illustrative Process

To improve conditions at Phibbs Exchange:

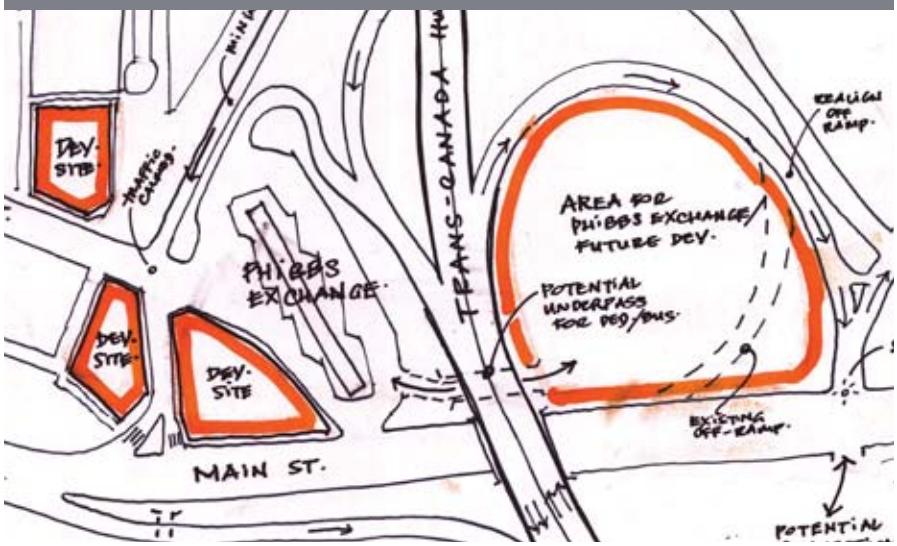
- Keep the exchange at its current location, such that, high-quality transit service will continue to be conveniently available in Lower Lynn.
- Explore opportunities to acquire surplus land around the exchange (currently owned by the Provincial Government) and convert it into development sites to better integrate the neighbourhood with the exchange.
- Develop high-quality passenger amenities at the exchange while maintaining functionality for transit vehicles.
- Provide new retail opportunities adjacent to the exchange, with sufficient development setbacks to provide a generous sidewalk and pedestrian-oriented building frontages.
- Explore the feasibility of establishing an adjacent plaza area incorporating retail shops which would provide conveniences and also increase a sense of personal security for passengers through additional lighting and natural surveillance.

These ideas are consistent with the guidance provided in **D2 Distance** and **D3 Design**, and further solutions for the exchange will be explored and developed in TransLink's Phibbs Exchange Concept Study, to be initiated in 2012.

To integrate TDM planning:

With new land uses in the area and improved conditions for walking, cycling, and transit, it is anticipated that more trips will be made on foot, bicycle, or transit and that new development in the area will attract residents interested in making trips by these modes of transportation. Any reduction in parking requirements for mixed use or multi-unit developments in Lower Lynn will also encourage more trips by walking, cycling, and transit. Specific demand management strategies have not yet been developed for this area.

Rough design sketches helped identify how added activity, safety, and an attractive environment could be introduced around Phibbs Exchange with new development.



Source: District of North Vancouver

3.5 Creating a More Transit-Oriented Community in Lower Lynn, District of North Vancouver: An Illustrative Process

3.5.3 Emerging Outcomes of Neighbourhood Scale Planning

The Lower Lynn case study provides a useful illustration of how the 6 Ds can be considered throughout a planning process. The principles laid out in these guidelines were used to identify and capitalize on the neighbourhood's strengths and to address its challenges and opportunities.

D1: Destinations

Land use and transportation planning efforts in the District's OCP have been coordinated to ensure that growth centres are located on the FTN. Lower Lynn has been designated as a growth centre to take advantage of its excellent transit connectivity and accessibility on the way to several high-demand destinations. The District has also identified Lower Lynn as a FTDA as part of the Regional Growth Strategy.

D2: Distance

To create safe, comfortable, and well-connected streets for pedestrians and cyclists, new pathways have been proposed to shorten distances to transit and new and existing crosswalks are being designed to be highly visible. In particular, these proposals aim to ensure that there are safe, comfortable, and direct routes around the community that connect with the bus exchange and safe bike storage in appropriate locations.

D3: Design

The District of North Vancouver is planning significant investment in design treatments to support a walkable area, including wide landscaped sidewalks and enhanced cycling facilities, as well as weather protection, building setbacks, and boulevard treatments for major streets, and street-facing retail. The District is also looking into the feasibility of such strategies as filling vacant land that surrounds the bus exchange with closer development and active street frontages, thereby creating a stronger sense of place and enclosure and allowing for natural surveillance and improved personal safety.

3.5 Creating a More Transit-Oriented Community in Lower Lynn, District of North Vancouver: An Illustrative Process

D4: Density

To help ensure that growth is accommodated in higher-density, mixed-use neighbourhood centres, North Vancouver's OCP envisions intensification with 3,000 new housing units in Lower Lynn Town Centre over the next 20 years.

D5: Diversity

The mix of residential, employment and other uses proposed for this area will promote walking within the defined neighbourhood, as well as bi-directional use of the FTN.

D6: Demand Management:

The District's key TDM initiatives have included mixing land uses and improving conditions for walking, cycling, and transit as comfortable and convenient travel choices. Reduced parking requirements may also be permitted in some cases, provided a trip-reduction strategy is included in a development proposal.

The neighbourhood planning exercise helped clarify the multi-modal transportation network in Lower Lynn which, in coordination with the land use plan, will support a more transit-oriented community.

Map 9. Lower Lynn Town Centre Mobility Network Map

DNV Official Community Plan | Schedule A

identity 113


PESSAC CENTRE

Appendices

A

The LRT provides convenient connections to mixed-use, pedestrian-scale destinations around the city, supporting the use of walking, cycling, and transit as preferred modes of travel.

Bordeaux, France.

A1 Transit-Oriented Communities Checklists

The following pages present a set of transit-oriented communities checklists that municipalities and other stakeholders are invited to use when applying these guidelines or when adapting them to specific needs and contexts. For convenience, the digital file is available in a spreadsheet format on TransLink's website at **www.translink.ca/TOCs**.

The checklists provide a simple approach to evaluating development proposals, community plans, and other proposals relevant to the design principles of transit-oriented communities, using a 'traffic light' scoring system whereby the design topics are presented as a series of questions and rated as green, amber, or red, where:

- a green light signifies that the topic has been considered and fully addressed,
- an amber light signifies that the intent of the guidelines has been partially addressed, and
- a red light signifies that the guidelines have not been addressed.

Those topics rating red or amber may require further consideration if the design is to meet with best practices. As the checklists are not intended to limit flexibility, no weightings are applied.

Three checklists, organized by geographic scale, have been provided. The first addresses projects and plans that consider community design at the corridor scale, such as transit and transportation corridor plans and OCP updates. The second is for use in projects and plans at the neighbourhood scale, such as neighbourhood plans, station area plans, and new street design standards. The third addresses the individual site scale when planning a new development project or reviewing a development application.

A1: Corridor and Regional Level Checklist

Corridor and Regional Level	Rating				Comments	Proposed Actions
Potential uses include transit/transportation corridor planning and OCP updates.	GREEN	AMBER	RED	N/A		
Regional Context						
Does the corridor connect one or more Urban Centres, Special Employment Areas, or FTDAs?						
Does the development contribute to meeting regional and/or municipal targets or desired outcomes (e.g., % mode share by sustainable modes and % of population and jobs located along the FTN)?						
Transit Context						
What is the highest order of transit service being aspired to along the corridor?						
Does the development provide sufficient support for the aspired level of transit service?						
Local Context						
Is the development consistent with the local vision and objectives for the area?						
D1. Destinations: Coordinate land use and transportation						
Does the proposal align major destinations and trip-generating uses along a direct corridor served by existing or planned frequent transit?						
Does the proposal focus the highest intensities of development at the most connected transit nodes (including Urban Centres)?						
Are both ends of the corridor anchored by an Urban Centre, major trip-generating use, or rapid transit station or exchange?						
Are there any Urban Centres, major trip-generating uses, or rapid transit station or exchanges located along the mid-point of the corridor to encourage shorter trip distances and promote transit passenger turnover?						
D2. Distance: Create a well-connected street network						
Does the proposal:						
Include connected networks of pedestrian and bicycle paths?						
Locate higher-intensity development in areas with well-connected street networks?						
D3. Design: Create places for people						
Does the plan or proposal:						
Encourage transit priority treatments in the design of streets?						
Contain design strategies to increase the travel-time competitiveness of transit?						
D4 Density: Concentrate and intensify activities near frequent transit						
Are areas of higher density being located in places on the existing or planned FTN?						
Does the plan or proposal focus most of its growth near frequent transit?						
Are major trip-generating uses located within 400 m of rapid/frequent transit?						
Are most office uses located within Urban Centres (highest priority) or around rapid transit stations or key nodes along the frequent transit network?						
D5. Diversity: Encourage a mix of uses						
Does the plan call for a mix of uses throughout the corridor to promote all-day bi-directional use of transit?						
D6. Demand Management: Discourage unnecessary driving						
Are sufficient strategies included in the plan to reduce auto ownership rates and auto usage?						
Does the plan call for:						
The cost of off-street parking to be unbundled from housing and commercial leases?						
On-street parking to be priced?						
Reduced or eliminated minimum parking requirements for new developments near rapid transit or in areas with high transit access to destinations?						
Will the proposed development make use of TDM measures where and when appropriate?						

A1: Neighbourhood Level Checklist

Neighbourhood Level	Rating				Comments	Proposed Actions
Potential uses include creating street design standards, neighbourhood plans, FTDA plans, and station area plans.	GREEN	AMBER	RED	N/A		
Regional Context						
Is the planning area located within an Urban Centre, Special Employment Area, or FTDAs?						
Transit/Corridor Context						
Does the planning area act as an existing or future frequent transit node where multiple frequent transit services intersect?						
Does the planning area act as an anchor or mid-point to an existing or planned FTN corridor?						
Do plans provide sufficient support for the aspired level of transit service?						
Local Context						
Are plans consistent with the local vision and objectives for the area?						
D1. Destinations: Coordinate land use and transportation						
Does the plan focus growth and key destinations within 400 m of bus stops with frequent transit service and within 800 m of rapid transit stations?						
D2. Distance: Create a well-connected street network						
Does the plan provide for a well-connected network of sidewalks and other pedestrian facilities?						
Will the neighbourhood have direct, high-quality pedestrian and bicycle paths to and from key transit passenger facilities?						
Does the plan provide for a well-connected network of bicycle facilities?						
Will the neighbourhood primarily include blocks no longer than 150 m?						
Will new arterial streets served by transit be approximately 800 m apart?						
Will proposed intersection density be at least 0.4 intersections per gross hectare?						
D3. Design: Create places for people						
Are high-quality sidewalks provided on at least one side of all streets and on both sides of arterials and collectors?						
Are there safe pedestrian crossings available at all intersections?						
Has traffic been calmed to speeds that are safe and comfortable for pedestrians?						
Are traffic signals in the neighbourhood timed to favour safe and comfortable pedestrian crossings?						
Are streets designed for universal access by people with disabilities?						
Does the design and placement of off-street parking facilities reduce its visual impact?						
For greenfield or major redevelopment sites, has the land use pattern been planned concurrent with complementary walking, cycling, and transit infrastructure and services?						
D4 Density: Concentrate and intensify activities near frequent transit						
Does the plan:						
Focus the highest intensity of use within 400 m of frequent transit and within 800 m of an existing or planned rapid transit station?						
Call for lower-density and auto-oriented uses farther away from frequent transit?						
Call for appropriate transitions between higher- and lower-density areas?						
D5. Diversity: Encourage a mix of uses						
Does the plan:						
Allow for a mix of residential, commercial, and/or institutional uses?						
Call for active uses within 200 m of transit facilities?						
Call for an appropriate amount of public open space?						
D6. Demand Management: Discourage unnecessary driving						
Does the plan:						
Encourage shared parking arrangements to minimize the amount of parking required?						
Encourage the cost of parking to be unbundled from housing and commercial leases?						
Call for pricing of on-street parking?						
Call for reduced or eliminated minimum parking requirements in Urban Centres, around rapid transit stations, or in areas with high transit access to destinations?						

NOTE

Please refer to Metro Vancouver's Regional Growth Strategy for additional guidance on Urban Centres and Frequent Transit Development Areas.

A1: Site Level Checklist

Site Level	Rating				Comments	Proposed Actions
Potential uses include planning a new development and reviewing a development application.	GREEN	AMBER	RED	N/A		
Regional Context						
Is the site located in an Urban Centre, Special Employment Area, or FTDAs?						
Transit Context						
If the site is a transit passenger facility or is adjacent to one, please also refer to the evaluation framework within the Transit Passenger Facility Design Guidelines.						
Are there any special transit considerations that need to be addressed (e.g., special types of transit facilities)?						
Local Context						
Is the development consistent with the local vision and objectives for the area?						
Does this site provide a key opportunity for development? Or is it a critical location that should be left undeveloped until a long-term, transit-oriented use is found?						
D1. Destinations: Coordinate land use and transportation						
Is the proposed site for higher-density development located within 400 m of existing or planned frequent transit or within 800 m of an existing or planned rapid transit station?						
If it is a major trip-generating use, is it located within 400 m of rapid/frequent transit?						
D2. Distance: Create a well-connected street network						
Does the proposed development site allow for direct, high-quality pedestrian and bicycle paths to and from nearby transit passenger facilities?						
If the proposed development includes new streets:						
Does it plan for blocks no longer than 150 m?						
Does it plan for an intersection density of at least 0.4 intersections per hectare?						
Are all internal streets open to the public?						
D3. Design: Create places for people						
Does the ground floor of the proposed building(s) address the street and contribute toward an active street frontage and visual interest for pedestrians?						
Does the exterior treatment of the proposed building(s), regardless of size and mass, create a space that is interesting and comfortable on a human scale?						
If located along an arterial where transit service is provided, does the building entrance provide close and convenient passenger access to frequent transit stops or stations?						
If the site is adjacent to an existing or planned rapid transit station, has the building design been well integrated with the existing or future station?						
Does the proposed development:						
Provide high-quality pedestrian ammenities (e.g., wayfinding, street furniture, trees and landscaping, and pedestrian-scale lighting)?						
Provide adequate bicycle parking?						
Provide universal access for people with disabilities?						
Provide protection from the sun, wind, and rain?						
Allow for natural surveillance ('eyes on the street') to enhance security?						
If the proposed development includes new streets, are these streets designed with high-quality, accessible sidewalks, bicycle paths, and pedestrian and bicycle crossings at intersections?						
Does the design and placement of off-street parking facilities reduce its visual impact?						
D4 Density: Concentrate and intensify activities near frequent transit						
If the proposed development is located within 400 m of frequent transit or within 800 m of a rapid transit station:						
Does it provide the highest intensity of use that is appopriate to the existing neighborhood context?						
Does it avoid providing lower-density and auto-oriented uses?						
Does it minimize space used for off-street parking in order to provide additional land and floor space for a mix of active uses?						
D5. Diversity: Encourage a mix of uses						
Does the proposed development either provide a mix of uses or add new land uses that will contribute to a 'complete community' in the surrounding area?						
If the proposed development is located within 200 m of a transit facility, does it provide retail or services that may be valuable to transit riders?						
Does the proposed development include public open space?						
D6. Demand Management: Discourage unnecessary driving						
Does the proposed development include shared parking arrangements in order to minimize the amount of parking required?						
Will the cost of parking be unbundled from housing and commercial leases?						
If the proposed development includes new streets, will on-street parking be priced (if appropriate to location)?						
If the development is within 400 m of frequent transit or within 800 m of rapid transit, will reduced parking standards be used to encourage sustainable travel?						
Will the proposed development include carsharing on-site?						
Will the proposed development make use of TDM measures?						

A2 How the 6 Ds Relate to Transportation Outcomes

The 6 Ds framework for transit-oriented communities is based on empirical research into the relationship between the built environment and transportation outcomes. This appendix summarizes some of the evidence behind each of the 6 Ds.

A large and growing body of research demonstrates how community form shapes travel behaviour. A recent comprehensive review of the literature on how individual and household travel behaviour relates to differences in the built environment analyzes and summarizes the research on how VKT (Vehicle Kilometres Travelled), transit use, and walking vary with respect to differences in community form (Ewing and Cervero, 2010).[1] These variables are of particular interest to TransLink and its partners because they relate to the regional and municipal goals of increased walking, cycling, and transit, reduced greenhouse gas emissions, and improved air quality.

These relationships are stated in terms of elasticities, which describe how a percentage change in one variable affects a percentage change in a second variable. For example, if a 100% increase in variable A corresponds with a 50% increase in variable B, then the elasticity of A with respect to B is 0.5.

All of these relationships are what economists call 'inelastic', meaning that a given percentage difference in any of the built form variables corresponds with a more modest difference in travel behaviour. Inelasticity occurs because other factors besides built form – including, income, geography, culture, and habit – influence travel behaviour. Though inelastic, these relationships are far from unimportant. In their meta-analysis, Ewing and Cervero find that by following through on land use and transportation visions using the tools available, more transit-oriented communities can meet their region's goals for mode shift and a more sustainable transportation system (while also helping to achieve other important policy goals).

1 The most recent and comprehensive meta-analysis of the literature on this topic, this review is organized to compare disparate findings and measures across the available studies. The authors' analysis reveals the elasticity of VKT (Vehicle Kilometres Travelled), transit use, and walking across a number of variables that represent different aspects of the built form. See the authors' summary table of their research on p. 143.

A2 How the 6 Ds Relate to Transportation Outcomes

The research shows that **destination** accessibility – how easy it is to reach homes, businesses, and other destinations using a particular mode of transportation – has an important relationship with how people move around. The closer and more connected a community is to the centre of the region, for example, the fewer kilometres residents will need to drive (on average, a 10% decrease in the distance to downtown corresponds with a 2% decrease in VKT). Similarly, when more jobs are accessible by way of transit, people use transit more often (a 10% increase in the number of jobs accessible by transit corresponds with a 0.5% decrease in VKT).

The **distance** a person must travel to reach a transit station or stop also corresponds strongly with choice of travel mode; for example, a 10% decrease in the distance from transit along the shortest street routes predicts, on average, a 2.9% increase in transit ridership and a 1.5% increase in walking. When thinking about community design, this finding has two important implications: the more homes, businesses, and other activities that can be located near transit, the better utilized transit will be and the less people will need to drive. As traveling to transit occurs not 'as the crow flies', however, but by using the available streets, a well-connected street network is equally essential for reducing traveler's effective distance to transit.

Research shows that street connectivity and block length have strong relationships with walking and transit use; for example, a 10% increase in intersection density corresponds with a 3.9% increase in walking, a 2.3% increase in transit use, and a 1.2% decrease in VKT. In addition to being important indicators of effective distance to transit, block length and street network connectivity are often used in transportation research to represent **design** quality. Short blocks and well-connected streets contribute to a higher-quality pedestrian experience and pedestrian realm, and they often occur in places where other elements of good design, such as adequate sidewalks, are also in place. Because of the importance of details and context, other aspects of design quality are difficult to quantify. [2]

2 Other, more tailored measures of design quality tend to be complex – in that they try to address the multitude of factors that make up good design through multi-part indices – and/or they require observational data that is not feasible to collect on a regional scale.

A2 How the 6 Ds Relate to Transportation Outcomes

Summary of the elasticities (impact) of the 6 Ds on selected transportation outcomes[3]

		WEIGHTED AVERAGE ELASTICITY OF AUTO USE (VKT)	WEIGHTED AVERAGE ELASTICITY OF WALKING	WEIGHTED AVERAGE ELASTICITY OF TRANSIT USE
Destinations	Jobs within one mile (1.6 km)		0.15	
	Job accessibility by auto	-0.20		
	Job accessibility by transit	-0.05		
	Distance to downtown	-0.22		
Distance and Design	Distance to nearest transit stop	-0.05	0.15	0.29
	Intersection density	-0.12	0.39	0.23
	Four-way intersections		-0.06	0.29
Density	Population density	-0.04	0.07	0.07
	Job density		0.04	0.01
	Commercial floor area ratio		0.07	
Diversity	Land use mix	-0.09	0.15	0.12
	Jobs/housing balance	-0.02	0.19	
	Distance to a store	-0.12	0.25	
Demand Management	Parking price	-0.1 to -0.3		

3 All data from Ewing and Cervero (2010). Demand management data from Kuzmyak, Weinberger, and Levinson (2003) and Vaca and Kuzmyak (2005) as documented in Litman (2012).

A2 How the 6 Ds Relate to Transportation Outcomes

The research shows clearly that land use **density** alone – without walkability, a mix of uses, and good transit access – does not significantly reduce driving: when all other factors are excluded, a doubling of density corresponds with just a 4% decrease in VKT. Density is the most important factor, however, allowing more people to live and work near good transit (as discussed in the distance findings above) and creating a market for a mix of uses within walking distance (see diversity findings below) are also critical. As a primary causal factor, density by itself is a weak predictor of transportation behavior; however, density combined with transit provides an exceedingly important precondition for other factors that reduce driving and promote transit and walking.

Research also shows how a **diversity** of land uses (including residential, commercial, industrial, institutional, and recreational) promotes walking and transit ridership and reduces driving. A common way to measure land use diversity in the transportation research is to create an index that assigns a high value to areas with a broad mix of land uses and a low value to areas with just one use. When land uses are more mixed, more daily needs can be met within walking distance: on average, a 10% increase in land use diversity corresponds with a 1.5% increase in walking (as well as a 1.2% increase in transit use and a 0.9% decrease in VKT).

Though not documented in the Ewing and Cervero analysis discussed above, an extensive body of research demonstrates the important influence of **demand management** policies on travel behaviour. Numerous studies show that employer-based TDM programs reduce employee vehicle commute trips by up to 36%, with the largest reductions achieved through parking pricing.[4] The literature also shows the primary importance of the price and availability of parking on choice of travel mode. Studies reviewed by the Victoria Transportation Policy Institute, for example, demonstrate that an average increase of 10% in the price of parking corresponds with a 1% to 3% decrease in vehicle trips.[5]

4 Willson and Shoup (1990); Comsis Corporation (1993); Valk and Wasch (1998); Pratt (2000).

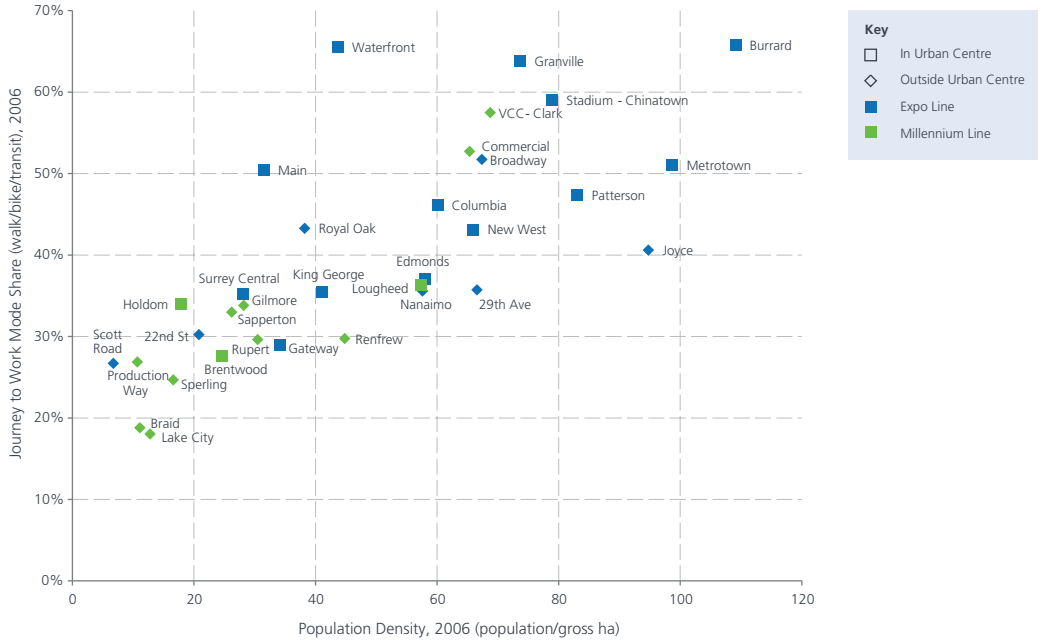
5 Kuzmyak, Weinberger and Levinson (2003) and Vaca and Kuzmyak (2005) as documented in Litman (2012).

A2 How the 6 Ds Relate to Transportation Outcomes

In the Metro Vancouver context, these examples show that higher intersection density (D2 Distance) and higher population density (D4 Density) around transit stations supports higher sustainable travel mode share.

Intersection Density, 2011 versus Journey to Work Mode Share (walk/bike/transit), 2006, for People Living Within 800 m of a Rapid Transit Station

Population Density versus Journey to Work Mode Share (walk/bike/transit) for People Living Within 800 m of a Rapid Transit Station, 2006



Source: Statistics Canada custom Census data, courtesy of Metro Vancouver, and Digital Road Atlas.

A3 Glossary

A

Accessibility (to destinations) – the ease of obtaining desired goods, services, and activities from a particular location; usually related to the time and/or distance required to access destinations.

Active uses – retail, commercial, and leisure land uses that facilitate street animation and natural surveillance through the provision of amenities or activities of interest.

Amenity – a service or element of the built environment that provides comfort, pleasure, or convenience.

Anchor – a trip-generating land use located at or near the end of a transit corridor, ensuring high utilization of the corridor's capacity all the way to the end.

Arterial street – a high-capacity urban road that connects traffic from collector roads to highways; designed to provide a high degree of mobility to, from, and within urban areas; usually located where transit services are provided.

B

B-Line – bus routes that provide frequent, fast, limited-stop service from early morning through late evening.

Bus bulge – a type of transit priority measure that includes a curb extension of the sidewalk into the nearest travel lane, reducing the need for buses to pull over at stops and then wait to merge back into traffic.

Bus Rapid Transit (BRT) – driver-operated bus technology that provides faster, more frequent, and more reliable service in dedicated lanes with longer stop-spacing than conventional bus services.

C

Carsharing – a membership-based model of car rental where people rent cars for short periods of time, often by the hour; attractive to customers who make only occasional use of a vehicle where owning a vehicle (or additional vehicles) is not cost-effective.

A3 Glossary

Complete community – neighbourhoods that provide an appropriate balance of residential and employment land uses, as well as facilities and services that meet most daily needs; this mix is facilitated in a community design that locates amenities for convenient access by walking, cycling, and transit.

Complete street – roadways designed and operated to meet the needs of all road users, ensuring safe, attractive, and comfortable access and travel for pedestrians, cyclists, motorists, and transit users of all ages and abilities.

Connectivity (spatial) – see **permeability** (spatial).

Coordination of land use and transportation – the purposeful alignment of the goals, processes, and outcomes of the planning, development, and operation of transportation systems with the planning, development, and regulation of land uses and built form; at the macro-level, coordination often occurs in the planning of regional transportation systems and growth management strategies.

Corridor – a broad, linear geographic area that follows predominant travel patterns connecting major origins and destinations; may contain a number of streets, highways, and transit routes.

Crime Prevention Through Environmental Design (CPTED) – a multi-disciplinary approach to deterring criminal behaviour through design; CPTED strategies rely primarily on changes to the built environment to influence offender behaviour that precedes criminal acts.

Curb extension – an extension of the sidewalk into the parking lane at intersections, a transit stop (see bus bulges), or a mid-block crossing to reduce pedestrian crossing distances and improve pedestrian visibility in order to increase pedestrian safety.

D

Density – the amount of a given characteristic (e.g., jobs, people, and housing units) present within a given geographic area (usually hectares in Canada and acres in the USA).

A3 Glossary

Desire line – preferred travel paths (usually with respect to walking and cycling) based on the convenience of travelling from one location to another; desire lines can be sidewalks and formal routes or informal paths.

E

Elasticity – describes the inter-relationship between two variables and how a change in one variable affects a change in the other (usually stated as a percentage); for example, if a 100% increase in variable A corresponds with a 50% increase in variable B, then the elasticity of A with respect to be is 0.5.

Exchange – a transit passenger facility serviced by more than one mode of transit, more than one rail-based line, or a significant number of bus-based transit routes, whereby transit passengers use the facility to connect from one route to another.

F

Fine-grained street network – a well-connected street system where the urban fabric consists of several small blocks and intersections in proximity to one another; fine-grained street networks are easy to navigate and promote non-motorized forms of travel.

Form-based code – a land use classification system that uses physical form, rather than separation of uses, as its organizing principle; form-based codes provide development flexibility and limit constraints to site-specific opportunities – by defining the interaction between building façades and the public realm, the form and mass of adjacent buildings, and the scales and types of streets and blocks – rather than prescribing acceptable uses.

Frequent transit – see **Frequent Transit Network**.

Frequent transit corridor – refers to the 400 m pedestrian catchment area around transit corridors that are on TransLink's Frequent Transit Network.

Frequent Transit Development Area (FTDA) – an overlay district designation in Metro Vancouver's Regional Growth Strategy; a priority growth area designated by a municipality (in consultation with TransLink and Metro Vancouver) adjacent to an existing or future Frequent Transit Network corridor; FTDAs are intended to accommodate higher-density development around frequent transit.

A3 Glossary

Frequent Transit Network (FTN) – a network of corridors in Metro Vancouver along which transit service is provided at least every 15 minutes in both directions, throughout the day and into the evening, every day of the week; a high frequency and span of transit service within a corridor, which may be provided by a single route or by a combination of routes and/or technologies within the same corridor (the FTN does not refer to specific routes, technologies, or vehicle types).

Frequent transit node – the 400 m (for stops) or 800 m (for stations and exchanges) area around transit passenger facilities where two or more frequent transit services intersect; unlike Urban Centres or FTDAs, frequent transit nodes may not have a specific designation within local or regional planning documents.

Front façade lot coverage – describes the length (usually stated as a percentage) of façade that abuts the sidewalk or is within a reasonable pedestrian-oriented setback from the sidewalk; for example, a retail store with an adjacent parking lot would likely have a front façade lot coverage of 50% or less (since the parking portion would not have a façade that abuts the sidewalk).

G

Greenways – designated routes for recreational use, travel by walking or cycling, and/or environmental protection by municipal, provincial, or federal levels of government.

H

High density – urban development where there are a high number of people or jobs in a particular site or area in relation to the size of that site or area; generally characterized by buildings higher than eight storeys on smaller sites with limited undeveloped land, such multi-family apartments or condominiums and office towers; high density (gross) is generally described as more than 50 residential units per hectare (approximately 130 people per hectare) or 50 jobs per hectare.

Historic street grid – the street pattern developed in the early days of urban development in North America, which used closely spaced streets on a perpendicular grid and rarely included curved streets or cul-de-sacs.

A3 Glossary

I

Integration of land use and transportation – coordinating the planning and design of the physical development, operations, and functions of buildings and public spaces with the design, construction, and operation of transportation facilities and services.

Intersection density – the number of intersections in a given area; corresponds closely to block size where the greater the intersection density, the smaller the blocks and the more connected the street network.

L

Legibility – refers to the ability to easily locate, discern, and navigate one's surroundings.

Light Rail Transit (LRT) – driver operated, electrically-powered, urban rail technology – primarily at-grade and within a dedicated right-of-way – that provides interurban services using unique vehicle and station design to integrate into communities.

Livability – the combination of subjective life-satisfaction indicators and objective determinants of quality of life – such as safety, air quality, and built environment; access to public space and to community facilities and services; and average income and cost of living and infrastructure – that relate broadly to the population of a city, region, province/state, or country.

Low density – urban development where there are a low number of people or jobs in a particular site or area in relation to the size of that site or area; generally characterized by one- or two-storey buildings on large sites with abundant undeveloped land, such as single-family housing or commercial warehouses; low density (gross) is generally described as less than 10 residential units per hectare (30 people per hectare) or 10 jobs per hectare.

M

Massing – the overall shape and arrangement of the bulk or volume of a building or development.

Mobility – the movement of people or goods; one of several means of gaining access (see Accessibility) to destinations.

A3 Glossary

Mode share – the percentage of travelers using a particular form of transportation (e.g., walking, cycling, transit, automobile driver or passenger, and taxi).

N

Natural surveillance – uses design features to increase the visibility of a property or building; aims to reduce illegal or anti-social behaviour and increase personal safety and security by keeping areas under constant observation, thereby making such behaviour less likely to occur.

O

Official Community Plan (OCP) – a statement of objectives and policies, made by municipal or regional governments, that guide decisions on planning and land use management within the area covered by the plan and respecting the purposes of local government.

Opportunity sites – potential higher-density development sites in key locations near rapid transit stations and transit exchanges or along existing or planned frequent transit corridors.

Overlay district – an additional zoning requirement placed on a geographic area that does not change the underlying land use designation; a common tool for establishing development restrictions or providing incentives in areas that warrant special consideration, such as transit orientation, historic preservation, and/or environmental protection.

P

Parking management – the various strategies, policies, and programs that may promote more efficient use of parking resources and facilities in urban areas; parking management plans generally seek to develop cost-effective measures and/or programs that can reduce parking requirements.

Pedestrian-scale – development designed with an emphasis on the street sidewalk and on pedestrian access to commercial and residential areas and to rapid transit stations and transit stops; such environments may be enhanced with human-scale lighting, landscaping, and other street amenities.

A3 Glossary

A3 Glossary

Permeability (spatial) – the interconnectedness (or connectivity) between street networks that encourages walking, cycling, and transit by creating direct paths along desire lines.

Price signal – a message sent to consumers and producers/providers in the form of the cost of a commodity, which signals producers/providers to increase supplies and/or consumers to reduce demand.

Public realm – outdoor areas accessible and usable to the public, including streets and the spaces between and around buildings.

R

Rapid transit – an urban transit service characterized by high carrying capacity and by speed, frequency, and reliability (high speed and reliability are usually achieved through separation from other modes of travel); typically provided by transit technologies such as rail rapid transit, light rail transit and bus rapid transit.

Regional Growth Strategy (RGS) – a growth management strategy for a region adopted by a jurisdiction that has statutory authority for this responsibility (in BC this jurisdiction is a regional district); BC's Local Government Act states that the purpose of an RGS is to "promote human settlement that is socially, economically and environmentally healthy and makes efficient use of public facilities and services, land and other resources." In the Metro Vancouver region, Metro Vancouver is responsible for preparing, adopting, and implementing the RGS in conjunction with affected local governments and other stakeholders.

Regional Transportation Strategy (RTS) – defines and outlines the overall transportation plan for a given region. In Metro Vancouver, the RTS is prepared by TransLink in consultation with the stakeholders in the region and the public and covers a period of at least 30 years; the RTS sets out the goals, directions, and key initiatives for the regional transportation system.

Resiliency – the ability of places to be adaptable and to retain their value as great places to live, work, and visit, even as the surrounding context and the needs of residents change.

A3 Glossary

S

Sight line – the unobstructed view between an observer and an object.

Single-occupancy vehicle (SOV) – a private vehicle operated by a single person.

Station – a transit passenger facility serviced by rail rapid transit, light rail transit, or bus rapid transit.

Station area – the 800 m radius surrounding a rapid transit station (the radius is 400 m for local transit stops); operationally, radius is typically represented as an 'as-the-crow-flies' distance, but can also be based on actual physical distance by way of available paths that can be covered in a 10-minute walk.

Stop – a transit passenger facility serviced by bus-based transit.

Stop area – the 400 m radius surrounding a transit stop (the radius is 800 m for rapid transit stations); operationally, radius is typically represented as an 'as-the-crow-flies distance, but can also be based on actual physical distance by way of available paths that can be covered in a 5-minute walk.

Sustainable transportation – any means of transportation that is energy efficient, has minimal impact on the environment, and uses renewable energy (or minimizes the use of non-renewable fossil fuels); usually refers to non-automobile trips – such as walking, cycling, and transit – but can also include carpooling and carsharing.

T

Territorial reinforcement – defines clear boundaries between public, semi-private, and private space using objects such as signs, walls, fences, buildings, and pavement to define property lines.

Transit-oriented community (TOC) – a place (neighbourhood, corridor, municipality, or region) that, by design, facilitates decreased reliance on driving and higher levels of walking, cycling, and transit use; in practice, it means concentrating higher-density, mixed-use, human-scale development around frequent transit stops and stations, in combination with parking management and TDM measures, to discourage unnecessary driving.

A3 Glossary

Transit-oriented development (TOD) – a higher-density development that is integrated with or oriented toward a rapid or frequent transit service and that is fundamentally shaped by its close proximity to transit.

Transit passenger facility – any component of the transit network (e.g., stops, stations, and exchanges) that interfaces with passengers and provides them with access to the transit network.

Transit priority – an infrastructure measure that gives transit vehicles priority over other road users in order to improve the speed, efficiency, and reliability of the service.

Transportation demand management (TDM) – the application of policies, strategies, and initiatives that aim to reduce travel demand, specifically that of single-occupancy private vehicles, or to redistribute this demand in space or time.

Trip-generator – a development that generates or attracts a high volume of trips as a function of demographic attributes (e.g., population and employment) and the characteristics of the persons and activities on the site, such as land use, hours of operation, size of development, and attractiveness to a range of people.

U

Unbundled parking – separating the pricing of residential and commercial parking from housing and tenancy costs in order to reduce the demand and space required for parking.

Urban Centre – an important focal point for jobs, homes, institutional facilities, services and entertainment, community and cultural activity, and future growth; generally characterized by higher population and employment density and more trip generators when compared to surrounding areas; designated in Metro Vancouver's Regional Growth Strategy, Urban Centres are intended to be the region's primary focal points for concentrated growth and transit service.

A3 Glossary

Urban Containment Boundary – defined in Metro Vancouver's Regional Growth Strategy, this boundary controls urban expansion into rural areas, reducing urban sprawl and promoting the efficient use of land, public facilities, and transit services; in Metro Vancouver, the Urban Containment Boundary is intended to establish a stable, long-term, regionally defined area for urban development.

V

Vehicle kilometres travelled (VKT) – a measure of the extent of motor vehicle operation; the total number of vehicle kilometres travelled within a specific geographic area over a given period of time.

W

Walkability – a measure of how supportive an area is of walking, as indicated by access to local destinations (e.g., shops, parks, schools, and transit), the safety and comfort of users, and the presence of pedestrian sidewalks and crosswalks.

Wayfinding – the way in which people orient themselves and navigate their movements from place to place; the design, coordination, and location of information (e.g., signs, maps, and diagrams), in conjuntion with the architectural and interior design, all serve to aid wayfinding and help travelers plan and execute their journeys.

Z

Zoning – the municipal land use practice of assigning all parcels of land within a community into separate zones, where each zone is designated for a specific land use or mix of land uses.

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A5 References and Resources

TRANSLINK'S TRANSIT-ORIENTED COMMUNITIES WEB PAGES

Find more details and best practice information on TransLink's website at: **www.translink.ca/TOCs**

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