The Metro Vancouver Apartment Parking Study

Revised Technical Report

Metro Vancouver
Metropolitan Planning, Environment, and Parks
September 2012

Executive Summary

Encouraging compact communities, sustainable transportation choices, and housing affordability are well-established objectives in Metro Vancouver's *Regional Growth Strategy* and *Regional Affordable Housing Strategy*. Parking is at the nexus of these objectives. Given that apartments represent over one-half of new housing starts in the region today and will remain so over the next three decades as the population grows by one million people, having current and efficient parking requirements are critical to the achievement of a sustainable region and livable neighbourhoods.

In metropolitan Vancouver, the cost of constructing on-site structured parking can range from $20,000 to $45,000 per stall, plus maintenance costs. Ensuring the parking requirements match actual demand can help reduce unnecessary housing development costs.

The Metro Vancouver Apartment Parking Study is one of the most comprehensive examinations of apartment parking supply and demand conducted on a metropolitan area. Through the exploration of emerging trends, review of past studies, discussions with municipal planners, engineers, and developers, and completion of two regional surveys, a robust evidence base was established.

Current and Emerging Trends

The amount of parking required in new apartment developments should reflect current and emerging trends. Transit ridership continues to increase year after year, in part from improved transit service levels and the expansion of TransLink's Frequent Transit Network. Since 2008, the region has seen a steady decline in the rate that additional cars and light trucks have been added to the region. High fuel prices have become the norm. Carshare programs have exploded in popularity in recent years such that the region has one of the most competitive markets in all of North America. Whether or not these patterns will continue on to become long-term trends, the evidence does point minimally to the need to revisit basic assumptions about the supply and demand for apartment parking in the region.

Lessons from Studies in Other Cities

Previous studies from other cities have consistently showed that parking supply in apartments close to transit exceeds parking demand by a wide margin. A common limitation of some of these studies was their singular focus on proximity to rail transit and a lack of comparative data on apartments located further away from transit. The Metro Vancouver Apartment Parking Study addresses this significant research gap by surveying apartment sites close to frequent bus corridors, SkyTrain stations, SeaBus stations, and sites further away from the Frequent Transit Network.

Lessons from Current Practices

Dialogues with apartment developers and municipal planners yielded insights about current practices in the region. Most municipalities stipulate minimum parking requirements of at least 1.0 stall per apartment unit. A few municipalities stipulate reduced residential parking requirements based on proximity to transit. Most allow for reduced requirements for non-market housing or seniors housing sites. Minimum visitor parking requirements are typically set at 0.2 stall per apartment unit.

Due to the diverse urban and transportation contexts of the region, there was no consensus from apartment developers on whether current municipal minimum parking requirements are too high or too low. Developers expressed reluctance to push for parking reduction variances for fear of risking the viability or approval of a project. An increasing number of municipalities are interested in updating their parking bylaws for new apartment developments close to existing and new SkyTrain stations.

Parking practices in the region were also compared to progressive practices in Calgary, Toronto, Montreal, Seattle, Bellevue, Portland, and Denver. These jurisdictions offer interesting lessons for metropolitan Vancouver:

Features	Metropolitan Vancouver	Other Cities: Calgary, Toronto, Montreal, Seattle, Bellevue, Portland, Denver
Minimum parking requirements	Most municipalities stipulate minimum parking requirements of at least 1.0 stall per apartment unit.	All of the cities reviewed have minimum parking requirements of less than 1.0 for their urban cores. Seattle and Portland have 0 minimums in specific geographic areas.
Maximum parking requirements	Only City of Vancouver and UBC Point Grey Campus stipulate maximum parking requirements.	Calgary, Toronto, Montreal, Portland, Bellevue have parking maximums.
Geographic-specific parking requirements	Most municipalities do not stipulate reduced parking requirements based on proximity to transit.	Calgary, Toronto, Montreal, Denver, Seattle, Bellevue, and Portland vary their parking requirements for specific geographic areas.
Consideration of frequent bus corridors	Planners and developers in the region typically recognize SkyTrain stations, but not frequent bus corridors, for marketing and potential parking reductions.	Toronto, Seattle, Portland, and Denver vary their parking requirements based on transit frequency, not technology.

Key Findings from the Parking Facility Survey and Household Survey

The only reliable way to evaluate whether current parking requirements are providing a good match between supply and demand is through surveys of recently built and fully occupied apartment buildings in the region. In the Fall of 2011, Metro Vancouver carried out two regional surveys. In the Parking Facility Survey, the number of parking stalls and parked vehicles in 80 participating apartment sites were counted on weeknights. In the Household Survey, Metro Vancouver distributed surveys to apartment households to obtain more information about parking habits and preferences. Over 1,500 apartment households responded.

The key findings were:

- Residential parking supply in strata apartments generally exceed parking demand in the range of 18-35 percent across the region.

- Residential parking demand is lower near TransLink's Frequent Transit Network. For apartments near the Frequent Transit Network, the parking demand range is 0.89 – 1.06 vehicles per apartment unit; whereas for apartments further away from the Frequent Transit Network, the parking demand range is 1.10 – 1.25 vehicles per apartment unit.

- Residential parking demand near Frequent Transit Network bus stops are similar to demand near SkyTrain/SeaBus stations, but the parking supply is higher.

- Vehicle holdings and parking demand for apartment renters are much lower than for owners. This is consistent with prior research. In purpose-built market rental sites, the parking demand range is 0.58 - 0.72 vehicles per apartment unit.

- Visitor parking supply may be over supplied. Observed parking demand rates were below 0.1 stall per apartment unit, compared to the typical municipal requirement of 0.2 visitor stall per apartment unit.

- Participation in carshare programs was highest in Vancouver (16% of surveyed households) and UBC (15% of surveyed households), where carshare programs predominantly operate. Households with carshare memberships have fewer vehicles than do non-members.

- Proximity to transit was consistently cited by over half of the households surveyed as one of the top three factors when choosing their current home.

Apartment Parking Near the Frequent Transit Network

Updating parking requirements for apartments is not something that is regularly completed for various reasons. What the study provides is objective evidence that communities and developers can use when determining the appropriate amount of parking in new apartment developments.

The greatest opportunities for change are new apartment sites near the Frequent Transit Network (generally within 400 metres of a frequent bus stop and/or within 800 metres of a SkyTrain station). High density communities with a robust network of frequent transit services offer the best opportunities to put these findings into practice. For suburban communities lacking the coverage of frequent transit services, these opportunities may be treated as long-term goals.

In the long-run, the benefits of taking action will be more efficient and livable neighbourhoods in Urban Centres and Frequent Transit Development Areas, improvements to housing affordability and housing choice, and greater use of sustainable transportation choices.

1. Treat On-Site and Street Parking as a System: A more holistic approach toward parking supply and parking demand management for new apartment projects is warranted. Attention should be paid to the availability, type, and relative permanence of street parking (e.g., free, paid, permit-only, and/or time-limited) and surrounded land uses, in association with any reductions in on-site parking requirements.

2. Encourage Parking Supply to Match Demand Near the Frequent Transit Network: Parking requirements should be set based on actual or expected demands with further reductions based on transportation demand management measures or other site-specific conditions.

3. Encourage Parking Unbundling/Opt-Out: Selling parking stalls separate from apartments or allowing consumers to opt out of a parking stall will increase choice, and provide the opportunity for consumers without cars to realize some modest improvement in affordability.

4. Encourage Rental Apartments Near the Frequent Transit Network: Apartment renters generally have lower parking demands than do owners, and living close to the Frequent Transit Network provides an opportunity to be less reliant on a private vehicle. For these reasons, it makes sense to encourage development of more rental apartment units close to the Frequent Transit Network.

5. Encourage Expansion of Carshare Programs where Feasible: Municipalities and developers should encourage carshare providers to expand beyond current operating boundaries to such places as emerging Urban Centres and Frequent Transit Development Areas in suburban areas where practical and feasible.

6. Consider Allowing Amendments to Parking Supply after Pre-Sales: It is often only after apartment pre-sales that developers will have better data to support modifications to residential parking supply. By adapting municipal processes to accommodate amendments before construction, the parking efficiency of new apartment developments can be improved.

7. Conduct Regular Post-Occupancy Surveys: Regular and frequent post-occupancy surveys of apartment projects should be conducted to provide timely information on parking demand in recently-built and fully-occupied apartment developments. Industry groups, such as the Urban Development Institute and the Urban Land Institutes, should contribute resources to these research efforts and support widespread dissemination of the findings.

8. Coordinating Frequent Transit Network Expansion: Uncertainties in the future stop or station locations of the Frequent Transit Network, and the staging of expansion, can be addressed effectively through enhanced collaboration and information sharing between TransLink and municipal partners.

Next Steps

Metro Vancouver's role is largely leadership through research, outreach, collaboration, and advocacy. Metro Vancouver is committed to working with stakeholders to advance the study findings. A summary booklet accompanies this technical report to be shared with a wider audience. Metro Vancouver will continue to cooperate with partners to further the implementation of the *Regional Growth Strategy* and *Regional Affordable Housing Strategy*, including matters related to parking, through timely research of best practices and empirical data collection and analysis.

Acknowledgements

Metro Vancouver would like to thank all individuals and parties who provided their expert opinions and feedback. They include the development community who provided insight about the apartment development design, approval and marketing process; and, municipal planners and engineers who provided information about current parking practices, challenges, and opportunities. The study could not have been completed without the cooperation of apartment property managers who provided building contact information, the condominium strata organizations that granted access to their parkades, and the individuals who took time to complete the household surveys.

Acuere Consulting Ltd., led by Clark Lim (principal) and Ken Tseng (survey manager) provided solid and dependable technical assistance in the design and implementation of the surveys. Special thanks go to the Insurance Corporation of British Columbia for providing timely data on vehicle licensing, BC Hydro and the City of New Westminster for providing electricity consumption data, and to municipal and TransLink staff for their feedback.

All analyses presented in this technical report were prepared by Metro Vancouver staff.

Metro Vancouver Project Staff
Raymond Kan (Project Manager/Senior Regional Planner)
Eric Aderneck (Senior Regional Planner)
Janet Kreda (Senior Housing Planner)
Meredith Seeton (2011 summer technical assistant)
Rosa Shih (2012 summer technical assistant)

Table of Contents

1 Introduction and Study Scope

Apartment parking is an issue at the intersection of sustainable urban development, transportation planning, and housing affordability. In metropolitan Vancouver, there is a growing interest by municipalities to refine the amount of parking required in new apartment developments, in particular near transit, and to require facilities or other measures that support other modes of travel, such as bicycle storage facilities and carshare vehicles and stalls.

Residential developers also have a financial stake in providing the appropriate amount of parking to meet the expectations of potential customers. Excessive parking can result in the inefficient use of land or resources, and unnecessarily add to the cost of housing and reduce affordability. Conversely, insufficient parking can lead to developer concerns about unmarketable units and neighbourhood dissatisfaction over vehicles spilling onto surrounding streets.

Getting parking "right" will have long lasting benefits for municipalities, developers, and residents. The region has been and will continue to move towards compact communities served by transit. Therefore, the issue of parking is only going to become more critical to the transportation efficiency and livability of neighbourhoods and communities, and to the overall sustainability of the region.

The challenge of addressing apartment parking has been the lack of evidence to support or refute existing regulations and practices. Hence, in consultation with the Metro Vancouver Regional Planning Advisory Committee (RPAC), Major Roads and Transportation Advisory Committee (MRTAC), and the RPAC Housing Subcommittee, Metro Vancouver undertook a region-wide apartment parking study in 2011. The objectives were to:

1. Establish a reliable evidence base on apartment parking supply and demand;
2. Provide guidance that municipalities and other stakeholders can use when determining parking supply in new apartment developments and other related apartment parking management strategies, with an emphasis on sites close to TransLink's Frequent Transit Network.

The study comprised the following:

- A review of the literature, including comparable apartment parking studies conducted recently;
- A review of current practices by municipalities in metropolitan Vancouver;
- A review of current practices in other cities in Canada, the United States, and Europe;
- Key informant interviews with residential developers and municipal planners;
- Two surveys conducted in the region:
  - Parking Facility Survey of parking occupancy rates in 80 apartment sites
  - Household Survey of 1,500 households residing in 90 apartment sites
- Identification of opportunities for apartment parking near the Frequent Transit Network

The interviews with developers were completed in March-May 2011. During this same period, feedback was received from municipal planners and engineers via e-mail. The review of current parking requirements based on bylaws from municipalities was completed in early 2012. The two surveys were conducted in September - November 2011 with the assistance of Acuere Consulting Ltd.

2 Defining the Problem and Opportunities

This section outlines the policy context for studying apartment parking, the cost of constructing parking, current and emerging trends, including the emergence of TransLink's Frequent Transit Network.

2.1 Regional Planning and Policy Context

Encouraging compact communities, sustainable modes of travel, whether by transit, walking, cycling, or carpooling, and increasing affordable housing choices for all segments of the population are keys to enhancing the economic, environmental, and social sustainability of metropolitan Vancouver. These values are well-established in regional plans. Efficient parking requirements will help contribute to the achievement of these objectives.

Regional Growth Strategy

The Regional Growth Strategy envisions a transit-oriented region arranged in an interconnected network of Urban Centres and Frequent Transit Development Areas, complemented by viable industrial and agricultural lands, and protected conservation/recreational areas. The majority of the residential growth – an additional one million new residents – over the next 30 years will be accommodated in the form of redevelopment within the Urban Centres and Frequent Transit Development Areas.

The region has been moving in the right direction. The majority of new residential development in the region is in the form of apartments and townhouses. Of the average 16,300 housing starts per year between 2007 and 2011 in the region, 59 percent have been apartments, 18 percent townhouse/rowhouse/semi-detached, and 23 percent single-detached homes.

In terms of specific actions, the Regional Growth Strategy requests that municipalities set out policies in their Regional Context Statements that establish or maintain reduced residential and commercial parking requirements in Urban Centres and Frequent Transit Development Areas, in coordination with the provision of transit, where appropriate.

The Regional Growth Strategy also strives for a sustainable region where transit, walking, cycling, and carpooling are popular alternatives to the single-occupant vehicle. TransLink's Transport 2040 also envisions a region where the majority of jobs and housing are located along the Frequent Transit Network, and where most trips are made by transit, walking, and cycling. Nearly three out of four trips made in the region today are in a private car or truck. The availability and cost of parking is one aspect of development that could have an effect on evolving travel behaviour.

Regional Affordable Housing Strategy

One of the greatest challenges facing metropolitan Vancouver is housing affordability. Metro Vancouver's Regional Affordable Housing Strategy recognizes that a broader range of housing choices near transit will contribute to more complete communities and expand opportunities for more people to benefit from regional transit investments. A well-housed population is also fundamental to the functioning of the region's economy.

Metro Vancouver estimates that new residential growth will increase the demand for affordable housing to at least 6,500 new rental units each year in the next decade, of which close to 5,000 units should be targeted to low-to-moderate income households. Well located, affordable rental and ownership housing is vital to the social and economic well-being of the region.

The Regional Affordable Housing Strategy includes "reducing parking requirements for all housing located in areas with good access to transit" as one of many actions that municipalities can take to increase the diversity and affordability of housing.

Of particular concern is increasing the supply of rental housing, but the economics of building rental housing in the region are challenging. Affordable housing providers and developers alike often raise parking as an area of cost savings that could increase housing affordability. While reducing or eliminating parking will not solve housing affordability on its own, parking reductions can contribute to lowering construction costs. In combination with other incentives, this can increase the affordability and viability of rental housing. Parking reductions are already a commonly sought variance for affordable rental housing developments. Expanding the conditions where parking reductions are used could help expand opportunities for rental housing, particularly near transit.

Implications for Renters and Low-to-Moderate Income Households

The implications of excessive parking for creating compact communities, promoting sustainable transportation choices, and reducing housing construction costs are clear. But what is underappreciated is the impact of excessive parking on lower-income renters. Renters tend to have lower incomes than owners and tend to own fewer cars than owner-occupied households. They are, not surprisingly, also more likely to depend on alternative modes of transportation including transit.

According to the 2006 Census, in metropolitan Vancouver, renters made up the majority of private apartment dwellers (59 percent). Average rents and house prices in the region have been growing at a faster rate than inflation over the past decade. Rents in purpose built apartments now average over $1,000 per month,[1] and vacancy rates have been persistently low. Rents in condo apartments are typically higher than the average rent in purpose built rental. The cost of parking is often embedded into housing prices and rents, whether or not the parking

[1] Canada Mortgage and Housing Corporation, Rental Market Report, Fall 2011. Data shown for October 2011.

is needed or not. This means that those least able to pay and least apt to use parking are often paying for the cost of parking anyway because it is included in their rent.

For low to moderate income households seeking entry level ownership housing, living in an area that does not require a vehicle for mobility, such as near transit, could lower household costs by eliminating the need to own and operate a vehicle. Being able to purchase a unit that does not include the cost of parking could provide further savings that make ownership more affordable. While affordability gains due to reduced parking costs may be quite modest, it is one tool – a low-hanging fruit – municipalities have that, in combination with other incentives can contribute to more affordable housing choices.

2.2 The Costs of Constructing Parking

In metropolitan Vancouver, the cost of constructing on-site structured parking on average ranges from $20,000 to $45,000 per stall. For underground parking facilities, the main cost driver is excavation. As underground parking facilities get built deeper down, the cost (especially after the second level) increases substantially. In these cases the marginal cost can be significantly higher than the average cost per parking stall. In addition to the capital cost, there are costs associated with maintaining the parking facility. With a reduced parking supply these costs could be reduced commensurately.

According to industry sources, the average cost to provide a parking stall can be in the range of approximately 10 percent of the apartment building construction cost. This depends on the type of apartment building structure and parking facilities as well as building specific design considerations. It should be noted that after other project costs are included -- municipal charges, infrastructure, sales and marketing – parking costs can end up being a relatively smaller component of the total project cost.[2] But from the customers' perspective, by providing too much parking, or including parking in the cost of apartment units, they have no choice but to accept an apartment with a higher cost.

Both municipalities and developers have every incentive to get parking "right." People want to be able to choose a well located, appropriately priced place to live. Municipalities want to create vibrant, harmonious, and complete communities with housing options for all income levels, and residential developers want to produce housing that meets consumer demand and fits with the community while still being able to make a profit.

But parking is something that is not always done right. It is frequently heard that the parkades in many apartment sites in the region are underutilized. Anecdotally, there have been suggestions that some parkades are half-occupied on most nights. In other instances, developers complain that municipalities are getting too far out in front of the market by requiring too few parking stalls. The contrast in perspectives is troubling. These cost variables,

[2] Source: Butterfield Development Consultants, Altus Group, and Urban Development Institute (telephone and e-mail correspondence, March 2012).

if not managed rigorously, leads to unnecessary project costs, which are either passed on to consumers or absorbed by the developer.

Prior to the Metro Vancouver study, there was limited evidence to validate or refute current apartment parking requirements in the region, particularly in locations near transit. In a past study surveying planning directors in the United States on how they set parking requirements, the two most frequently cited methods were to "survey nearby cities" and to "consult Institute of Transportation Engineers (ITE) handbooks." Both of these strategies can lead to repeating mistakes by others and not incorporating local context to set appropriate requirements.[3,4] This approach can also fail to advance policies that reflect or anticipate changing patterns in the region.

2.3 Current and Emerging Trends

Infrastructure, attitude, behaviour, and technology are constantly evolving. This section provides some indicators of current and emerging trends. Whether these patterns point to long-term trends or simply a symptomatic reflection of short-term regional, provincial, and global economic conditions, the overall body of evidence lends support to reviewing the match between parking supply and demand.

2.3.1 Emergence of TransLink's Frequent Transit Network

Transit service has improved markedly in the region over the past 10 years. In places like Vancouver, Burnaby, New Westminster, and now Richmond, transit is a viable alternative to driving a car, or even owning one. Over the past five years, TransLink has built the Frequent Transit Network into a functional and identifiable brand.

The Frequent Transit Network is a network of corridors along which transit service is provided at least every 15 minutes in both directions throughout the day and into the evening, seven days a week. The Frequent Transit Network does not refer to specific routes, technologies, or vehicle types. It provides the travelling public the certainty of consistent service levels throughout the region, and the relative permanence of established travel corridors. Another strategic intent is to influence land use decisions, so that there is a high degree of coordination between land development and transit service provision.

The Frequent Transit Network will evolve over time, as it should, in terms of improved frequencies, hours of service, and geographic extent as the region continues to densify in strategic locations in accordance to the *Regional Growth Strategy* and local plans. Looking ahead, any opportunities to provide guidance on parking requirements must take into account proximity to TransLink's Frequent Transit Network.

[3] The Trouble With Minimum Parking Requirements, Donald C. Shoup, 1999.
[4] See for example the differences between the amount of parking required in the City of Vancouver parking bylaw, the amount actually requested by the City for this project specifically, and the amount of parking recommended by the ITE Parking General Manual in the transportation assessment and management study commissioned by the proponent of the original Marine Gateway proposal in 2009 (Last retrieved from http://www.marinegateway.ca/documents/trafficStudy.pdf).

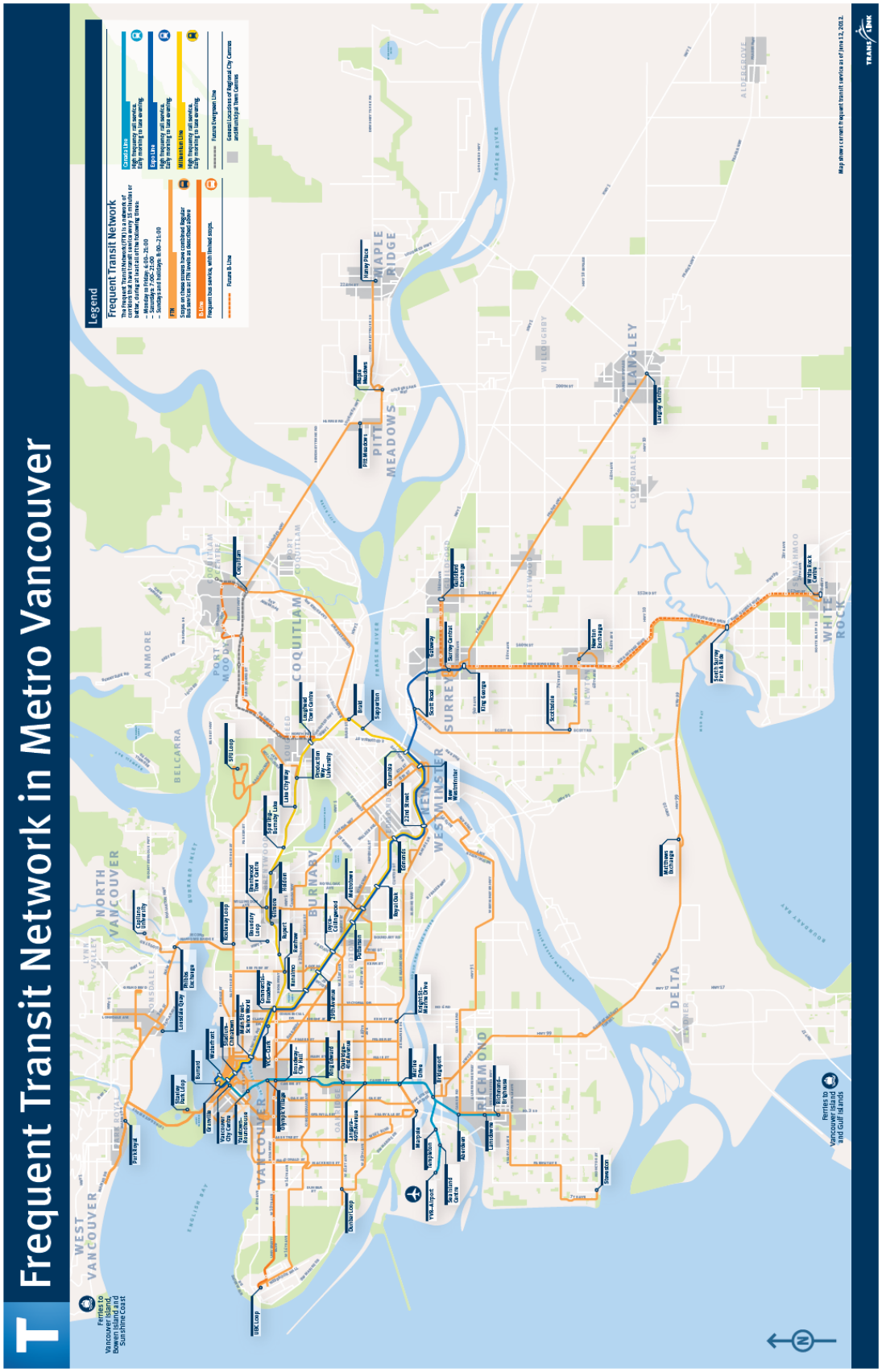


Figure 1. TransLink's Frequent Transit Network, Updated June 2012 (available at www.translink.ca)

2.3.2 Emerging Patterns in Actively Licensed Vehicles

Owning a car, or having access to one, has been one of the quintessential symbols of the North American lifestyle for decades. But this may be changing now as historically high gas prices (in current terms) remain unabated; the younger generation of adults are choosing to live in higher-density areas close to transit, shops, and other amenities; the older generation of adults are downsizing and shedding the second or third family car; and, transit service has improved throughout the region. These are some of the anecdotes that are often mentioned, whether to reinforce urban densification and compact community policies, or to shed light on the evolving cultural mores of car ownership in light of peak oil, climate change, a volatile economy, and demographic changes.

In metropolitan Vancouver, a slowdown in the growth of passenger vehicles is emerging. Taking data of all actively licensed cars, motorcycles, and light trucks with Insurance Corporation of British Columbia insurance renewal reminder addresses in metropolitan Vancouver and operated within the region, Figure 2 shows the absolute number of licensed vehicles as of December of each year, and the year-on-year change.

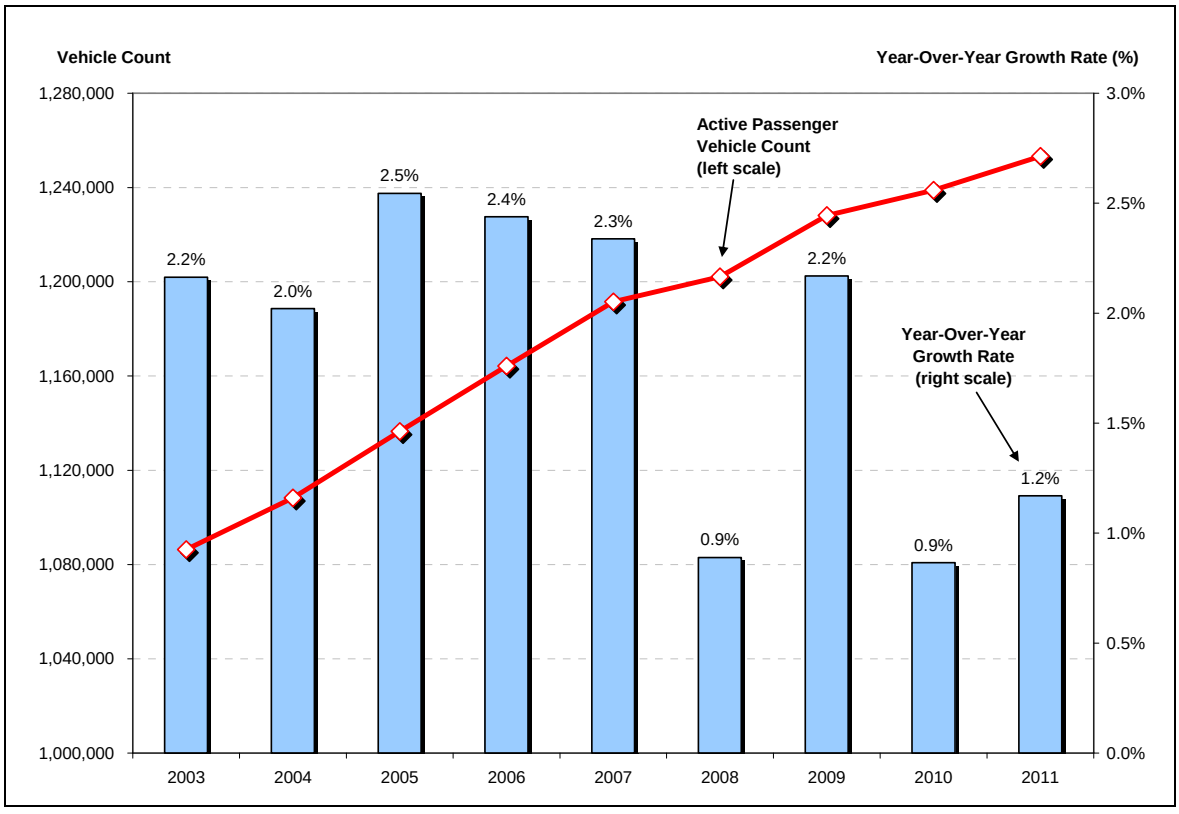


Figure 2. Actively Licensed Passenger Vehicles in Metro Vancouver (December 31 of each year)

Between 2002 and 2007, the year-on-year increase in the number of passenger vehicles averaged between 2.0 and 2.5 percent. More vehicles than people were being added to the

region every year.[5] In late 2008, at the peak of the global recession, the year-on-year growth in vehicles fell below 1.0 percent. Growth in passenger vehicles rebounded by the end of 2009, but retracted to around 1.0 percent in 2010 and 2011.

Figure 3 shows the pattern on a monthly basis between 2007 and 2012. During this period, the average annual growth rate was tracking just below the regional population growth rate of 1.8 percent – a reversal of the prior five-year period when vehicles were growing faster than population.[6]

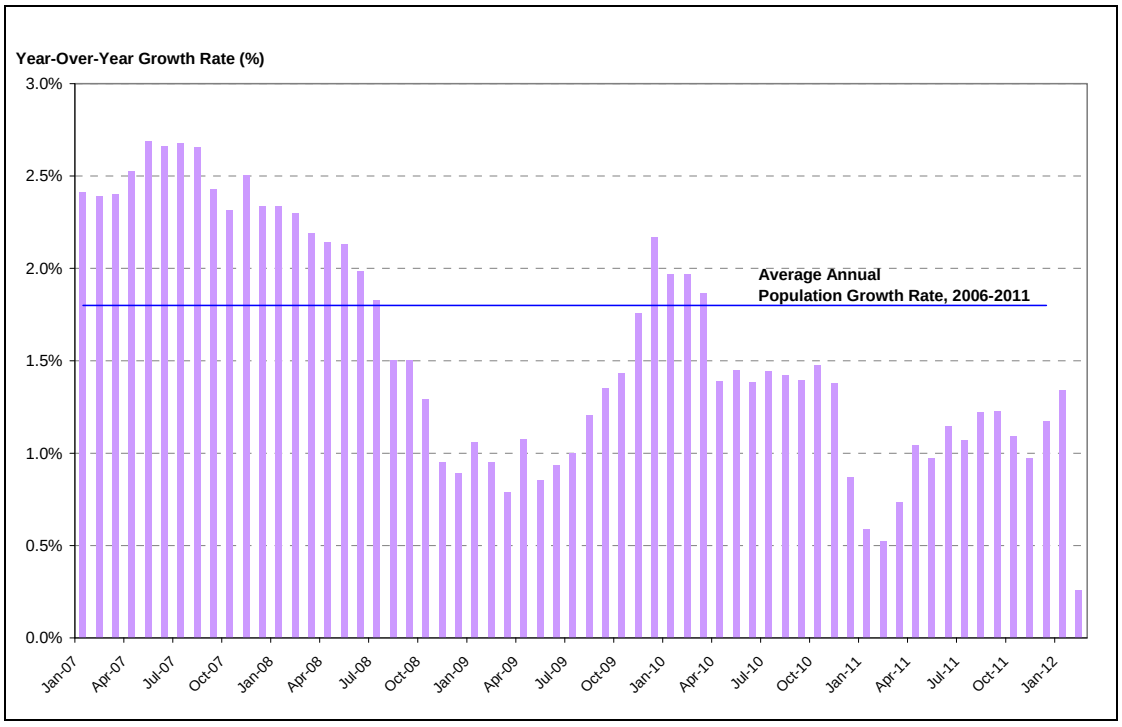


Figure 3. Actively Licensed Passenger Vehicles in Metro Vancouver (year-on-year change by month)

2.3.3 Emergence of Carsharing Programs

Carsharing programs are increasingly popular in North American cities and particularly in dense urban areas. These programs provide consumers with a cost-effective alternative to owning a car when they only need a car infrequently. Individuals and households join these carshare programs for different reasons, such as wanting to save on owning and operating a car or reducing environmental impacts. Regardless of the specific personal reasons, carshare programs can have profound impacts on car ownership by allowing a household to shed one or more vehicles, or delay the purchase of an additional vehicle. One of the local carshare providers in the region reported in 2008 that 15.5 percent of members were able to give up

[5] Between 2001 and 2006, the annual average population growth rate in Metro Vancouver was 1.3 percent. Between 2006 and 2011, the population growth rate was 1.8 percent.

[6] At the subregional level, actively licensed vehicle growth rates vary. Pitt Meadows, Maple Ridge, and communities south of the Fraser River are experiencing growth rates generally higher than the regional average. The Northeast Sector, Burnaby, and New Westminster are essentially tracking the regional average. The North Shore, Vancouver, Richmond, and Delta are experiencing much lower growth rates.

their only vehicle after becoming a member, while an additional 3.7 percent were able to give up a second car. Also, close to 7 out of 10 members reported that their mobility has improved since joining the carshare program[7]. These effects have been validated in research elsewhere[8,9].

One Toronto study reviewed car sharing impacts elsewhere in North America. Generally, each carshare vehicle was found to replace approximately four private vehicles, and six to eight residents avoided having to purchase a vehicle in the first place. Based on the evidence, the study recommended that in Toronto, the minimum parking requirement for apartments should be reduced by up to four stalls for each carshare stall, and that the carshare stalls should not be counted towards the maximum allowable parking provision, if applicable. The implications for parking requirements in new apartment developments are immense, especially in increasingly denser areas of metropolitan Vancouver.

The metropolitan Vancouver market is served by three carshare providers: Modo, Zip Car, and the latest entrant, car2go. These programs operate primarily in the higher density parts of the region where car ownership rates are lower and access to transit and other amenities by walking is more convenient. These carshare providers are constantly looking for new members as well as new locations to expand their market and station their fleet. Hence, the providers are very interested in securing carshare program parking in new residential developments, in addition to other locations.

To encourage this, some municipalities are allowing developers to provide fewer resident parking stalls in exchange for providing one or more carshare parking stalls and funding for a carshare vehicle. The carshare vehicle could then be purchased and managed by a carshare provider. Access to the vehicle may or may not be restricted to residents of the building only. A study recommended reducing residential minimum parking requirements by 5-10% when a carsharing program is located nearby, or reducing 4-8 parking spaces for each carshare vehicle parked in the building[10].

It would appear that the increasing acceptance of carshare programs by consumers and the competitive marketplace in metropolitan Vancouver could yield beneficial results for a broad range of stakeholders. Developers can save on the development costs of providing the full amount of parking in exchange for providing carshare stalls and vehicles; building-specific or area residents can have additional mobility options and reduce expenditures on transportation; and surrounding neighbourhoods could potentially experience less congestion from resident and visitor vehicles. Reduced parking requirements and carshare programs appear to be two mutually reinforcing strategies.

[7] The Car Co-op Social and Environmental Report 2008. The Co-operative Auto Network.
[8] Carsharing's Impact on Household Vehicle Holdings: Results from a North American Shared-Use Vehicle Survey, Elliot Martin, Susan Shaheen, Jeffrey Lidicker, University of California, Berkeley, March 15, 2010
[9] Parking Standards Review: Examination of Potential Options and Impacts of Car Share Programs on Parking Standards, Submitted to the City of Toronto by IBI Group, 2009.
[10] Parking Standards Review: Examination of Potential Options and Impacts of Car Share Programs on Parking Standards, Submitted to the City of Toronto, by IBI Group, March 2009, Final Report.

3 Review of Parking Studies from Other Jurisdictions

Residential parking in apartment developments is an under-studied aspect of urban and regional planning. In metropolitan Vancouver, municipalities undertake sporadic surveys of specific sites. To inform the approach for the Metro Vancouver study, a high-level scan of recent apartment parking studies and surveys was completed, in addition to the literature cited in Section 2. The following is a summary of the review.

3.1 City of Vancouver

The City of Vancouver has made progressive amendments to its parking bylaw since it was first introduced in 1986 based on periodic data collection, including a major study in 1996.

In 1996, Greystone Properties, the developer of Collingwood Village in the Joyce-Collingwood SkyTrain precinct, in association with the Cities of Vancouver and Burnaby, commissioned a household survey of parking demand in select SkyTrain precincts (Nanaimo, 29th Avenue, Joyce-Collingwood, Patterson, Metrotown, and Royal Oak) and surrounding neighbourhoods in Vancouver and Burnaby. The surveys were conducted by phone, hand-outs at existing Greystone projects, and mail-back surveys. Surveys were administered in about 60 sites comprising 4,000 households. A total of 555 surveys were completed (response rate of 14 percent).

Some of the key survey findings were[11]:

- The average vehicle ownership rate for households within 300 metres of a SkyTrain station was 0.96, compared to 1.05 for comparable-sized units beyond 1,000 metres of a station.
- Household income was the primary differentiator between vehicle ownership rates: households earning more than $70,000 per year owned 1.51 vehicles, while households earning less than $30,000 had 0.73 vehicles.
- There was no clear gradient in vehicle ownership between sites located 50 metres, 100 metres, or 300 metres from a SkyTrain station.
- The actual amount of parking being built exceeded the bylaw requirements of the time.

Ultimately, the findings helped inform the City of Vancouver to reduce on-site parking requirements by 25 percent below the then-current level in Collingwood Village.

More recently in 2004, households living in 10 recently-built condominium sites in the Marpole neighbourhood were surveyed.[12] The results showed that for those sites close to frequent bus stops, the vehicle ownership rate was comparable to that found in the 1996 study of sites near the Joyce-Collingwood SkyTrain station. Subsequently, in 2005, the City amended its parking bylaw to reduce parking requirements in Marpole, along Kingsway, Central Broadway, and other nodes throughout the city (usually at the intersection of frequent bus corridors).

[11] A précis of the study can be found here: http://www.citebc.ca/Feb98_Ownership.html
[12] City of Vancouver report to Council: http://vancouver.ca/ctyclerk/cclerk/20050426/tt3.pdf

3.2 City of Toronto

In 2006, the City of Toronto retained Cansult Limited to conduct a parking study of apartments (strata, market rental, and non-market rental) and condominium townhouses to inform potential new parking requirements under a new unified zoning bylaw.[13]

The Toronto study employed a mail-out survey to gauge the level of vehicle ownership and parking demand[14]. The household survey was conducted on residents of apartments and townhouses built since 1975. Prior to this study, the last major parking study was conducted in 1977 focusing on downtown Toronto.

The household survey obtained 4,698 household responses from rental and condominium apartment sites (50.4 percent response rate) and 784 household responses from condominium townhouse developments (23 percent response rate). The study was able to obtain a high response rate because a systematic method of follow-up was employed. After the first wave of survey packages was mailed to over 9,000 households, reminder/thank you postcards were mailed out in the following week. Two weeks later, a second wave of survey packages was mailed out to the remaining 7,000 households who had not responded.

A rich dataset was assembled that allowed for exploration of the relationships between parking demand and the following factors:

- Tenant tenure (rent versus own)
- Building tenure (purpose-built rental, non-market rental, condominium)
- Unit type (bachelor suite, one, two and three plus bedrooms)
- Unit size (square feet)
- Building size (number of units)
- Geographic group
    - Downtown core
    - Downtown Toronto and central waterfront
    - Centres and avenues on the subway
    - Avenues well-served by surface transit
    - The rest of the city

The study found that vehicle ownership varies by location, but the variance was not consistent between condominium and market rental apartments:

- Average auto ownership in market rental apartments in the sample was 0.73. The rates in the downtown core and downtown and central waterfront areas were substantially lower than in suburban locations.

[13] City of Toronto, Parking Standards Review – Phase Two Apartment Building / Multi-Use Block Developments Component, New Zoning Bylaw Project, Cansult Ltd, 2007.
[14] The assessment of visitor parking demand was supplemented by a survey of several condominium visitor lots and data from the parking manager of market rental buildings.

- Average auto ownership rates in condominium apartments in the downtown core and downtown and central waterfront areas were at around 1.0 vehicle per household. In suburban locations not served by rapid transit, the rate was only slightly higher at 1.08 vehicles per household.
- Average auto ownership in condominium apartments in designated centres and avenues on the subway had the highest reported vehicle ownership of 1.15 vehicles per household. The study suggested that this may be due in part to the higher income characteristics of the specific buildings surveyed.

The study also confirmed the following relationships:

- Auto ownership increases with the number of bedrooms
- Controlling for the number of bedrooms, condominium units have the highest vehicle ownership, followed by market rental apartments, then non-market rental apartments
- Market rental apartments in more suburban locations have higher vehicle ownership rates and are nearly the same levels as condominium units in the same locations.
- Owner-occupied households own more vehicles than do renter-households, even controlling for unit type.
- The relationship between vehicle ownership for 2-bedroom condominium units and subway access was relatively weak.
- The relationship between vehicle ownership and building size (total units) was weak.

Based on the empirical evidence, the study team proposed aggressive minimum and maximum residential and visitor parking requirements for condominium apartments and rental apartments in each of the five geographic groups. Subsequently, the City of Toronto adopted new parking regulations which reflect these recommendations (see Section 5 for details).

3.3 East Bay (San Francisco Bay Area) and Metro Portland

In 2008, researchers from the University of California, Berkeley directly surveyed the parking demand in 31 apartment sites within 1,000 metres of suburban rail stations in the East Bay of the San Francisco Bay Area and in Metro Portland.[15] The research team surveyed each site during the "peak" period of 12AM to 5AM, and the off-peak period of 10AM to 2PM.

The study found that parking supply exceeded peak parking demand (number of parked vehicles per unit) by 33 percent in the East Bay and 42 percent in Metro Portland. The observed demand was similar to the guideline of 1.2 stalls per unit issued in the ITE *Parking Generation Manual*.

[15] University of California Transportation Center, UCTC Research Paper No. 882, Are TODs Over-Parked? Robert Cervero, Arlie Adkins, and Cathleen Sullivan University of California, Berkeley.

Table 1. Results of East Bay Study

Sites within 1,000 metres of a rail station	Parking Stalls Per Unit	Parked Vehicles Per Unit	Oversupply of Parking
East Bay (16 sites)	1.59	1.20	33%
Metro Portland (15 sites)	1.52	1.07	42%

The study found several on-site and off-site factors were significant predictors of parking demand. The significant on-site factors were parking supply and the project's land area (although the researchers noted that these two factors are likely not independent from each other).

The significant off-site factors were walking distance and peak headways of the nearby rail services. The non-significant predictors of parking demand included project density, rent levels, and the socio-demographic characteristics of the surrounding neighbourhood.[16]

The researchers, through cross-referencing another study[17], suggest that in suburban transit-oriented developments, households tend to shed more vehicle trips than they shed vehicles. In other words, households will still need access to a vehicle, but will use it less for work trips. For non-work trips, a vehicle would still be desired and needed. The researchers suggest that carsharing programs could be a powerful policy response to meet these lifestyle choices and to encourage more households to shed their personal vehicles.

3.4 Santa Clara County (San Francisco Bay Area)

In 2010, graduate student researchers at San Jose State University, in collaboration with the Santa Clara Valley Transportation Authority, surveyed 12 apartment sites near light rail and commuter rail stations in Santa Clara County, a largely sprawling suburban county in southern San Francisco Bay Area.[18] The approach was identical to that employed in the 2008 study of East Bay and Metro Portland sites.

The sites selected for the study were generally older than one year, presumably had few vacancies, and had at least 80 units. Nine of the sites were within 800 metres of a rail station, the remaining three within 1,600 metres. On-the-ground surveys were conducted on a mid-week night between 12AM and 4AM.

The study found that parking supply (1.68 stalls per unit) exceeded parking demand (1.31 parked vehicles per unit) in all 12 sites by an average of 22 percent. The research team goes on

[16] University of California Transportation Center, UCTC Research Paper No. 882, Are TODs Over-Parked?, Robert Cervero, Arlie Adkins, and Cathleen Sullivan University of California, Berkeley.
[17] Vehicle Trip Reduction Impacts of Transit-Oriented Housing. Robert Cervero and G. Arrington. 2008. Journal of Public Transportation, 11(3):1-17.
[18] A Parking Utilization Survey of Transit-Oriented Development Residential Properties in Santa Clara County, San José State University, Santa Clara Valley Transportation Authority, SJSU/VTA Collaborative Research Project, Volume I: Technical Report, 2010.

to recommend that parking demand in transit-oriented sites in Santa Clara County could support a parking requirement of 1.3 stalls per unit.

3.5 Evidence from Europe

In the report "Europe's Parking U-turn: From Accommodation to Regulation", the Institute for Transportation & Development Policy[19] presents case studies from 10 European cities that have implemented aggressive parking management strategies that make residential and commercial parking generally less accessible and more expensive, as well as other steps to make neighbourhoods more pedestrian friendly.

Some of the results include: significant reductions in private car trips; less congestion; reductions in air pollution; revitalized and thriving town centers and generally improved quality of life. While the specific policies and outcomes vary, the main lesson is clear: municipal decisions on where and how much parking to provide have a significant impact on the number of trips that are taken by car versus other modes.

For residential parking, European cities are reducing or eliminating minimum parking requirements, particularly in town centres and areas with frequent transit, and in some cases imposing maximum parking provisions. This is coordinated with other parking strategies including street parking regulations, to reduce the overall demand for vehicles and use of parking. Novel ideas include allowing owners of parking spaces in garages to lend them temporarily to visitors by way of controlled reservations, and allowing residential vehicles to park overnight in loading zones.[20]

The European case studies provide evidence that systematic management of residential and non-residential parking supply and pricing can have beneficial reductions in vehicle usage, improved modal shares for transit, and improved urban landscapes. This transportation supply management feature may encourage people to consider other modes of transportation, such as walking, cycling, transit, and car sharing.

[19] Kodransky, Michael and Gabrielle Hermann. Europe's Parking U-Turn: From Accommodation to Regulation. Institute for Transportation & Development Policy. 2011

[20] Ibid.

3.6 Key Lessons Learned

Several key lessons emerged from the review of the five parking studies both on the methodologies employed and on the substance of the findings:

- On-the-ground surveys provide direct evidence of parking usage; household surveys provide evidence of vehicle ownership, plus, depending on the survey questions, other attributes of households and units. A combination of these approaches would appear to provide a richer set of data than either one alone.

- The Toronto and Vancouver examples provide evidence that there is a measurable difference in vehicle ownership (and therefore ultimate parking demand) between sites close to (primarily rail) transit and sites further away from transit.

- In Toronto and Vancouver, municipal councils were convinced of the evidence and amended their parking bylaws accordingly.

- The two American studies provide evidence that parking demand is measurably lower than parking supply in sites close to rail transit, even in suburban settings.

- A large focus of the studies was on the relationship between parking demand and proximity to rail stations. There remains a gap in understanding how parking demand may be different for sites close to frequent bus corridors.

- Evidence from Europe has demonstrated that systematic management of residential and non-residential parking supply and pricing can have beneficial reductions in vehicle usage, improved modal shares for transit, and improved urban landscapes. This transportation supply management feature may encourage people to consider other modes of transportation, such as walking, cycling, transit, and car sharing.

4 Review of Current Municipal Practices

4.1 Apartment Parking Requirements in Metropolitan Vancouver

Metro Vancouver staff reviewed current practice for on-site parking for apartment developments in 17 of the larger municipalities in the region, plus the University of British Columbia Point Grey Campus (Table 2)[21]. Minimum requirements were documented as well as whether the municipality made allowances for parking reductions in urban centres, near transit, for seniors and affordable housing. Some interesting patterns were found on what these jurisdictions currently require and provisions for variances.

4.1.1 Minimum Parking Requirements

Most municipalities stipulate minimum parking requirements of at least 1.0 stall per unit for apartments. Ten jurisdictions have some degree of variation of minimum parking requirements according to the number of bedrooms or floor area in an apartment unit, whereas the remaining municipalities require the same minimum number of stalls for all unit types.

The City of Vancouver and UBC Point Grey Campus are the only jurisdictions that have minimum parking requirements less than 1.0 stall per unit. They also stipulate maximum parking requirements.

The City of Vancouver, North Vancouver District, West Vancouver District, and UBC Point Grey Campus are unique in their use of the residential floor space, rather than the number of bedrooms, as the basis for deriving minimum parking requirements.

The parking bylaws are silent on the allocation of specific parking stalls to individual apartment units. Municipalities allow developers to allocate parking stalls to individual apartment units as they determine best during their sales process.

Most municipalities stipulate minimum parking requirements for visitors in addition to the residential requirement. The most common rate is 0.2 stalls per unit. In Burnaby, North Vancouver District, and White Rock, visitor parking requirements are subsumed within the residential parking requirements for apartments.[22]

Finally, Maple Ridge is the only municipality that varies its visitor parking requirement within its town centre based on the availability of on-street parking supply. The minimum requirement is 0.1 per unit if on-street parking is available, and 0.2 per unit if on-street parking is not available.

[21] To estimate, for illustrative purposes only, the number of parking stalls required per apartment based on regulations specifying floorspace ratios, the following apartment floorspace were assumed: 500 sqft for a bachelor suite; 600 sqft for a one-bedroom unit; 800 sqft for a two-bedroom unit; and, 1,000 sqft for a three-bedroom unit.

[22] By the request of Burnaby planners, the minimum residential and visitor parking requirements have been split out in Table 3.

Table 2. Select Base Apartment Minimum Parking Requirements in Metropolitan Vancouver

		Parking Requirements (Stalls per Unit)				
Municipality	**Notes**	**Bachelor Suite**	**1 Bedroom**	**2 Bedroom**	**3 + Bedroom**	**Visitor**
Burnaby	Apartments	1.35				0.25
	Urban Village Commercial (Hastings)	1.0				Off-site parking lots
	Apartments in Multiple Family Residential Districts 3, 4, and 5 (w/density bonus)	1.1				0.1
	SFU Neighbourhood District (UniverCity)	1.0 w/o flex unit; 1.25 w/ flex unit; +0.1 for each bedroom in excess of 1 bedroom				0.2
Coquitlam	Apartment	1.0	1.0	1.5	1.5	0.2
Delta	Apartment	1.5				0.2
Langley City	Multiple-Unit Residential Zone 1	N/A	1.0	2.0		0.2
	Multiple-Unit Residential Zones 2, 3, and C1	1.2		1.2-1.4	2.0	0.2
Langley Township		1.0	1.5			10% of total parking
Maple Ridge	Medium and High density	1.5				0.2
	Village/Neighbourhood Centre	1.0				0.2
	Town Centre	0.9	1.0	1.1	1.2 +	0.1 w/ on-street supply; else 0.2
New Westminster	Town, Row, Multi-family, Apartment	1.0	1.2	1.4	1.5	0.2
North Vancouver City		1.2 (including visitor parking)				Greater of 10% of parking or 0.2
North Vancouver District		1 stall per unit, plus 1 stall per 100m^2 of gross area, to maximum parking minimum of 2.0 stalls				Base includes 0.25
	Illustrative parking stalls	*1.5*	*1.6*	*1.7*	*1.9*	
Pitt Meadows		1.3	1.3	1.5	1.5	0.2 per unit
Port Coquitlam		1.0	1.3	1.5	2.0	0.2
Port Moody		1.5				0.2
Richmond		1.5				0.2
Surrey		1.3		1.5		0.2
Vancouver	Multi-family	0.5/ unit <50 m^2	0.6, plus 1 space for each additional 200m^2 of gross floor area, to max of 1.5			7.5% of base parking
	Illustrative parking stalls.		*0.9*	*1.0*	*1.1*	
	Eligible development near rapid transit or intersection of two distinct bus routes	20% reduction				7.5% of total dwelling units
West Vancouver		Greater of 1 stall per unit, or 1 stall for 84m^2 gross floor area				No explicit requirement
	Illustrative parking stalls.	*1.0*	*1.0*	*1.0*	*1.1*	
White Rock		1.5				Base includes visitor parking
UBC Campus	Parking Maximum	Lesser of 1 space per 70m^2 of building area or 1.8 space per dwelling unit				0.1 minimum
	Estimated parking spaces by unit type	0.7	0.8	1.1	1.3	

4.1.2 Allowable Parking Reductions

The municipal parking bylaws generally allow for reductions in parking from the base minimum requirement under certain scenarios. If the bylaw does not allow for reductions in minimum parking required, a variance application may be submitted by the applicant for consideration and approval by the municipal council. Table 3 summarizes the areas where municipalities allow parking reductions.

Some of the key observations are:

- Metro Vancouver municipalities generally do not stipulate reduced parking requirements near transit. An exception is the City of Vancouver with specific parking reductions near transit (i.e., within two blocks of a rapid transit station or the intersection of two distinct bus routes running north/south and east/west).

- Nine municipalities provide for parking reductions in Urban Centres or higher density areas.

- Seven municipalities allow for parking reductions in mixed-use projects with shared parking arrangements, subject to conditions (e.g., transportation impact analysis). In three municipalities, the total parking reductions can be as high as 25 percent.

- Four municipalities allow for reduced parking if transportation demand management (TDM) measures are provided. These TDM measures include carshare vehicles and stalls or bicycle spaces.

- Most municipalities allow for reduced parking requirements for non-market housing or seniors housing sites, reflecting the expected reduced vehicle ownership rates and parking demand for these households.

- Seven municipalities include provisions allowing developers to reduce the on-site parking provided subject to providing cash in lieu payments to the municipality, which may be used for off-site municipal parking facilities. This cash-in-lieu ranges from $8,000 to $35,000 per parking stall.

Table 3. Bylaw Provisions for Parking Reductions in Select Municipalities in Metropolitan Vancouver

Bylaw Provisions for Parking Reductions	Burnaby	Coquitlam	Delta	Langley City	Langley Township	Maple Ridge	New Westminster	North Vancouver City	North Vancouver District	Pitt Meadows	Port Coquitlam	Port Moody	Richmond	Surrey	Vancouver	West Vancouver	White Rock	UBC Point Grey Campus
Near Transit															✓			
Urban Centres/Higher Density Areas	✓			✓		✓				✓	✓		✓	✓	✓		✓	
Shared Parking in Mixed-Use Developments (subject to conditions)						✓	✓		✓	✓			✓	✓	✓			
TDM Requirements							✓	✓		✓			✓					
Cash-in-Lieu					✓	✓	✓	✓			✓		✓		✓			
Non-Market or Market Rental Housing	✓	✓				✓		✓					✓		✓			✓
Seniors Housing	✓		✓		✓		✓		✓		✓	✓				✓	✓	

4.2 Apartment Parking Requirements in Other Cities

Metro Vancouver staff reviewed parking requirements from a number of jurisdictions in Canada and the United States. Staff chose peer jurisdictions that share similar urban, suburban, or transit contexts as those in various subregions of metropolitan Vancouver. Toronto and Montreal both have a strong downtown core and extensive heavy rail transit systems complemented by a comprehensive network of surface transit services. Calgary and Denver are both sprawling but rapidly urbanizing city-regions served by a network of bus and light rail transit services. The Puget Sound cities of Seattle and Bellevue are served primarily by a comprehensive network of buses, although light rail transit service is emerging in Seattle, and will soon be expanded 18 km east to the suburb of Bellevue. Portland has the most comprehensive bus and light rail transit system of any medium-sized city in North America.

4.2.1 Residential Parking Requirements

All of the jurisdictions offer useful lessons, including zero minimum parking requirements. Seattle has a zero minimum parking requirement for all apartment developments in urban centres and transit station areas. The zero minimum parking requirement also applies to sites that are in urban villages and within 400 metres of frequent transit service, which is defined as 15-minute headway or better for at least 12 hours per day, 6 days per week, and 30-minute headway or better for at least 18 hours per day. In all other areas, the minimum requirement is only 1 stall per unit, but may be reduced 20 percent if the site is within 400 metres of frequent transit service. Bellevue has a zero minimum parking requirement and a 2 stall per unit maximum in its downtown (Table 4).

Toronto, as discussed in Section 3.2, has both minimum and maximum parking requirements that vary by geography and proximity to transit. The minimum requirement for 0 to 2-bedroom apartment units is under 1.0 stall per unit. Of note, Toronto City Council went even further recently by approving a 315-unit apartment building (primarily bachelor suites and one-bedroom units) in downtown without any parking supplied, other than several carshare vehicles and a bicycle stall for each unit. The site is located close to a subway station and other amenities. It is expected that very few of the occupants will own cars, and those that do have cars can find parking on nearby streets and available private parkades (see Section 5.4 for an interview with a Toronto-based transportation consultant involved in this development).

Montreal has very low minimum and maximum parking requirements in Ville Marie Borough, its central core. Montreal has a reduction of 50 percent for sites within 150 metres of a subway station.

Calgary has an across-the-board minimum requirement of 0.9 stall per unit for its downtown. Outside of the downtown (in Area 2), minimum and maximum parking requirements are stipulated. In contrast to the large range between the minimum and maximum parking requirements in Bellevue, for example, Calgary's Area 2 requirements are tightly bounded between 1.0 and 1.25 stalls per unit.

Portland has one of the more innovative suites of apartment parking requirements. The city has a zero minimum parking requirement for sites within 150 metres of a 20-minute or better peak hour transit service. For sites in the high density zoning designation, the minimum parking requirement is 0.5, which is further reduced by 50 percent if the site is also located within 150 metres of a light rail alignment. The city also allows required vehicle parking to be substituted by bicycle parking (up to 25 percent), transit-supportive plazas (up to 10 percent), and motorcycle parking (up to 5 percent).

Portland also imposes parking maximums in specific districts within the downtown, ranging from 1.35, 1.5, or 1.7 stalls per unit.

Denver's parking code is unique because it is based on an urban form typology. Minimum parking requirements are lower in the more urban environs or areas within 400 metres of transit. A parking maximum of 110% of the minimum requirement is applied to surface parking only.

4.2.2 Visitor Parking Requirements

Calgary and Toronto generally require a minimum 0.1 stall per unit for visitor parking. There was limited reference to visitor parking in urban centres and near transit in the zoning bylaws of other jurisdictions, particularly where there were "0" minimum parking requirements or parking maximums.

4.2.3 Key Lessons Learned

Several key lessons emerged from the scan of peer cities in Canada and the United States:

- The suburban cities (i.e., Calgary, Denver, Bellevue) generally have somewhat lower parking requirements than do comparable suburban municipalities in metropolitan Vancouver.
- All of the cities explicitly differentiate parking requirements for specific geographic areas, whether the downtown or areas close to transit.
- All of the cities studied have minimum parking requirements of less than 1.0 for its urban cores.
- Calgary, Toronto, and Montreal have reduced parking requirements for sites close to different types of transit technology, primarily rail-based. Seattle, Portland, and Denver have reduced parking requirements for sites close to rapid or frequent transit service, without explicit reference to technology.
- Calgary, Toronto, Montreal, Portland, Bellevue are using parking maximums, with Calgary and Toronto having the most extensive application.
- Other than Toronto, the cities do not vary parking requirements by the number of bedrooms.
- In Seattle, selling units without including parking in the unit price appears to be the norm (especially with purpose-built rental sites) and in Toronto for both condominium and rental sites.

Table 4. Select Apartment Parking Requirements in Other Jurisdictions

		Parking Requirements (Stalls per Unit)				
Municipality (population)	**Designated Geography**	**Bachelor Suite**	**1 Bedroom**	**2 Bedroom**	**3+ Bedroom**	**Visitor Parking**
Calgary (1.1 million in 2011)	Downtown	0.9				0.1
	Area 2 MIN	1.0				0.15
	Area 2 -within 600 m of LRT (MAX)	1.25				NA
	Area 1 - Rest of City (MIN)	1.0 / unit <60 sq m		1.25 / unit >60 sq m		NA
	Area 1 -within 600 m of LRT (MAX)	1.5				NA
Toronto (2.6 million in 2011)	PA 1 – Downtown Core (MIN)	0.3	0.5	0.8	1.0	0.1
	PA 1 -- Downtown Core (MAX)	0.4	0.7	1.2	1.5	--
	PA 2 and 3 -- Condo on Subway and Central Waterfront (MIN)	0.6	0.7	0.9	1.0	0.1
	PA 2 and 3 -- Condo on Subway and Central Waterfront (MAX)	0.9	1.0	1.3	1.5	--
	PA 4 -- Surface Transit (MIN)	0.7	0.8	0.9	1.1	0.15
	PA 4 -- Surface Transit (MAX)	1.0	1.2	1.3	1.6	--
	All other areas (MIN)	0.8	0.9	1.0	1.2	0.2
Montreal (1.7 million)	Ville Marie Borough (MIN)	0.25 / unit <50 sq. m		0.5 / unit >50 sq m		--
	Ville Marie Borough (MAX)	1.0 / unit <50 sq m		1.5 / unit >50 sq m		--
	Within150 metres of metro station - 50% reduction (MIN)	0.125 /unit <50 sq. m		0.25 / unit >50 sq. m		--
	For development with 6 or less units meeting specific conditions	0				--
Seattle (617,000 in 2009)	Urban Centre and station area; In Urban Villages and within 400 m of frequent transit service	0				--
	Other areas within 400 m of frequent transit	20% reduction				--
	Other areas	1.0				--
Bellevue (127,000 in 2009)	Downtown Res. Zones (MIN)	1.0				--
	Downtown Res. Zones (MAX)	2.0				--
	Downtown Transit District (MIN)	0.75 – 1.0				--
	Downtown Transit District (MAX)	2.0				--
Portland (567,000 in 2009)	Select Downtown Districts (MAX)	1.35 or 1.5 or 1.7				--
	Highest Density Zone (MIN)	0				--
	Zones within 150 metres of 20-min peak hour transit service (MIN)	0				--
	Other zones (MIN)	0.5				--
Denver (611,000 in 2009)	Urban Centre	0.75				--
	Urban Edge/General Urban neighbourhood	1.0				--
	Suburban	1.25				--
	Main Street Zones	1.0				--
	Within 400 m of transit	Up to 25% reduction (outside urban centre)				--
	Surface parking (MAX)	110% of minimum parking requirement				--

5 Key Informant Interviews

Metro Vancouver staff conducted interviews with developers and municipal planners both in the region and elsewhere[23].

5.1 Apartment Developers

In the spring of 2011, Metro Vancouver staff interviewed eight major apartment developers in the region and one townhouse developer. The interviewees were executives or senior staff directly involved in project design and approval processes. (See Appendix 2 for the list of participants and Appendix 3 for the interview questions).

Participants were asked a number of questions about their recent experiences with municipal parking bylaw requirements, receptiveness to lower parking requirements, and other aspects of parking in the residential design, approval, construction, marketing, and sales process.

The following is a summary of the developer responses without attributing specific comments to individual interviewees. The findings of these interviews informed the subsequent parking surveys and analyses.

5.1.1 Reasonableness of Municipal Residential Parking Requirements

There was no consensus on the question of whether current municipal residential parking requirements are reasonable and appropriate. One developer noted anecdotally a region-wide change in municipal council attitudes towards parking from five years ago, observing that more municipalities are appropriately asking for much less parking. Another developer noted a municipality informally applying its minimum parking requirement as a maximum instead.

Many developers expressed limited appetite for variances in parking requirements, even if they felt a lower parking requirement was appropriate. Even if it is discovered during the apartment pre-sale period (but before construction commences) that there is less demand for parking than expected, developers tend not to request a variance to the approved plans to allow for a reduction in parking construction due to the associated potential risk of approval delay. A few developers noted that some municipalities offer limited support for parking variances and that requests for parking reductions can expose developers to additional approval time and risk if the variance is not approved. An exception was in cases where the cost to build underground parking is very high (e.g., involving extensive excavation). Moreover, during the development application process, there can be significant concerns about traffic and parking from nearby residents and merchants.

The variety of development conditions throughout the region from highly urban, transit centred locations to suburban settings with limited transit options also contributed to the lack of consensus on whether current municipal parking requirements are reasonable. There was a

[23] Some of the developers also build townhouses; one developer specialized in townhouse development only.

general agreement that parking requirements should vary for smaller, lower-priced apartment units, in particular in higher-density and transit-rich areas such as downtown Vancouver.

Parking stall size and tandem parking were raised as issues. One developer stated that several municipalities require excessively large parking stall dimensions. Another developer stated that tandem stalls[24] are gaining market acceptance, especially in new townhouse designs but current parking requirements sometimes restrict them from bringing more efficient housing designs such as stacked townhouses with tandem parking to the market.

Other comments regarding municipal bylaw requirements:

- Municipalities can encourage more shared parking between commercial tenants, visitors, and residents in mixed use projects.
- In some municipalities, exclusive stalls must be provided for carwashes, which add to project costs and space consumed.
- Municipalities are increasingly asking for more disabled user stalls; however it is difficult to match these stalls with appropriate unit owners.
- HandiDART (a door-to-door shared-ride service with people with disabilities) is very restrictive in their loading locations, which can sometimes necessitate construction of an extra loading stall, which can be a problem in a smaller complex.

5.1.2 Lowering Minimum Parking Requirements

There was general agreement that targeted amendments to minimum parking requirements may be appropriate. But there was a mix of opinions on whether across-the-board modifications to minimum parking requirements or even maximum parking requirements are justifiable. One developer suggested that there is an opportunity to modify minimum parking requirements, but proposing maximum parking requirements may be too challenging, especially in mixed-use projects. Conversely, another developer stated that parking maximums would be welcomed so that developers can work within this parameter during the design process, suggesting a maximum of 1.3 stalls per unit inclusive of visitor parking independent of unit types (number of bedrooms).

5.1.3 Visitor Parking

A number of developers stated that the commonly-used minimum visitor parking requirement of 0.2 stall per apartment unit is excessive. In some instances, surplus visitor spaces were sold to tenants as privately assigned parking stalls rather than retained as designated visitor parking stalls. One developer noted that secured gates make visitor parking less accessible and therefore underused.

[24] Tandem parking stalls are two stalls arranged so that two vehicles are parked nose-to-end, rather than side-by-side.

5.1.4 Proximity to Transit

Developers expressed a common viewpoint that proximity to high quality transit matters when selecting sites, designing the amount of parking to be built, and marketing a project. Some offered the perception that SkyTrain service is a much more reliable, faster, and less crowded service compared to frequent buses and noted that they market projects as being close to a SkyTrain station, but not bus corridors. Others recognized that in parts of the region, such as in Vancouver, bus service can be as or more important than SkyTrain in terms of both service and marketability. Frequency was cited by a developer as a key attribute, whether bus or SkyTrain (staff did not ask about SeaBus or West Coast Express).

None of the developers systematically used distance-based guidelines for gauging proximity to transit. One developer suggested 400 metres to a frequent bus or SkyTrain station is an asset for marketing. Another developer suggested a 10-minute walking distance was marketable, but noted that a parking variance was not granted for two recent projects that were well within a 10-minute walking distance of two SkyTrain stations.

5.1.5 Construction Cost per Parking Stall

The average construction cost per parking stall in a structure was noted to be in the range of $20,000-$45,000, depending on site conditions and whether the parkade is above grade or below grade. The marginal cost typically increases significantly with the depth of excavation, particularly in areas with challenging geo-technical conditions, such as downtown Vancouver. All developers recognize that while it may be attractive to reduce the number of unnecessary parking stalls, the situation is much more nuanced and challenging in practice. One developer typically sells surplus unassigned parking stalls at cost. Another developer caps the selling price to $15,000 and absorbs the loss.

The developers described the lumpiness of parking. A floor of parking (or in some cases half floor depending on the design of the parking structure and ramps) is either built or not built – a partial floor is not possible. If the parking regulations allow for a reduction in parking per apartment unit but the total supply still requires a certain number of floorplates, the developer would likely build the full floorplate. Building and parking facility design issues are very site specific, thus greatly influencing the potential impact of parking regulation changes on the number of parking floorplates provides.

5.1.6 Determining Market Acceptability

Developers build what they believe they can sell, and felt strongly that they know how to deliver the right amount of parking. However, none of the developers interviewed conduct formal post-occupancy parking surveys of their projects to supplement future design decisions. One developer does have a program to sell surplus parking and this provides some quantitative evidence. Otherwise, it would appear many decisions related to parking are governed primarily by municipal parking requirements, general expectations about customer preferences, generally

accepted practices and assumptions from past projects, and, in some instances, by traffic impact studies.

Another consideration expressed by a developer is that investor buyers tend to want parking associated with an apartment unit to meet the perceived parking needs of renters and/or to protect future resale values. A greater requirement for parking is also prevalent in the luxury apartment segment where vehicle ownership rates are higher than average.

There was some recognition by the developers that it is possible to market apartments with no parking stalls, but the perception is that this market is limited to small bachelor suites located close to transit, and amenities such as downtown Vancouver. One developer who specializes in townhouse projects cited that for projects South of Fraser, two stalls per household are usually assumed.

When asked about options such as unbundled parking – where the cost of the parking stall is sold separately from the apartment unit – developers indicated that it is not a common practice. Most developers bundle and assign one parking stall as part of the apartment base price, with some offering the opportunity to purchase a second stall if surplus stalls remain. The sale price for the surplus parking stall is often at cost or sometimes even below cost, and sold on a first come / first serve availability basis. One developer stated they are more likely to unbundle parking for lower-priced apartment units.

5.1.7 Transportation Demand Management Measures

Most of the developers have experience supporting alternatives to driving through the provision of on-site bicycle storage facilities, car share programs, and providing transit passes. Many municipalities are increasingly interested in requiring them. Providing on-site bicycle storage facilities for both residents and visitors is common, although usually not in lieu of parking stalls. One issue cited was that bicycle storage facilities are usually required on the floor closest to the parkade entrance, which is the most valuable space for vehicle access.

An emerging TDM measure is the car share program. In some cases, the developer and municipality negotiate a voluntary reduction such as five parking stalls for the provision of one car share car and stall. Most of the noted challenges were related to the administration and management of the 3rd party car share vehicle, including having the vehicle and parking facility accessible to all car share program members rather than limiting access to building residents.

Another emerging TDM measure is the provision of transit passes to residents. A developer cited a couple of municipalities requesting one transit pass per housing unit for up to two years as part of some recent projects. The developer noted that one municipality asked for transit passes, car share stalls, and enhanced pedestrian facilities in lieu of parking.

What was inferred from the responses was that there was no monitoring, whether by municipalities or developers, of actual resident behaviour after occupancy to validate whether these TDM measures are well-used or effective in shedding vehicle trips or shedding cars. This is a significant gap.

5.1.8 Financing Considerations

Generally for apartment projects, project financiers do not examine project details such as whether sufficient parking has been supplied. There is an implicit trust by lenders that developers are best positioned to make these detail project decisions. Although not posed to the interviewees, it may be the case that for apartment/commercial mixed-use projects, the commercial parking component may indeed be influenced by corporate standard development formulae and project financiers. As large-scale mixed-use projects become increasingly popular, in particular near transit, the criteria and formulae for parking requirements will be an important area for further investigation.

5.2 Municipal Planners in Metropolitan Vancouver

In the spring of 2011, a questionnaire was sent to all municipalities in the region. The questionnaire asked about current parking regulations and process to review regulations, provisions for reductions in certain circumstances, and possible transportation incentives in lieu of parking (see Appendix 4 for the questionnaire).

Responses were received from 11 municipalities. Based on the limited responses received, the following general comments about municipal parking regulations from the perspective of the municipality were concluded:

- Most respondents receive regular requests for variances from developers. Variance is granted on a case-by-case basis. Municipalities usually require a traffic impact study completed by the applicant's consultant in order to make an informed decision about granting a parking variance. The municipality may also request appropriate transportation demand management measures by the developer if reduced parking is granted.

- Few municipalities consider on-street parking availability when determining on-site parking requirements. One obvious concern is that currently free street parking spaces could potentially be eliminated (or become regulated) in the future and are for the general public and not designated for any specific development.

- Most municipalities require the developer to provide on-site bicycling parking for residents and encourage further amenities that offer alternatives to driving.

- Municipal parking requirements are not regularly reviewed or amended, although there is emerging recognition that sites near rapid transit and in Urban Centres should have lower minimum parking requirements.

5.3 Interview with City of Seattle Planning Staff

In March 2011, Metro Vancouver staff met with planning staff at the City of Seattle.[25] This meeting covered discussions about the allowable reductions in parking in Seattle, including its zero parking for apartments and townhouses in locations with frequent transit. Staff also visited several recently-built townhouse sites.

Seattle has revised its zoning code, including the parking element, several times over the past decade. Prior to 2010, the city had a zero minimum parking requirement in effect for multi-residential developments in urban centres or designated transit station areas. The most recent code revision in 2010 had the net effect of expanding the zero minimum parking requirement to include multi-residential developments within the smaller-scale urban villages and within 400 metres of a frequent transit stop (the previous code affected developments within urban centres and designated transit station areas only). In addition, parking minimum requirements were lowered for multi-residential development serving low-income elderly and disabled residents.[26] No maximum parking allowances are stipulated.

Interestingly, some of the key drivers behind the 2010 amendments were to improve the design of townhouses, increase housing affordability by encouraging other forms of low-density multi-residential development beyond townhouses, and to better accommodate parking in neighbourhoods.[27]

As part of the process to adopt these codes with reduced parking, Seattle staff identified key factors that helped the passage of these progressive regulations:

- The timing was good insofar public awareness of global climate change became more common and the recognition that automobile use should be discouraged in favour of transit, cycling, and walking became more entrenched.

- The Seattle City Council was generally supportive, but staff noted a generational split among Seattle stakeholders in support for parking reductions, with the younger and more urban generation tending to be more supportive and the older generation more resistant.

- Residential developers were generally supportive of the parking revisions because it allowed for a market-based approach to providing parking based on experience and perceived market demand.

[25] Mary Catherine Snyder, Parking Strategist, Seattle Department of Transportation; Mike Podowski, Supervisor, Seattle Department of Planning and Development; Dennis Meier, Senior Urban Designer, Seattle Department of Planning and Development.
[26] In multi-residential and commercial zones, the minimum parking requirement for all uses was reduced by 20 percent if the use is located with 1,320 feet of a street with frequent transit service. In industrial zones, the minimum parking requirement for a non-resident use is reduced by 15 percent if the use is within 1,320 feet of a street with frequent transit service.
[27] Townhouse development is the predominant form of new multi-residential development in Seattle outside of downtown.

- Seattle staff emphasized that to build confidence in the implementation of these regulatory changes, generally strong data/evidence along with parking requirements and on-street parking management are required.

According to Seattle planners, the past experience with the zero minimum parking requirement was that developments in downtown and in the Pike-Pine neighbourhood just east of downtown were built with 0.75 stall per unit, ranging from 0.6 for rental buildings to 1 for condominium buildings. Also, parking tends to be unbundled from rental units, with tenants paying separately for parking in their building.

It should be noted that there is no formal agreement between the City and the two major transit operators, King County Metro and Sound Transit, to ensure existing frequent service will remain at current levels or expectations that certain routes will be upgraded to frequent service levels in the future.

5.4 City of Toronto Interviews

Metro Vancouver staff interviewed a Toronto-based transportation consultant with expertise in Toronto's multi-residential development market[28]. The consultant noted that in Toronto most new apartment units are sold with unbundled parking, with each stall sold separately for $40,000-50,000. Unlike current practices in metropolitan Vancouver, developers in Toronto may request a parking reduction variance to construct less parking if after the pre-sale period fewer parking stalls are required than originally assumed. Apparently, there is no risk of significant delay for the applicant.

The consultant was also involved in the design of the 315-unit zero parking project at the former Royal Canadian Military Institute site near a subway station in downtown Toronto. The project is on an unusually small property which would have caused design challenges if a parkade were to be constructed. The average apartment size is 500 sqft. Council approved the project with no parking against the recommendation of city staff who were concerned about potential parking spillover impacts and precedence[29]. Ultimately, Council was convinced that the occupants will be those who live and work in downtown, and therefore will have little to no need to own a vehicle. The building will have eight carshare spaces and one bicycle stall for each unit. The project will be completed by 2013.

An interview with the city's zoning manager was also conducted on several topics, including parking variances, and trends in car ownership and carsharing.[30] City staff have been somewhat resistant to accommodating requests from developers to vary parking requirements based on pre-sales data. It is believed that in some instances developers set the price of a parking stall above cost, which then deters some consumers from purchasing a stall even though they may require parking now or in the future.

[28] Ralph Bond, Senior Vice-President, BA Group Transportation Consultants.
[29] The original staff report can be found here: http://www.toronto.ca/legdocs/mmis/2009/te/bgrd/backgroundfile-21943.pdf
[30] Klaus Lehmann, Manager of Zoning Bylaw, City of Toronto.

It was also noted by city staff that reduced parking requirements may be quite suitable for younger households, but for older households downsizing from a suburban house, they may be bringing along their vehicles and therefore require parking stalls.

Regarding carshare programs, the city's zoning bylaw does not have provisions for requiring carshare vehicles or stalls. These features can be negotiated. City staff prefers carshare vehicles be parked on adjacent streets or public parkades where members can easily access them. City staff is less supportive of carshare vehicles that are parked within the building for the exclusive use of the building's residents because the membership within the building may not be sufficiently large to sustain the financial sustainability of the vehicle for the long term.

5.5 Key Lessons Learned

Based on the key informant interviews, there appears to be opportunities to explore parking reductions in apartments in the region, particularly in urban centres and areas well served by transit.

1. Amongst developers, there was no consensus on whether current parking requirements in the region are reasonable; some developers saw room for reductions, others saw risks.
2. Current visitor parking requirements are generally seen by developers as too high.
3. Parking costs are usually included in the apartment purchase price, while in Seattle and Toronto, unbundled parking is the accepted norm.
4. Frequent bus service is typically not a consideration in parking supply decisions (Seattle and Portland being the exception).
5. Municipal parking bylaws are not regularly reviewed and amended.
6. Municipalities allow for negotiations with developers and variances from bylaw requirements, but developers expressed their reluctance to push the envelope on requesting variances due to the spectre of approval delays.
7. In Toronto, the market demand for parking is established through the pre-sales period, after which the developer can request parking reduction variances from the city.
8. Municipalities will have to be the impetus for change through updates to parking bylaws and development approval processes.

6 Parking Facility Survey and Household Survey Methodology

The primary objective of the Metro Vancouver Apartment Parking Study was to establish an evidence base of residential parking supply and peak residential parking demand based on data collected in this region. To facilitate this objective, two surveys were conducted in the Fall of 2011. The surveys yielded a rich dataset for analysis.

- The Parking Facility Survey recorded direct observations of residential parking demand in select apartment parkades across the region.
- The Household Survey collected responses to a survey distributed to households residing in the same buildings to capture additional data, such as household vehicle access (ownership or lease) and visitor parking experiences.

6.1 Site Selection

The survey sites were selected based on several criteria: representation from across the region; building age; building tenure; and, proximity to TransLink's Frequent Transit Network. The same buildings were sought for both surveys. Several sites were dropped from the Parking Facility Survey either because the strata council changed its mind about participating in the study late in the process, or logistical reasons arose which prevented the surveyors from accessing the sites. Similarly, several sites were included in the Parking Facility Survey, but not in the Household Survey due to the inability to obtain a complete mailing list of all the dwelling units. Ultimately, 80 sites were confirmed for the Parking Facility Survey, and 90 for the Household Survey (see Appendix 6).

Criterion 1: Representation from across the region

Having a broad-based representation of sites from across the region was important because the applicability of any lessons learned or patterns revealed would be limited to how confident one could make broader conclusions given the diversity between subregions. For example, lessons learned in downtown Vancouver may or may not have immediate applicability for communities in other subregions.

In early 2011, an initial long list of over 300 properties was identified through Internet searches, property management companies, and referrals by several of the developers and municipal planners whom staff interviewed. Through a combination of communicating directly with property managers and strata councils, a short list of sites was confirmed in August 2011.

Table 5. Distribution of Survey Sites by Subregion

Subregion	Number of Sites in Parking Facility Survey	Number of Sites in Household Survey
Burnaby/NW	18	19
North Shore	6	6
Northeast Sector (incl. Pitt Meadows/Maple Ridge)	10	14
Richmond	9	11
Surrey/Delta/White Rock/Langley	10	10
Vancouver/UBC (excluding Metro Core Peninsula)	19	23
Metro Core Peninsula	8	7
Total	**80**	**90**

Criterion 2: Proximity to the Frequent Transit Network (FTN)

A central hypothesis of the study was that proximity to transit (and various levels of transit service) will have a measurable relationship with vehicle access (ownership or lease) and parking demand. In order to facilitate this line of inquiry, sites were selected based on their proximity to TransLink's Frequent Transit Network[31].

Note that in some of the analysis, the "FTN Station Only" and "FTN Bus and Station" are lumped together as "FTN Station". Sites in the "FTN Station Only" group are located in Burnaby and Surrey.

Table 6. Distribution of Survey Sites by Proximity to the Frequent Transit Network

Proximity to the 2011 Frequent Transit Network	Number of Sites in Parking Facility Survey	Number of Sites in Household Survey
FTN Bus Only (within 400 metres of a Frequent Bus stop)	24	30
FTN Station Only (within 800 metres of a SkyTrain or SeaBus station)	11	11
FTN Bus and Station (close to both a Frequent Bus stop and SkyTrain/SeaBus station)	29	31
Beyond FTN	16	18
Total	**80**	**90**

[31] The FTN is a network of corridors 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. This 15 minute or better service is provided at least from 6am-9pm on weekdays, 7am-9pm on Saturdays and 8am-9pm on Sundays. The FTN does not refer to specific routes or technologies or vehicle types; rather it refers to a high frequency and span of transit service within a corridor. This level of service may be provided by a single route or by a combination of multiple routes and/or technologies within the same corridor.

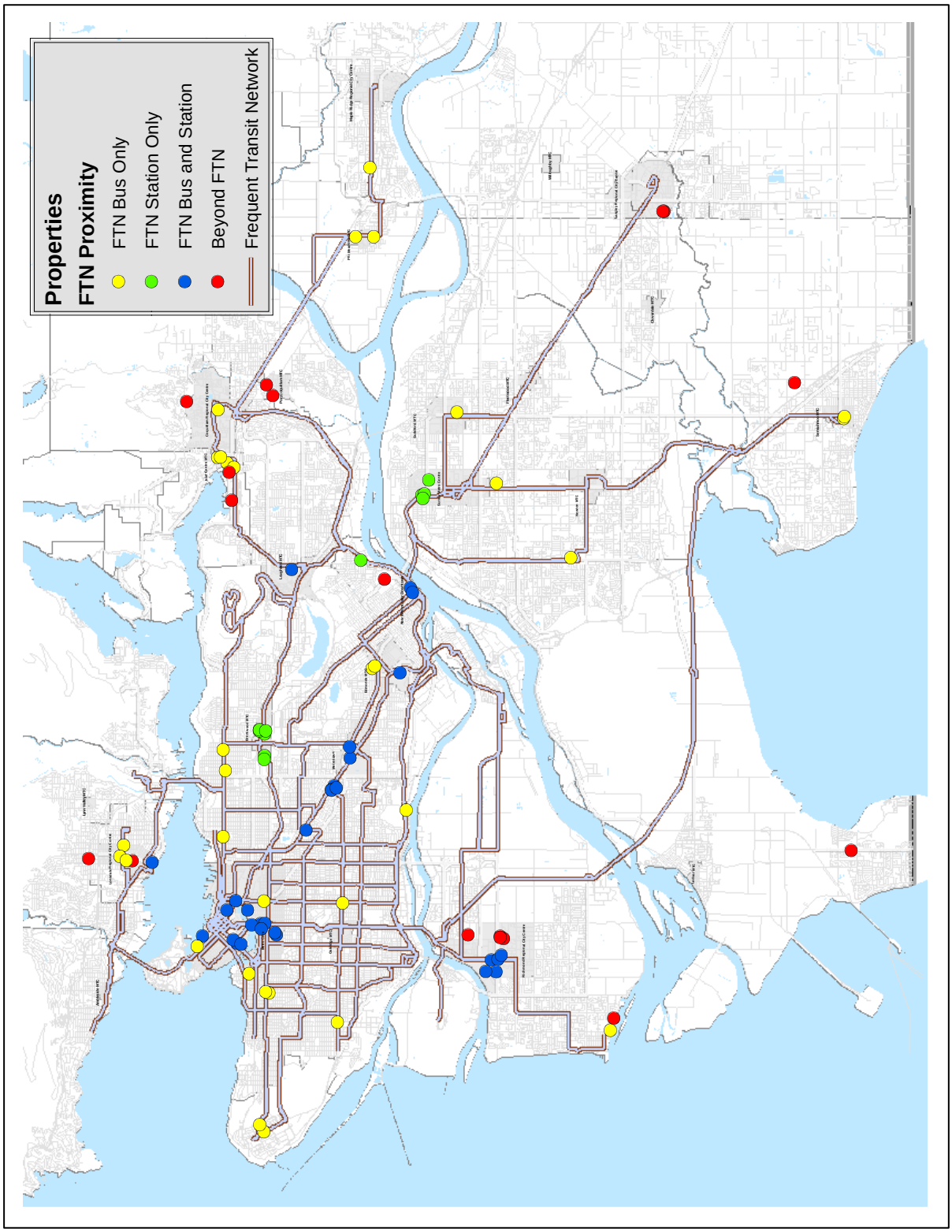


Figure 4. Household Survey Sites relative to 2011 Frequent Transit Network

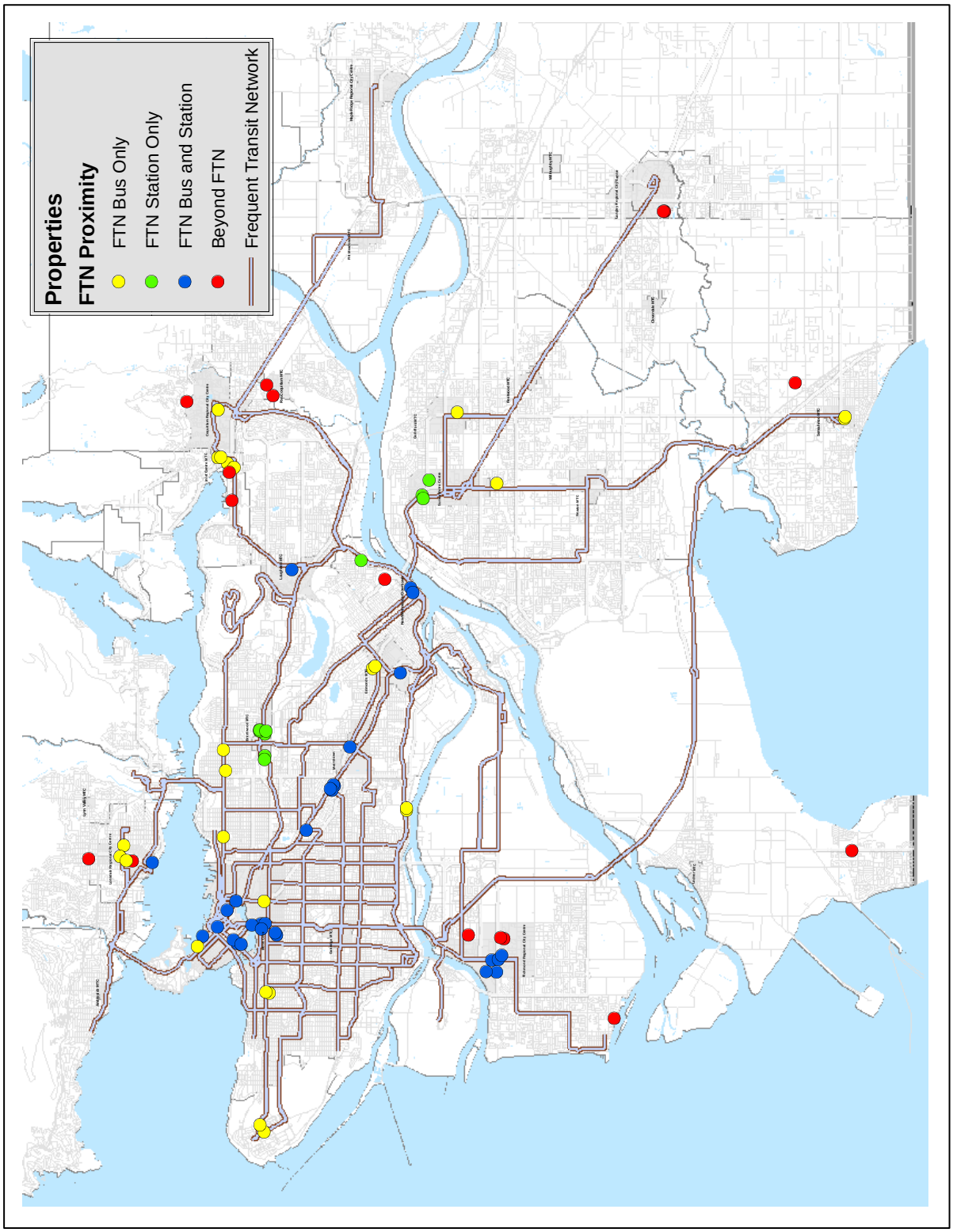


Figure 5. Parking Facility Survey Sites relative to 2011 Frequent Transit Network

Criterion 3: Building Age

Most of the survey sites were built recently to best represent current municipal parking bylaws and development approval practices. Over 80 percent of the sites selected were built within the past 12 years. The pre-2000 sites were mainly purpose-built market and non-market rental sites.

Table 7. Distribution of Survey Sites by Building Age

Building Age	Number of Sites in Parking Facility Survey	Number of Sites in Household Survey
Pre-2000 (1982-1999)	15	14
2000-2006	19	22
2007-2010	46	53
Total	**80**	**90**

Criterion 4: Building Tenure

The vast majority of surveyed sites were strata. This composition was intentional because strata buildings make up nearly all the multi-residential starts in the region and represent the main source of new rental housing in the region. The non-market sites included two Metro Vancouver Housing Corporation sites and two housing co-ops.

Table 8. Distribution of Survey Sites by Building Tenure

Building Tenure	Number of Sites in Parking Facility Survey	Number of Sites in Household Survey
Strata	67	76
Market Rental	9	8
Non-Market Rental	4	6
Total	**80**	**90**

6.2 Parking Facility Survey Design and Conduct

The Parking Facility Survey was conducted between September 19 and November 3, 2011 by Acuere Consulting Ltd. Generally, the surveyors initiated access to the parkades after 10PM on a weeknight, Monday through Thursday. Seventy-two sites were observed once only. Eight sites were observed twice to assess the variability of residential parking demand on two different nights. Three sites were observed on a single Saturday in November at four different time periods to assess the magnitude and variability of visitor parking demand.

Metro Vancouver staff provided Acuere Consulting with the appropriate contact person at each site, whether a strata council member, property manager, or on-site caretaker. The scheduling and conduct of the surveys were executed by Acuere Consulting. The data was transmitted to Metro Vancouver in December 2011.

6.3 Adjustments for Survey Time and Building Occupancy

All surveys contain varying degrees of measurement error. While the intent of the Parking Facility Survey was to capture the peak residential parking demand rate (the number of parked vehicles divided by the number of dwelling units in the building), two adjustments to the raw data were deemed necessary in order to not artificially undercount parking demand.

The first adjustment factor affects the numerator in the parking demand rate formula. On any given night, it can be expected that some residents return home very late at night or in the next morning or have driven out of town for business or vacation. As shown in Table 9, the raw observations of parking occupancy (percent of stalls occupied by a car or truck) increased later in the night. Based on this pattern, conservative adjustment factors were applied to the number of occupied parking stalls for each site.

Table 9. Parking Facility Survey Start Time

Survey Start Time	Number of Sites	Average Parking Occupancy (Raw)	Parking Occupancy Adjustment Factor
9PM-9:59PM	6	61%	+10%
10PM-10:29PM	54	58%	+10%
10:30PM-10:59PM	10	65%	+5%
11PM and Later	10	67%	+3%

The second adjustment affects the denominator in the parking demand rate formula. It is expected that there will exist a small proportion of units in each site that are unoccupied for various reasons. Some units may have been vacant because the owners are part-time residents or that the units were on the market for sale or rent with no one living in them. In order to minimize this error, electricity consumption data was obtained from BC Hydro on the sites, but aggregated at the subregional level. Units that consumed 100 kWh or less of electricity per month was deemed in this study to be vacant (BC Hydro staff originally recommended using a threshold of 75 kWh, but Metro Vancouver staff decided to err on the side of having more

vacant stalls by using the "lower" threshold of 100 kWh). Using data from September and October 2011, adjustments were made to the strata sites. For market and non-market sites, actual or estimates of occupancy rates were obtained directly from the property managers.

Table 10. Estimated Percent of Vacant Strata Units During Survey Period

Subregion	September and October 2011 Average	Parking Vacancy Adjustment Factor
Burnaby	5.3%	+6%
New Westminster[32]	6.6%	+7%
North Shore	7.2%	+8%
Northeast Sector+	4.7%	+5%
Richmond/Delta[33]	7.7%	+8%
Surrey/White Rock/Langleys	6.5%	+7%
Vancouver/UBC	5.8%	+6%
Metro Core Peninsula	7.0%	+8%

6.4 Household Survey Design and Conduct

The Household Survey was conducted between October 13 and November 22, 2011. Metro Vancouver staff and Acuere Consulting developed the survey questionnaire. An invitation letter, unique code, and survey questionnaire were distributed to all dwelling units in the study via First Class lettermail (no return postage was included). Residents were provided an opportunity to respond either by mail or through a web-based form designed by Acuere Consulting.[34]

The survey questionnaire comprised 14 questions asking residents about the number of vehicles and parking stalls they have, their parking habits, visitor parking experiences, participation in carshare programs, use of on-site bicycle storage facilities, locational preferences, willingness to forego parking stalls, the number of bedrooms in their unit, the square footage of their units, and the demographics of their household members. Respondents were also given an opportunity to provide additional comments. The web-based form contained logic checks to maximize the number of completed surveys and minimize the amount of manual data validation required. The data, with all personal information removed, was transmitted to Metro Vancouver in mid-December.

[32] Electricity data was obtained directly from the City of New Westminster, which distributes and administers electricity for its residents and commercial/business customers.
[33] In the original list of sites provided to BC Hydro, the lone survey site in Delta was categorized within the "Richmond/Delta" group.
[34] Respondents were eligible to be entered into a draw for one of three prize bundles, each worth approximately $250. Acuere Consulting was successful in securing one monthly transit pass from TransLink and one giftcard from Vancity Credit Union for inclusion in the gift bundles. The remaining costs were covered under the consultant contract.

6.5 Survey Returns

Over 1,500 households responded to the Household Survey. While the overall response rate of 13 percent was modest, the large number of responses allow for comprehensive and disaggregated data analysis. Tables 11 and 12 show the total and returned surveys.

Higher response rates could have been achieved by mailing reminder postcards, sending out a second wave of invitation letters and survey questionnaires, and perhaps providing opportunities to respond in other languages given the known ethnic composition in specific subareas of the region. As an alternative, Metro Vancouver staff requested property managers, on-site caretakers, or strata council members to post-up a notice in the common areas to remind residents to complete the survey or to contact Metro Vancouver staff if they had misplaced the survey questionnaire. Approximately 60 sites agreed to post a reminder notice.

Table 11. Household Survey Responses

Household Survey	Number
Surveys Distributed	12,221
Web-based Form Responses	1,382
Mail-back Responses	175
Total Responses (response rate)	**1,557 (12.7%)**

Table 12. Household Survey Responses by Subregion

Subregion	Completed Surveys	Partially Completed Surveys[35]	Surveys Distributed	Response Rate
Burnaby/NW	382	4	2,600	14.8%
North Shore	101	0	636	15.9%
Northeast Sector+	189	2	1,509	12.7%
Richmond	215	4	2,111	10.4%
Surrey/Delta/White Rock/Langley	122	1	1,336	9.2%
Vancouver/UBC	533	1	4,029	13.3%
Total	**1,542**	**15**	**12,221**	**12.7%**

[35] Includes three partially completed mail-back surveys but no information on municipality.

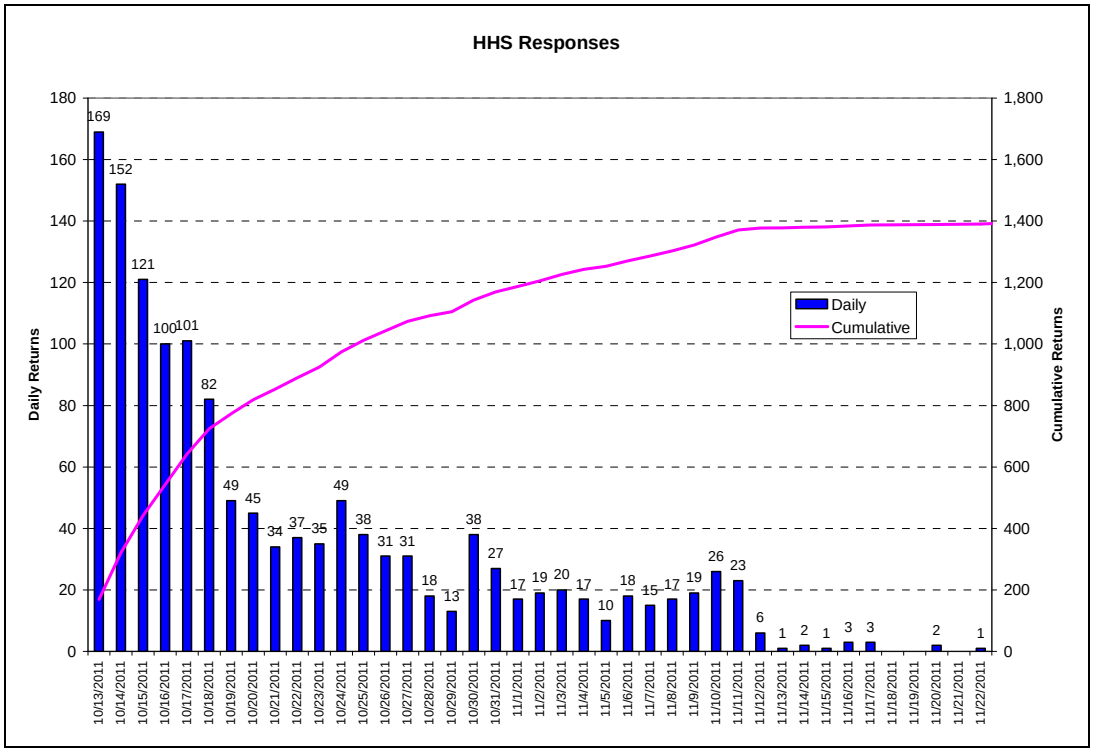


Figure 6. Daily and Cumulative Responses to the Internet-based Household Survey Form

Because the sampling design was not intended to achieve a representative regional sample, it is useful to examine some of the characteristics of the respondent households. This will be useful in helping to rationalize some of the patterns revealed in the analysis, and any potential biases, in Section 7.

Household Size Distribution

Three out of four survey responses came from households comprising 1 or 2 persons. The average household size was 2.0 persons, which is slightly larger than the regional average for households living in apartments per the 2006 Census (1.7 persons per household living in apartments of five storeys or higher; 1.9 persons per household living in apartments of less than five storeys).

Table 13. Household Size Distribution in the Household Survey

Household Size	Household Responses	Distribution of Responses
1 persons	493	31.8%
2 persons	711	45.9%
3 persons	240	15.5%
4 or more persons	104	6.7%
Total	**1,548**	**100%**

Unit Type Distribution

Households living in one and two-bedrooms made up 87 percent of the respondents.

Table 14. Unity Type Distribution in the Household Survey

Unit Type	Household Responses	Distribution of Responses
Bachelor Suites	58	4%
1-Bedroom Units	471	30%
2-Bedroom Units	884	57%
3-Bedroom Units	129	8%
4 Plus-Bedroom Units	6	<1%
Total	**1548**	**100%**

Household Age Distribution

Most of the household respondents were made up of prime working age people. Forty-four percent of households had at least one member in the 25-34 years cohort. Just over half of the households had at least one member in the 35-64 years cohort. This pattern is qualitatively consistent with the median resident age of 39.1 years in Metro Vancouver according to the 2006 Census.

Table 15. Household Age Group Distribution in the Household Survey

Age Groups	Number of households with at least one member in the age group	Proportion of Total Household Respondents (1,548)
0-15 years	235	15%
16-24 years	194	13%
25-34 years	681	44%
35-64 years	793	51%
65 and older	237	15%

Building Tenure Distribution

Close to 9 out of 10 survey respondents lived in a strata site.

Table 16. Building Tenure Distribution in the Household Survey

Building Tenure	Household Responses	Distribution of Responses
Non-Market	69	4%
Market Rental	127	8%
Strata	1,358	87%

Resident Tenure Distribution

Two out of three survey responses came from households who owned and occupied their dwellings. This is consistent with the fact that the vast majority of sites in the study were condominiums. In contrast, the 2006 Census counted 41 percent of apartment dwellers – strata or rental – as owner-occupiers versus 59 percent renters. Also, of the apartments built between 2001 and 2006, 58 percent are occupied by owners and 42 percent are occupied by renters (2006 Census). Altogether, the evidence suggests a degree of over-representation in the survey by owner-occupied households.

Table 17. Resident Tenure Distribution in the Household Survey

Resident Tenure	Household Responses	Distribution of Responses
Owner-Occupied	1,049	68%
Renter-Occupied	505	32%

When controlling for strata sites only in the Household Survey, the distribution of household responses is even more tilted towards owner-occupiers.

Table 18. Resident Tenure Distribution of Strata Sites in the Household Survey

Tenure for Household Survey Respondents in Strata Sites Only	Households Responses	Distribution of Responses
Owner-Occupied	1,047	77%
Renter-Occupied	308	23%

Vehicles Per Household

In strata sites, owner-occupied households have more vehicles on average than do renter households.

Table 19. Comparison of Vehicles Per Household by Resident Tenure in Strata Sites

	Owner-Occupied Unit in Strata Site	Renter-Occupied Unit in Strata Site
Households Responding	1,047	308
Vehicles Per Household	1.30	1.19
Parked Vehicles Per DU	1.17	1.07

Frequent Transit Network Distribution

A broad representation of households residing close to or far away from the Frequent Transit Network was attained.

Table 20. Distribution of Responses by Proximity to the Frequent Transit Network

Proximity to FTN	Household Responses	Distribution of Responses
Beyond FTN	309	20%
FTN Bus Only	463	30%
FTN Station Only	197	13%
FTN Bus and Station	585	38%

7 Parking Facility Survey and Household Survey Data Analysis

The value of the Parking Facility Survey and Household Survey is the ability to bracket the range of parking demand and to explore various relationships between household vehicle access, parking demand, parking supply, and other factors.

7.1 Residential Parking Supply and Demand by Building Tenure

The following tables present parking supply and demand results from the two surveys. There is a high degree of consistency between the sets of parking supply numbers. In contrast, there is a greater degree of variance between the two sets of parking demand numbers. One possible reason, as alluded to previously, is the potential bias in the Household Survey from an over-representation of owner-occupied households who tend to have more vehicles than do renter households. Another possible reason is that the Parking Facility Survey, even after making the adjustments, may be capturing residents who bought one or two extra parking stalls for personal visitor parking or for other reasons, including future use. Therefore, in the first two tables below, the parking oversupply is presented as a range.

In general, parking supply, parking demand, and the number of vehicles per household all tend to increase with the tenure ladder. Residents of the surveyed purpose-built market or non-market rental sites tend to have on average less than one vehicle per household. These results are consistent with the patterns observed in the Toronto study (see Section 3.2).

Table 21. Residential Parking Supply and Demand by Building Tenure (HHS=Household Survey; PFS=Parking Facility Survey)

Building Tenure Type	Stalls Per DU (HHS)	Stalls Per DU (PFS)	Vehicles per Household (HHS)	Parked Vehicles per DU (HHS)	Parked Vehicles per DU (PFS)	Parking Oversupply Range
Non-Market	0.90	0.94	0.81	0.67	0.73	29-34%
Market Rental	0.82	0.99	0.83	0.72	0.58	14-71%
Strata	1.35	1.32	1.27	1.14	0.98	18-35%
All Sites	**1.28**	**1.27**	**1.21**	**1.09**	**0.92**	**17-38%**

A similar pattern emerges when controlling for strata sites only. The variance between parking supply and demand is consistently high across the region. Household respondents in the City of Vancouver and UBC have on average the fewest number of vehicles per household.

Table 22. Residential Parking Supply and Demand in Strata Sites by Subregion

Surveyed Strata Sites by Subregion	Stalls Per DU (HHS)	Stalls Per DU (PFS)	Vehicles per Household (HHS)	Parked Vehicles per DU (HHS)	Parked Vehicles Per DU (PFS)	Parking Oversupply Range
Burnaby/NW	1.35	1.33	1.34	1.19	0.98	13-36%
North Shore	1.38	1.28	1.33	1.19	1.04	16-23%
Northeast Sector+	1.55	1.50	1.40	1.24	1.17	25-28%
Richmond	1.43	1.34	1.36	1.24	1.02	15-31%
South of Fraser	1.28	1.35	1.27	1.12	0.98	14-38%
Vancouver/UBC	1.24	1.29	1.09	1.02	0.94	22-37%
Metro Core Peninsula	1.19	1.14	0.97	0.88	0.78	35-46%
Total	**1.35**	**1.32**	**1.27**	**1.14**	**0.98**	**18-35%**

Across the region, close to two out of three household respondents have one vehicle only. Outside of Vancouver and UBC, up to one in three household respondents have two vehicles. The City of Vancouver and UBC have the highest proportion of 0-vehicle households. These patterns are consistent with expectation.

Table 23. Distribution of 0, 1, 2, 3+ Vehicle Households by Subregion

Surveyed Strata Sites by Subregion	0-Vehicle Household	1-Vehicle Household	2-Vehicle Household	3-Vehicle Plus Household
Burnaby/NW (n=386)	3%	64%	30%	4%
North Shore (n=101)	3%	63%	32%	2%
Northeast Sector+ (n=191)	3%	57%	37%	3%
Richmond (n=219)	5%	58%	35%	3%
South of Fraser (n=123)	3%	68%	27%	2%
Vancouver/UBC (n=364)	20%	63%	16%	1%
Metro Core Peninsula (n=170)	26%	58%	13%	3%
Total	**10%**	**62%**	**26%**	**2%**

7.2 Residential Parking Supply and Demand by the Frequent Transit Network

For the surveyed strata sites, parking demand and the number of vehicles per household tend to be the lowest if a site is close to both a frequent bus stop and SkyTrain/SeaBus station. The "ultimate" parking demand (i.e., number of vehicles per household) close to the Frequent Transit Network generally does not exceed 1.3 vehicles per unit.

The number of vehicles per household and the parking demand between "FTN Bus Only" and "FTN Station Only" are not statistically different, but the two parking supply results are statistically different (Table 24)[36]. This observation corroborates with the interviews with key informants that suggested a lack of recognition in practice by municipalities and developers of the relationship between parking demand for sites close to frequent bus corridors. This pattern persists even when sites located in the City of Vancouver and UBC were excluded (Table 25).

Table 24. Residential Parking Supply and Demand in Strata Sites by Proximity to the FTN

Geography	Stalls Per DU (HHS)	Stalls Per DU (PFS)	Vehicles per Household (HHS)	Parked Vehicles Per DU (HHS)	Parked Vehicles Per DU (PFS)	Parking Oversupply Range
Beyond FTN	1.39	1.40	1.43	1.25	1.10	11-27%
FTN Bus Only	1.41	1.43	1.27	1.14	1.05	24-36%
FTN Station Only	1.28	1.26	1.28	1.16	0.95	10-33%
FTN Bus and Station	1.30	1.23	1.15	1.06	0.89	23-38%
All Sites	1.35	1.32	1.27	1.14	0.98	18-35%

Table 25. Residential Parking Supply and Demand in Strata Sites by Proximity to the FTN, Excluding Vancouver and UBC

Geography (Strata sites excl. CoV/UBC)	Stalls Per DU (HHS)	Stalls Per DU (PFS)	Vehicles per Household (HHS)	Parked Vehicles Per DU (HHS)	Parked Vehicles Per DU (PFS)	Parking Oversupply Range
Beyond FTN	1.39	1.40	1.43	1.25	1.10	11-27%
FTN Bus Only	1.47	1.44	1.34	1.19	1.08	24-34%
FTN Station Only	1.28	1.26	1.28	1.16	0.95	10-33%
FTN Bus and Station	1.42	1.31	1.29	1.18	0.96	20-36%
All Sites	1.40	1.36	1.35	1.20	1.03	17-32%

[36] A one-way between-groups analysis of variance was conducted to explore the impact of Frequent Transit Network proximity (four groups) on vehicles per household and stalls per unit for strata apartment sites using data from the Household Survey. However, the assumption of homogeneity of variance was violated as determined by Levene's test. Therefore, the Welch and Brown-Forsythe tests were conducted and showed that there were statistical significant differences between groups at the $p < 0.05$ level. Post-hoc comparisons using the Games-Howell test indicated that the mean stalls per unit for "FTN Bus Only" was significantly different from "FTN Station Only". Post-hoc comparisons using the Games-Howell test indicated that the mean vehicles per household for "FTN Bus Only" was not significantly different from "FTN Station Only".

7.3 Residential Parking Supply and Demand by Strata and Number of Bedrooms

The previous analyses were conducted at the "site-level". Equally important is to examine the patterns at the apartment unit level, which is how many municipalities set their parking bylaws. As shown in Table 26, parking supply, parking demand, and the number of vehicles per households all increase with the number bedrooms (unit type). Households living in units with bachelor suites and one-bedroom units generally have at most one vehicle to park. Households living in two-bedroom units on average have fewer than 1.4 vehicles to park.

Table 26. Residential Parking Supply and Demand in Strata Sites by Unit Type

Unit Type (Strata sites)	Household Responses	Stalls Per DU (HHS)	Vehicles Per DU (HHS)	Parked Vehicles Per DU (HHS)
Bachelor Suites	41	0.93	0.88	0.73
1-Bedroom Units	390	1.11	1.09	0.96
2-Bedroom Units	797	1.42	1.33	1.22
3-Bedroom Units	118	1.84	1.57	1.37
4 Plus-Bedroom Units	3	*Small sample size*	*Small sample size*	*Small sample size*

7.4 Residential Parking Supply and Demand by Strata, Number of Bedrooms, and the Frequent Transit Network

It is important to test the robustness of the relationship between parking demand and proximity to the Frequent Transit Network at the "unit type level" (see Appendix 11 for analysis based on apartment unit floorspace).

For 1-bedroom apartment units, the number of vehicles per household and parking demand are lower in sites close to the Frequent Transit Network. One-bedroom units may be able to support much lower minimum parking requirements than is typical in current parking bylaws.

Table 27. Residential Parking Supply and Demand in Strata One-Bedroom Units

One-Bedroom Strata				
Geography (Strata sites)	**Household Responses**	**Stalls Per DU (HHS)**	**Vehicles per Household (HHS)**	**Parked Vehicles Per DU (HHS)**
Beyond FTN	55	1.15	1.24	1.05
FTN Bus Only	122	1.10	1.09	0.90
FTN Station	213	1.11	1.05	0.96

For 2-bedroom units, the parking supply in sites near frequent bus corridors is statistically higher than in sites near stations, even though the parking demands do not justify such a supply variance[37]. Overall, two-bedroom units near the Frequent Transit Network may be able to support lower minimum parking requirements than is stipulated in current parking bylaws.

Table 28. Residential Parking Supply and Demand in Strata Two-Bedroom Units

Two-Bedroom Strata				
Geography (Strata sites)	**Household Responses**	**Stalls Per DU (HHS)**	**Vehicles per Household (HHS)**	**Parked Vehicles Per DU (HHS)**
Beyond FTN	229	1.39	1.45	1.26
FTN Bus Only	249	1.51	1.35	1.25
FTN Station	319	1.37	1.24	1.16

For 3-bedroom units, the relationship between parking demand and proximity to the FTN is inconsistent. Households living close to frequent bus corridors have the fewest number of vehicles and lowest parking demand; households near stations have more vehicles and higher parking demand. The inconsistency may be due to the smaller number of responses from 3-bedroom households or it may be evidence that beyond the 2-bedroom threshold, the relationship between parking demand and proximity to the FTN is counter-influenced by other factors.

Table 29. Residential Parking Supply and Demand in Strata Three-Bedroom Units

Three-Bedroom Strata				
Geography (Strata sites)	**Household Responses**	**Stalls Per DU (HHS)**	**Vehicles per Household (HHS)**	**Parked Vehicles Per DU (HHS)**
Beyond FTN	23	1.91	1.70	1.61
FTN Bus Only	47	1.79	1.40	1.23
FTN Station	48	1.85	1.67	1.40

It should be noted that about 1 in 10 strata households in the survey reported parking one or more vehicles on a nearby street (see Appendix 13). Further investigation is warranted so that effect parking management strategies can be prepared and that impacts on neighbourhoods can be prevented or mitigated.

[37] A one-way between-groups analysis of variance was conducted to explore the impact of Frequent Transit Network proximity (three groups) on vehicles per household and stalls per unit for strata two-bedroom units using data from the Household Survey. However, the assumption of homogeneity of variance was violated as determined by Levene's test. Therefore, the Welch and Brown-Forsythe tests were conducted and showed that there were statistical significant differences between groups at the $p < 0.05$ level. Post-hoc comparisons using the Games-Howell test indicated that the mean stalls per unit for "FTN Bus Only" was significantly different from "FTN Station". Post-hoc comparisons using the Games-Howell test indicated that the mean vehicles per household for "FTN Bus Only" was not significantly different from "FTN Station".

7.5 Market Rental Sites

Because the sample size is smaller for the market rental household responses, disaggregated analysis is limited. In general, observed parking demand does not exceed one vehicle. In particular, the evidence suggests that market rental sites could support low minimum parking requirements and/or parking maximums.

Table 30. Residential Parking Supply and Demand in Market Rental Sites by Proximity to the FTN

Surveyed Market Rental Sites by FTN	Household Responses	Stalls Per DU (HHS)	Stalls Per DU (PFS)	Vehicles per Household (HHS)	Parked Vehicles Per DU (HHS)	Parked Vehicles Per DU (PFS)	Parking Oversupply Range
FTN Bus Only	35	0.97	1.12	1.00	0.91	0.82	7-37%
FTN Bus and Station	92	0.76	0.94	0.77	0.65	0.48	17-96%

7.6 Visitor Parking Supply and Demand

Although visitor parking was not a focus of the study, some municipal partners requested that some data be collected on visitor parking demand. Consequently, three strata sites were surveyed on Saturday, November 19, 2011. The sites were chosen primarily for their suburban contexts and ease of access (no separate gates). The sites are mixed-use developments; the parkades have assigned parking for the attached retail and commercial tenants (but only the parking supply and demand for the resident-based visitor parking was counted).

The small sample of observations suggests that the commonly used visitor parking standard of 0.2 visitor stall per dwelling unit may be excessive. Further study is warranted on a larger sample and at other times and days of the week.

Table 31. Visitor Parking Supply and Demand in Three Strata Sites

Site Location	Start Time of Survey	Visitor Parking Stalls	Parked Vehicles in Visitor Stalls	Parking Demand Rate
Burnaby site • 81 units • "FTN Bus and Station"	11:40AM	16	3	0.04
	2:45PM	16	5	0.06
	7:00PM	16	2	0.03
	9:41PM	16	2	0.03
Port Coquitlam site • 138 units • "Beyond FTN"	11:05AM	27	3	0.02
	2:00PM	27	0	0.00
	6:00PM	27	0	0.00
	8:59PM	27	1	0.01
Richmond site • 282 units • "FTN Bus and Station"	12:30PM	39	5	0.02
	3:30PM	39	11	0.04
	7:30PM	39	2	0.01
	10:03PM	39	6	0.02

Also, the Household Survey asked:

"Typically, how often do your visitors have difficulty finding a parking space in your building's parking facility?"

Perceived visitor parking challenges were most pronounced in Vancouver/UBC and in the Metro Core Peninsula, where over one-half of respondents declared that their visitors frequently have difficulty finding a parking space in the on-site parkade (Figure 7). This is consistent with expectations.

Individual submitted comments were also examined. A cluster of comments about visitor parking difficulty in specific sites in the City of North Vancouver and New Westminster were identified. In these instances, supply may or may not be the problem. Rather, site-specific

designs, such as stall dimensions that are too narrow and restrictions on on-street parking, were cited. Further study may be warranted.

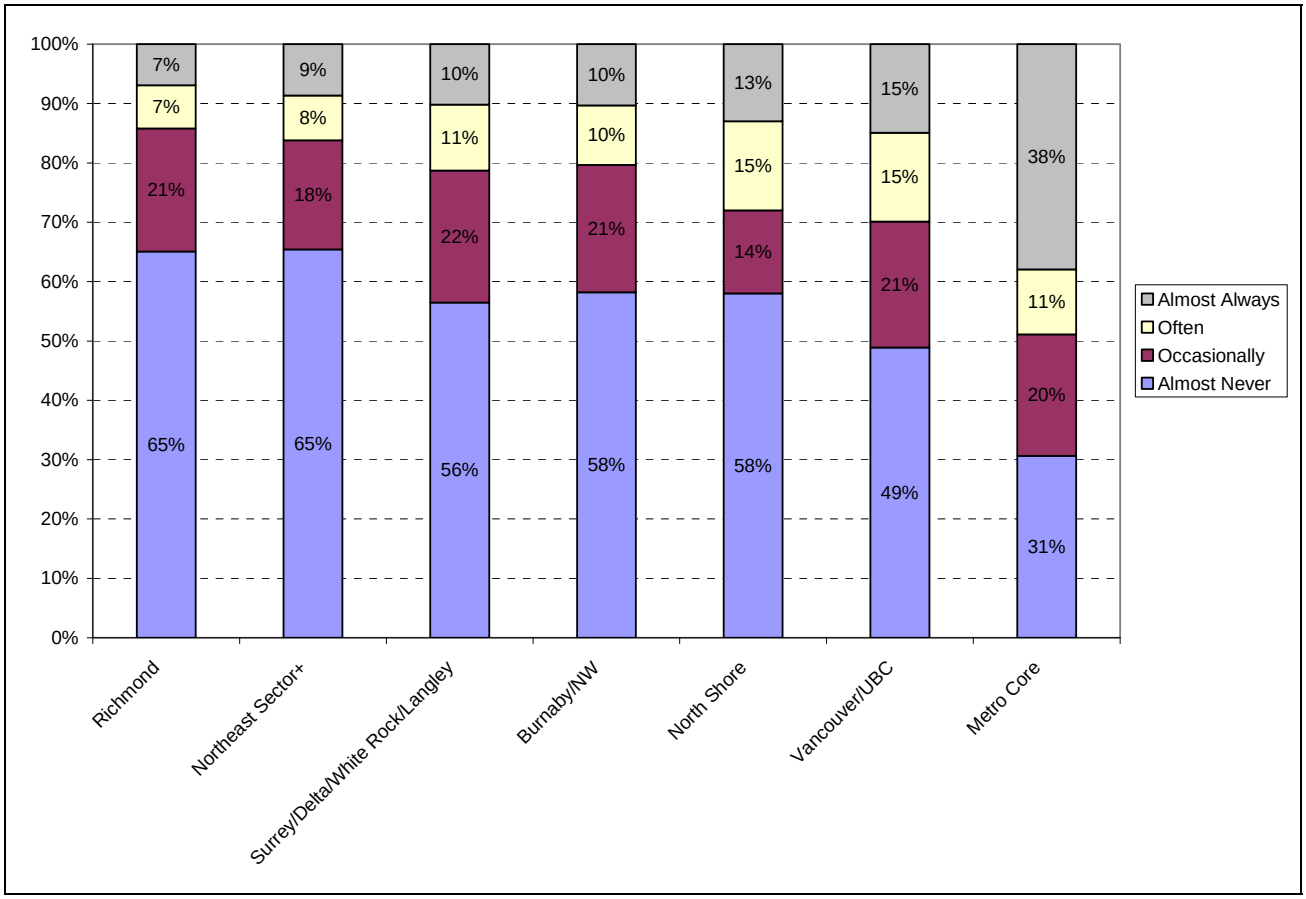


Figure 7. Visitor Parking Challenges by Subregion

7.7 Carshare Participation

"Is your household a member of a car share program, such as car2go, Modo, Zipcar, or through your strata?" (Yes or No)

Vancouver/UBC and the Metro Core Peninsula showed the highest rate of at least one household member being a member of a carshare program. This result is not surprising when the three major carshare providers (i.e., car2go, Modo, and Zipcar) in the region have most of their stalls within the Vancouver/UBC subregion. In the case of car2go, the current operating area is exclusively within the City of Vancouver.

Demand for carshare programs is likely a function of the availability of such services. Also, the availability of such services is likely contingent on activity centres that are close to one another and in areas where walk access is convenient.

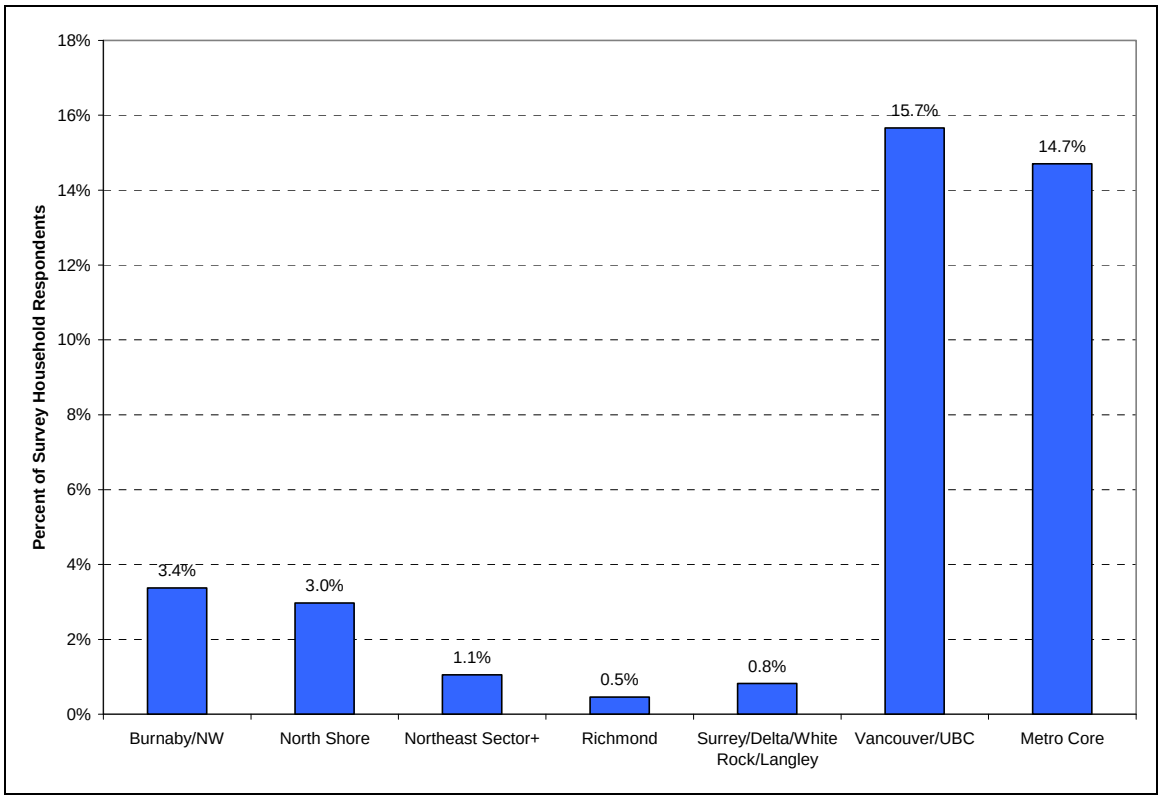


Figure 8. Carshare Participation by Subregion

Table 32. Carshare Participation by Subregion

Subregion	Households with Membership in a Carshare Program	Total Households
Burnaby/NW	13	385
North Shore	3	101
Northeast Sector+	2	190
Richmond	1	218
Surrey/Delta/White Rock/Langley	1	122
Vancouver/UBC	57	364
Metro Core Peninsula	25	170
Total	**102**	**1,550**

Households with membership in a carshare program also have fewer vehicles as shown below by stratifying the responses within Vancouver and UBC.

Table 33. Carshare Membership and Household Vehicle Rates

Strata Sites in Vancouver and UBC (including Metro Core Peninsula)	Carshare Member?	Number of Vehicles Per Household
0-Bedroom	Yes (n=5)	0.00
	No (n=28)	0.96
1-Bedroom	Yes (n=14)	0.79
	No (n=129)	0.95
2-Bedroom	Yes (n=16)	0.63
	No (n=125)	1.18

7.8 Location Preferences

"Which features were most important to you when you chose your current apartment/townhouse? (Select top 3)"

One of the more interesting findings from the Household Survey is the degree that proximity to public transit was an important factor for residents when choosing their current residence. Price, proximity to transit, and proximity to shops, services, and entertainment were consistently cited as the top three factors. About one-half of respondents stated transit was very important. This pattern was robust at the subregional level and by owner-occupied or renter households. The outlier was the Metro Core peninsula, where households consistently ranked proximity to transit lower in favour of proximity to jobs or building amenities (see Appendix 14 for the subregional breakdowns).

The relatively lower ranking for resident and visitor parking availability may be due in part to the general expectation that parking is always bundled with an apartment unit, and therefore parking is not seen as an optional feature or amenity.

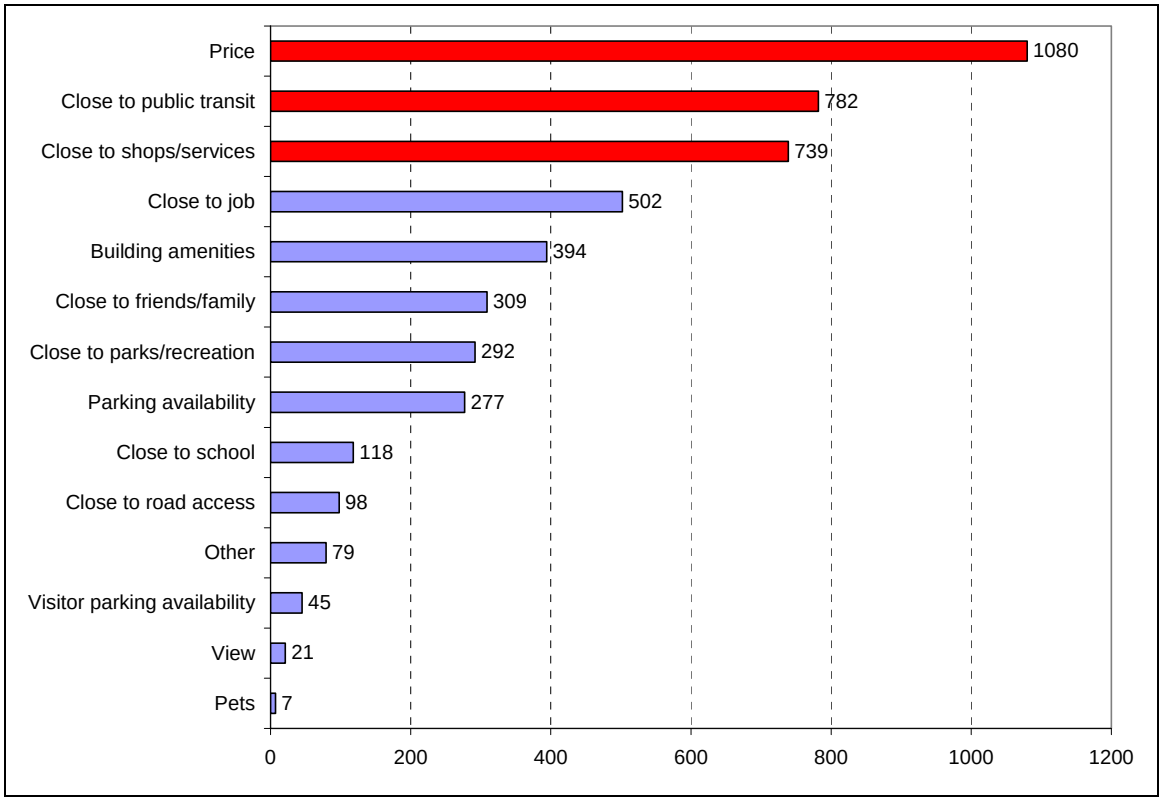


Figure 9. Frequency of Factors Cited as Most Important by Residents

7.9 Willingness to Forego Parking Stalls

"If provided the opportunity, would you have purchased/rented your current apartment/townhouse without a parking stall, if it meant having a lower purchase/rental price for your unit?" (Yes, Maybe/Unsure, No)

Municipalities require parking and developers supply parking all to satisfy real or perceived parking demand. The Household Survey provides evidence that certain market segments are more willing to give up their parking stalls.

A high proportion (36 percent) of 0-vehicle households living in strata sites having at least one parking stall would have given up those stalls if it meant having a lower purchase price or rent. Households having at least one vehicle are considerably less willing to give up their stalls. Note also the relatively high proportion of respondents who were undecided.

Table 34. Household Vehicle Rate in Strata Sites and Willingness to Forego Parking Stalls

	Willingness to Forego Parking Stalls		
Number of Vehicles per Household (Strata sites)	**No**	**Maybe/Unsure**	**Yes**
0 vehicles (n=86)	34%	30%	36%
1 or more vehicles (n=1,256)	78%	19%	3%

7.10 Key Lessons Learned

Based on the evidence from the two surveys, the following lessons have been learned:

- Residential parking supply in strata apartments generally exceed parking demand in the range of 18-35 percent across the region.
- Residential parking demand is lower near TransLink's Frequent Transit Network. For apartments near the Frequent Transit Network, the parking demand range is 0.89 – 1.06 vehicles per apartment unit; whereas for apartments further away from the Frequent Transit Network, the parking demand range is 1.10 – 1.25 vehicles per apartment unit.
- Residential parking demand near Frequent Transit Network bus stops are similar to demand near SkyTrain/SeaBus stations, but the parking supply is higher.
- Vehicle holdings and parking demand for apartment renters are much lower than for owners. This is consistent with prior research. In purpose-built market rental sites, the parking demand range is 0.58 - 0.72 vehicles per apartment unit.

- Visitor parking supply may be over supplied. Observed parking demand rates were below 0.1 stall per apartment unit, compared to the typical municipal requirement of 0.2 visitor stall per apartment unit.

- Participation in carshare programs was highest in Vancouver (16%) and UBC (15%), where carshare programs predominantly operate. Households with carshare memberships have fewer vehicles than do non-members.

- Proximity to transit was consistently cited by over half of the households surveyed as one of the top three factors when choosing their current home.

8 Apartment Parking Near the Frequent Transit Network

Updating parking requirements for apartments is not something that is regularly completed for various reasons. This study provides objective evidence that communities and developers can use when determining the appropriate amount of parking in new apartment developments. In this section, Metro Vancouver staff provides eight opportunity areas to effectively plan and manage apartment parking near the Frequent Transit Network.

The greatest opportunities for change are new apartment sites near the Frequent Transit Network (generally within 400 metres of a frequent bus stop and/or within 800 metres of a SkyTrain station). High density communities with a robust network of frequent transit services offer the greatest opportunities to put these findings into practice. For suburban communities lacking the coverage of frequent transit services, these opportunities may be treated as long-term goals.

In the long-run, the benefits of having refined parking requirements and implementing parking management will be more efficient and livable neighbourhoods in Urban Centres and Frequent Transit Development Areas, improvements to housing affordability and housing choice, and greater use of sustainable transportation choices.

8.1.1 Treat On-Site and Street Parking as a System

A more holistic approach toward parking supply and parking demand management for new apartment projects is warranted. Attention should be paid to the availability, type, and relative permanence of street parking (e.g., free, paid, permit-only, and/or time-limited) and surrounded land uses, in association with any reductions in on-site parking requirements.

8.1.2 Encourage Parking Supply to Match Demand Near the Frequent Transit Network

Parking requirements should be set based on actual or expected demands with further reductions based on transportation demand management measures or other site-specific conditions. The evidence provides support for any municipality wanting to explore reducing current minimum apartment parking requirements near the Frequent Transit Network. Reduced minimums provide flexibility for developers to meet market demand. For example, in Seattle, even though it is optional to provide parking in new apartment developments within 400 metres of frequent transit service, experience has shown that the actual parking supplied ranges from 0.6 to 1.0 stall per unit.

The evidence also supports municipalities wanting to explore introducing parking maximums near the Frequent Transit Network. Maximums provide a degree of assurance that parking will not be grossly oversupplied near high quality transit. Setting a range between the minimum and maximum rates provides flexibility for development sites near the Frequent Transit Network.

For example, in Toronto, the min-max requirement for new apartments on surface transit corridors is 0.7-1.6 stalls per unit.

8.1.3 Encourage Parking Unbundling/Opt-Out

In metropolitan Vancouver, the prevailing practice of developers is to bundle the cost of one or more parking stalls in the base price (purchase or rental) of an apartment unit. Unbundling the price of a parking stall from the apartment unit would provide consumers with a choice and an opportunity to realize some modest improvement in housing affordability, especially for households that do not own a vehicle. Further, unbundling can potentially provide an incentive for consumers to re-evaluate whether buying a new vehicle, or even a second one, is necessary. Residents requiring parking would have the option to purchase or rent a stall separately.

While unbundling is the norm and the market fully expects and accepts it in Toronto and Seattle, in metropolitan Vancouver the practice has been primarily limited to downtown Vancouver. One possible way to expand this concept to other areas of the region, in particular close to the Frequent Transit Network, is for developers to allow consumers to "opt out" of a pre-bundled parking and apartment unit package. In this scenario, the consumer can weigh the relative benefits of owning a parking stall versus paying a lower price for the apartment and exploring transportation alternatives. While municipalities can encourage unbundling or parking opt-out, it is the development community who must take a leadership role in this matter.

8.1.4 Encourage Rental Apartments Near the Frequent Transit Network

Generally, market and non-market renters have lower vehicle ownership rates than do apartment owners. In order to maximize affordability and efficiency in apartment buildings, municipalities should encourage rental housing in Urban Centres and Frequent Transit Development Areas. Household expenditures on transportation should inherently be lower in locations near transit as there is a reduced need to own or operate a private personal vehicle. Reduced parking reduces the cost of development. Municipalities could encourage rental apartment units near transit by reducing or waiving parking requirements as part of an incentive package as appropriate, and encouraging inclusion of rental apartment units in new developments through policy or housing agreements.

8.1.5 Encourage Expansion of Carshare Programs where Feasible

Carshare programs hold enormous potential to shape behaviour and expectations about car ownership, and to complement reductions in residential and visitor parking requirements in new apartment projects. In metropolitan Vancouver, some municipalities, such as Vancouver and New Westminster, request carshare vehicles/stalls in lieu of parking. Further investigation is warranted to establish appropriate substitution rates between carshare vehicles/stalls and regular parking stalls.

Municipalities and developers should actively encourage more carshare providers to explore the latent market demand beyond current operating boundaries and to identify suitable locations to achieve synergies with new apartment developments. Emerging Urban Centres and Frequent Transit Development Areas and other higher density locations near transit are obvious opportunities for expansion.

Additional supportive municipal actions include designating on-street parking spaces for carshare vehicles and providing strata councils with the knowledge, tools, and capacity to administer their own building-specific carshare programs if appropriate.

8.1.6 Consider Allowing Amendments to Parking Supply after Pre-Sales

Parking opt-out or unbundling would be more attractive to developers if there is greater flexibility and certainty in municipal processes to allow developers to propose and receive approval of parking design modifications to an approved project after pre-sales. It is often after pre-sales that the proponent will have actual data which may suggest the extent of parking demand is different than what was originally assumed. Developers should be able to use this data to refine the project. One approach could be to allow conditional approval of amended parking, subject to verification from the developer of parking demand after pre-sales. Further investigation into approaches that could allow flexibility is warranted.

8.1.7 Conduct Regular Post-Occupancy Parking Surveys

Regular and frequent post-occupancy surveys of apartment projects should be conducted either by developers or municipalities. Industry groups, such as the Urban Development Institute or the Urban Land Institute, should leverage its membership resources to assist in the collection of empirical evidence to support refinements to parking supply requirements and other innovations. TransLink, as the regional transportation authority, can demonstrate leadership by providing grants or in-kind assistance to municipalities to support post-occupancy surveys. Metro Vancouver, as demonstrated by this study, could provide research assistance as appropriate to close the knowledge gap.

8.1.8 Coordinate Frequent Transit Network Expansion

One common concern expressed by developers and municipalities was that in order for any parking reductions to be fully embraced, much greater certainty in the location and staging of the Frequent Transit Network, especially high-capacity transit, is needed. (The Evergreen Line is often cited because full funding was not confirmed until 2011, nearly eight years after the preferred alternative was first approved by TransLink.)

These uncertainties can be effectively addressed through improved collaboration, information sharing, and possible agreements between TransLink, senior governments, and municipal partners. At a minimum, TransLink and municipalities should continue to collaborate and

expand on corridor transit and land use planning, and to share the outcomes early on and widely to residents and developers.

The important feature to note is that these types of shared commitments and understandings have benefits for both high-capacity transit expansion projects, like the Evergreen Line, and enhancements of local bus service to Frequent Transit Network service levels. New Bus Rapid Transit, Light Rail Transit, or SkyTrain expansion, are typically high-capacity upgrades to existing Frequent Transit Network corridors. Some of the existing bus stop locations on the planned corridor would have to be rationalized to avoid duplication of infrastructure and service. Planning, design, and construction could take anywhere from two to five years depending on the project scope and complexity. If, on the other hand, local bus service is contemplated to be upgraded to Frequent Transit Network service levels, then confirmation of the timing of enhancements would be more important. As the study shows, proximity to frequent transit services, whether bus or rail, makes a difference in household vehicle ownership and parking demand.

8.2 Other Opportunities to Improve the Efficiency and Livability of Neighbourhoods

8.2.1 Provision of Shared Parking

There may be opportunities to have shared parking facilities in mixed-use projects with uses that require parking at different peak times (of the day or of the week). This could be an office / residential building, where peak office parking demand occurs during weekdays, and peak residential and visitor demand occur during weekday evenings and weekends. A single shared parking facility with fewer stalls could satisfy multiple users.

8.2.2 Provision of Unassigned Parking Stalls

Virtually all residential developments have parking stalls assigned to specific apartment units. When the apartment occupant does not use the stall, it remains unused even if someone else in the building is in need of one. Sometimes there may be an informal arrangement between apartment occupants to rent their stalls. If not, then there is a potential loss of efficiency. If some or all of the stalls were unassigned, potentially fewer stalls could be provided while still satisfying the total demand from residents in the building.

8.2.3 Provision of Good Access and Design for Visitor Parking

One of the cited reasons for visitors to not use the designated visitor parking stalls is the design of the facility. It can be inconvenient for residents to provide visitors with a separate key fob to access the parking facility or to have to manually open the gate for the visitor. These issues can be addressed in part by either having the security gate located past the visitor parking area (thus the visitor parking area is unsecured) or having a double gating system – one for the visitor area and one for the residents. However, some municipalities do not allow for these different layout

and access designs. Municipalities should be flexible to allow such designs to ensure that visitor parking is more accessible and efficiently used.

8.2.4 Provision of Appropriate Parking Stall Sizes

Another concern expressed in the household survey was parking stall sizes. In some apartment buildings, the dimensions of residential stalls are narrower than desired for drivers of sport utility vehicles, minivans, and trucks. In some instances, this has resulted in residents parking in the visitor stalls, which then forces visitors to park on nearby streets.

8.2.5 Provision of Secured and Appropriately-Sized Bicycle Parking Facilities

The study does not present evidence to suggest that the presence of an abundance of bicycle parking spaces will induce residents to switch from driving to bicycling. What the study does show is that a sizable proportion of bicycle owners surveyed are frustrated by the lack of secured and sufficient-sized bicycle parking facilities in their buildings (see Appendix 10). Increasingly, apartment buildings are including on-site bicycle parking / storage facilities. Most municipalities in the region require bicycle parking / storage facilities in new apartment developments. By providing an adequate supply of bicycle parking, along with appropriate facilities, for occupants the option of taking their bicycle for more recreational and/or commuting trips becomes more attractive and an important part of a healthy, active lifestyle.

There may be opportunities to also promote innovative forms of space-efficient bicycle storage, such as vertical racks, that would still satisfy bylaw requirements and save buildable floorspace.

8.2.6 Balancing Affordability and Payments-in-Lieu-of-Parking

Municipalities are enabled under the 2008 *Local Government (Green Communities) Statutes Amendment Act* to collect cash-in-lieu for on-site parking and to fund new and existing off-street parking spaces or transportation infrastructure that supports walking, bicycling, public transit or other alternative forms of transportation. Some municipalities in the region already incorporate this provision into their bylaws.

Payments-in-lieu of parking should be paired with realistic base parking requirements. One note of consideration is that collecting payments-in-lieu, depending on the design of the policy, can erode in part the affordability benefits gained from building less parking.

The flexibility and efficiency of constructing a separate shared parking facility may be most appropriate in higher density mixed-use projects, which have users with peak parking demands at different times of the day, or have greater design challenges in accommodating on-site parking.

9 Future Studies

Given the importance of parking in relation to fostering efficient and livable neighbourhoods within a sustainable and transit-oriented region, additional areas of research may be warranted to bring evidence to bear on important policy and regulatory proposals. Given the shared policy interests, it is appropriate for Metro Vancouver and TransLink to collaborate and pool resources to further these initiatives in consultation with municipal partners. Participation by the development community, such as the Urban Development Institute and Urban Land Institute, would also be appropriate to ensure relevance of such activities and that key findings are conveyed widely to stakeholders.

The following initiatives are not listed in any particular order.

9.1 Extensions to the Metro Vancouver Apartment Parking Study

- Surveying the same buildings (and surrounding streets) over time would help to capture emerging trends. Almost one in 10 households with vehicles surveyed reported parking a vehicle on a nearby street. This is happening in light of the general oversupply of parking for apartments. Further investigation is warranted as to why some residents are choosing to park on the street so that effect parking management strategies and improved designs can be developed and incorporated into new apartment developments to pre-empt or mitigate impacts on neighbourhoods.

- Further exploration of the visitor parking supply and demand would be appropriate given the preliminary findings that these parking stalls are often under-utilized. For visitor parking demand, parking facility surveys could be conducted during weeknights and weekends.

- The household survey could be administered more aggressively to attempt to achieve a higher participation rate. This may be through additional survey follow up mailings and other techniques. The parking facility survey could also be completed later in the evening / early morning to gather more accurate results of peak usage. This would provide for a larger and better dataset allowing for more disaggregated analysis.

- The household survey could be expanded further to explore the transportation behaviour and patterns of households. There is significant gap in the literature and understanding of how parking supply and travel behaviour are connected.

- Future efforts could capture more areas “under-represented” in this study, such as the Langleys, Pitt Meadows, and Maple Ridge. Guidance on appropriate parking guidance for apartments near West Coast Express stations is likely to be useful.

9.2 New Areas for Investigation

The following are potential new areas for investigation.

- A review of current and best practices should be carried out on approaches to treating on-site and street parking as a system.
- The concept of allowing amendments to parking supply after pre-sales holds great potential. Further investigation is warranted on any legal and administrative constraints and opportunities.
- For mixed-use projects, a better understanding of parking supply and demand by time period would be useful, in particular to evaluate the practical aspects of shared and unassigned parking.
- Townhouse developments will remain a popular product in this region. The perception of tandem parking has been both positive and negative, even though this style of parking could improve housing affordability through more efficient housing forms.
- The rapidly aging demographics will cause ripple effects for housing choices and parking demand. While some age-related analysis was performed using data from the Household Survey (see Appendix 12), further investigation on parking demand for older adults, particularly in buildings catering to older adults may be warranted. Better evidence may point to appropriate parking guidance for these sites. Also, it is worth exploring the intentions of older adults who are considering downsizing to apartments and how likely they could shed their vehicles.
- A complete community is more than just singles and couples. Municipalities are increasingly interested in attracting families to the urban cores close to transit. As the study suggests, household vehicle ownership rates in larger apartments (floorspace and number of bedrooms) appear to be less sensitive to transit proximity. Further investigation on the likelihood of families and larger households to shed vehicles may be warranted. The obvious implication is that there is a trade-off between attracting more families (and therefore larger apartment units) and reducing parking supply.
- Given the expense of constructing underground parkades and some of the challenging geotechnical conditions across the region, it is appropriate to investigate the costs and benefits of alternative forms of parking, such as automated stacked parking, surface parking on smaller development sites, etc.
- An increasing number of municipalities allow for carshare parking stalls and carshare vehicles to be provided in lieu or regular parking stalls. Further investigation is warranted on appropriate substitution rates, effectiveness of carshare programs on changing car ownership patterns, and the feasibility of expanding carshare programs to more suburban locations.

10 Conclusions and Next Steps

The Metro Vancouver Apartment Parking Study is one of the most comprehensive examinations of parking supply and demand ever conducted for a metropolitan area. The evidence provided by the parking surveys, coupled by intelligence from residential developers, municipal planners, and progressive practices in other cities, strongly supports moving beyond current parking practices in the region.

Apartment parking supply is measurably higher than parking demand. Providing an excessive supply of parking represents lost opportunities for maximizing efficient use of land resources, supporting transportation choices, and achieving modest improvements in housing affordability. The study points to opportunities for the planning and management of apartment parking near TransLink's Frequent Transit Network.

Metro Vancouver's role is largely leadership through research, outreach, collaboration, and advocacy. Metro Vancouver is committed to working with stakeholders to best communicate and advance the study findings. Metro Vancouver will distribute a summary booklet of the study, present at industry events, and engage one-on-one with stakeholders.

Each of these stakeholders has a vested interest in ensuring public and private resources are optimally used. This shared interest coincides with the broader regional objectives to build vibrant, efficient, and livable transit-oriented Urban Centres and Frequent Transit Development Areas, encourage alternative forms of transportation, and reduce housing development costs.

Opportunities abound for future research related to parking and to further the implementation of the *Regional Growth Strategy* and *Regional Affordable Housing Strategy*. Metro Vancouver will endeavour to consult, coordinate, and collaborate with municipal partners, TransLink, the Urban Development Institute, the Urban Land Institute, and the Province.

APPENDIX 1: Bibliography

Bunt, Paul and Peter Joyce. Car Ownership Patterns Near Rapid Transit Stations. Bunt & Associates Engineering Ltd. 1998. http://www.citebc.ca/Feb98_Ownership.html

Canada Mortgage and Housing Corporation. Rental Market Report. Fall 2011.

Cansult Limited. City of Toronto Parking Standards Review - Phase Two Apartment Building/Multi-residential Block Developments Component, New Zoning By-Law Project. 2007.

Cervero, Robert, Arlie Adkins, and Cathleen Sullivan. Are TODs Over-Parked? University of California Transportation Center. 2009.

City of Toronto. 426 University Avenue – Zoning By-law Amendment and Site Plan Approval Applications – Refusal Report. From: Director, Community Planning, Toronto and East York District, To: Toronto and East York Community Council. May 25, 2009. http://www.toronto.ca/legdocs/mmis/2009/te/bgrd/backgroundfile-21943.pdf

Co-operative Auto Network. The Car Co-op Social and Environmental Report. 2008.

IBI Group. Parking Standards Review: Examination of Potential Options and Impacts of Car Share Programs on Parking Standards. Submitted to the City of Toronto. 2009.

Kodransky, Michael and Gabrielle Hermann. Europe's Parking U-Turn: From Accommodation to Regulation. Institute for Transportation & Development Policy. 2011

Martin, Elliot, Susan Shaheen, and Jeffrey Lidicker. Carsharing's Impact on Household Vehicle Holdings: Results from a North American Shared-Use Vehicle Survey. University of California, Berkeley. March 15, 2010.

Metro Vancouver. Regional Affordable Housing Strategy. 2007.

Metro Vancouver. Regional Growth Strategy: Metro Vancouver 2040: Shaping Our Future. 2011.

MMM Group. Transportation Assessment and Management Study - Marine Gateway on Canada Line - Vancouver, BC. For: PCI Developments Corp. November 2009. http://www.marinegateway.ca/documents/trafficStudy.pdf

Pinsker, Paul. Subject: Parking Requirement Standards for Multiple Residential Use. To: Standing Committee on Transportation and Traffic, From: General Manager of Engineering Services in consultation with the Director of City Plans, Director of Development Services, Director of Legal Services, and Chief Building Official. April 13, 2005. http://vancouver.ca/ctyclerk/cclerk/20050426/tt3.pdf

San José State University and Santa Clara Valley Transportation Authority. A Parking Utilization Survey of Transit-Oriented Development Residential Properties in Santa Clara County, Volume I: Technical Report. SJSU/VTA Collaborative Research Project. 2010.

Shoup, Donald. The Trouble With Minimum Parking Requirements. Transportation Research Part A, Vol. 33A, Nos.7-8, September/November, 1999.

APPENDIX 2: List of Developers Interviewed

Developer	Typical Products	Target Markets
Bosa Properties	Highrise apartments	Region-wide
Citimark	Highrise apartments	Richmond, Surrey, Vancouver
Concert Properties	Highrise apartments	Vancouver
Mosaic Homes	Townhouses	Region-wide
ParkLane Homes	Townhouses, single-detached homes	Port Moody, Langley, Surrey, Vancouver
Onni Group of Companies	Highrise apartments	Region-wide
Polygon Homes	Highrise and lowrise apartments, and townhouses	Region-wide
Quadra Homes	Townhouses	Langley, Abbotsford
Westbank Developments	Highrise apartments	Vancouver

APPENDIX 3: Interview Questions with Developers

Municipal Regulations

1. Do you believe that reductions in multi-unit residential parking supply requirements could offer a significant opportunity to reduce development costs?
2. Do you believe that municipal parking regulations for apartments and townhouses in the region are generally reasonable? Do some municipalities require too many or too few parking stalls?
3. What has been your experience in obtaining a variance from the municipal parking regulations for individual projects?

Project Design

4. What are the key factors you use to determine appropriate levels of parking stalls per apartment unit or townhouse unit (plus visitor parking)?
5. When determining parking needs, how do you take into account proximity to transit and transit technology / service levels (local bus, limited-stop bus, SkyTrain, etc.)?
6. What do you use as a rule-of-thumb to define proximity to transit: 400 metres, 800 metres? Does that vary by transit technology?
7. What is the marginal or average construction cost per parking stall (underground, above grade structure)?
8. Prior to construction, do you adjust the number of parking stalls in a building after pre-sales have been completed? How easy is it to accommodate a change in parking facility design and approvals at that stage?
9. What is the typical number of parking stalls provided per residential unit in your recent projects? Would this differ if there were no municipal parking requirements or reduced municipal parking requirements?

Consumer Preference, Project Financing, and Marketing

10. How would reductions in parking supply requirements affect project financing or marketing?
11. Do you sell or rent parking stalls independent (un-bundled) of the residential unit in any of your projects? Do you have surplus parking to sell/rent?
12. Are consumers willing to buy residential units without a parking stall? Or with un-assigned parking?
13. Do many consumers buy more parking stalls than they immediately need for possible future needs, or to preserve future rental or resale potential?
14. Have you offered transportation incentives in lieu of parking, such as co-op car parking, co-op vehicles, carpool parking, extra bike storage, transit passes, to reduce parking needs? If so, what has your experience been? What challenges have you faced in marking / explaining such features to consumers? Did you encounter any issues with financial lenders?
15. Do you conduct post-occupancy surveys of unit owners/occupants, asking about their vehicle ownership or parking usage?
16. What else could be done to make housing development more affordable?

APPENDIX 4: Municipal Questionnaire

1. Do you believe that the current multi-unit residential municipal parking regulations are providing for an appropriate level of parking?

2. Does your municipality have provisions for reduced parking requirements for mixed use, multi-unit residential developments near transit and/or low income units? If so:
   a. How does your municipality establish allowable reductions for:
      i. Mixed use / shared parking projects
      ii. Near Transit
      iii. Low income
   b. How well do these reductions work? Does your municipality receive parking related complaints post-occupancy of projects with reduced parking?

3. Do you receive requests for reductions in parking requirements from developers? How do you evaluate these requests?

4. Is on-street parking availability/management considered when setting on-site parking regulations or evaluating requested variances?

5. Does your municipality encourage developers to offer transportation incentives in lieu of parking, such as co-op car parking, co-op vehicles, carpool parking, bike storage, transit passes, to reduce parking needs?

6. How frequently are municipal parking regulations reviewed and adjusted, and what is the process?

APPENDIX 5: City of Seattle Multifamily Parking Code

Residential Use	Previous Minimum Parking Requirement	Revised Minimum Parking Requirement (2010)
Nominal Standards		
Multifamily residential	1 space per DU	1 space per DU
Single-family dwelling units	1 space per DU	1 space per DU
Location Criteria		
Residential uses in commercial and multifamily zones within urban centers or within the Station Area Overlay District (SAOD)	No minimum requirement	No minimum requirement
Residential uses in commercial and multifamily zones within urban villages that are not within urban centers or the Station Area Overlay District, AND the residential use is located within 1,320 feet of frequent transit service	--	No minimum requirement
Income or Location + Income Criteria		
Low-income elderly multifamily residential uses not located in urban centers or within SAOD	1 space for each 6 DU	1 space for each 6 DU
Low-income disabled multifamily residential uses not located in urban centers or within SAOD	1 space for each 4 DU	1 stall/4 DU; deleted reference to urban centers and SAOD
Low-income elderly/low-income disabled multifamily residential uses not located in urban centers or within SAOD	1 space for each 5 DU	1 space for each 5 DU; deleted reference to urban centers and SAOD
Multifamily residential uses: for each DU rented to and occupied by a household with an income at the time of its initial occupancy at or below 30% AMI, for the life of the building	--	1, 2 bedrooms = 0.33 stall/DU 3+ bedrooms = 1 stall/DU
Multifamily residential uses: for each DU rented to and occupied by a household with an income at the time of its initial occupancy of 30-50% AMI, for the life of the building	--	1,2 bedrooms = 0.75 stall/DU 3+ bedrooms = 1 stall/DU

APPENDIX 6: Survey Sites

Municipality	Site Name	Address	Parking Facility Survey and/or Household Survey
Burnaby	Altura	3855 PENDER ST	Both
	Arcadia East	7178 COLLIER ST	Both
	Cortina	6888 SOUTHPOINT DR	Both
	Crystal Residences	6028 WILLINGDON AVE	Both
		6088 WILLINGDON AVE	
	Emerson	7063 HALL AVE	Both
	Jackson House	4788 BRENTWOOD DR	Both
	Montage	4728 DAWSON ST	Both
	OMA2	4250 DAWSON ST	Both
	Patterson Park	4155 CENTRAL BLVD	Both
	Silhouette Towers	9868 CAMERON ST	Both
		9888 CAMERON ST	
	Tandem 3	4182 DAWSON ST	Both
	The Harris	4768 BRENTWOOD DR	Both
	Thomson House	4799 BRENTWOOD DR	Both
	Tramonto	4365 HASTINGS ST	Both
	Watercolours	2289 YUKON CRES	Both
Coquitlam	Claremont	1175 THE HIGH ST	Both
		1177 THE HIGH ST	
		1179 THE HIGH ST	
		1185 THE HIGH ST	
		1187 THE HIGH ST	
		1189 THE HIGH ST	
		1191 THE HIGH ST	
		1193 THE HIGH ST	
		1197 THE HIGH ST	
		1199 THE HIGH ST	
	Tamarisk	2958 SILVER SPRINGS BLVD	Both
		2966 SILVER SPRINGS BLVD	
		2968 SILVER SPRINGS BLVD	
	Tantalus	2951 SILVER SPRINGS BLVD	Both
		2959 SILVER SPRINGS BLVD	
Delta	Oliva	1315 56 ST	Both
Langley City	Brydon Walk	5454 198 ST	Both
	The Southbrook	5474 198 ST	Both
Maple Ridge	Westbrooke	12020 207A ST	Household Survey
New Westminster	Anvil	200 KEARY ST	Both
	Carnarvon	410 CARNARVON ST	Both
		420 CARNARVON ST	
	The Grove	245 ROSS DR	Both
		255 ROSS DR	
		265 ROSS DR	
		270 FRANCIS WAY	
		275 ROSS DR	
		285 ROSS DR	

Municipality	Site Name	Address	Parking Facility Survey and/or Household Survey
		290 FRANCIS WAY	
	The Point	610 VICTORIA ST	Both
North Vancouver City	Avondale	1468 ST. ANDREWS AVE	Both
		307 15TH ST E	
		308 14TH ST E	
		309 15TH ST E	
		310 14TH ST E	
		311 15TH ST E	
		312 14TH ST E	
		313 15TH ST E	
		314 14TH ST E	
		315 15TH ST E	
		316 14TH ST E	
		317 15TH ST E	
		318 14TH ST E	
		319 15TH ST E	
		320 14TH ST E	
		321 15TH ST E	
		322 14TH ST E	
		323 15TH ST E	
		324 14TH ST E	
		325 15TH ST E	
		327 15TH ST E	
		329 15TH ST E	
		331 15TH ST E	
	Esplanade West	168 ESPLANADE E	Both
	Mira in the Park	683 VICTORIA PK W	Both
	The Silva	121 16TH ST W	Both
	Vista 29	188 29TH ST W	Both
	Vista Place I and II	1301 Civic Place Mews Blvd	Both
		1303 Civic Place Mews Blvd	
		1305 Civic Place Mews Blvd	
		1309 Civic Place Mews Blvd	
		1313 Civic Place Mews Blvd	
		1317 Civic Place Mews Blvd	
		1320 CHESTERFIELD AVE	
		1321 Civic Place Mews Blvd	
		1322 CHESTERFIELD AVE	
		1324 CHESTERFIELD AVE	
		1325 Civic Place Mews Blvd	
		1326 CHESTERFIELD AVE	
		1328 CHESTERFIELD AVE	
		1329 Civic Place Mews Blvd	
		158 13TH ST W	
Pitt Meadows	Keystone	12350 HARRIS RD	Household Survey
	Origin	11950 HARRIS RD	Household Survey
Port Coquitlam	Verde	2484 WILSON AVE	Both
	Villagio 1 and 2	2627 SHAUGHNESSY ST	Both

Municipality	Site Name	Address	Parking Facility Survey and/or Household Survey
		2628 MAPLE ST	
Port Moody	Libra A and B	101 MORRISSEY RD	Both
		201 MORRISSEY RD	
	Lighthouse at Rocky Point	84 GRANT ST	Both
	The Sentinel	290 NEWPORT DR	Both
	The Sinclair	235 GUILDFORD WAY	Both
	The Square at Saint Johns	3240 ST JOHNS ST	Both
		3250 ST JOHNS ST	
		3260 ST JOHNS ST	
	Tides	300 KLAHANIE DR	Both
		400 KLAHANIE DR	
		500 KLAHANIE DR	
Richmond	Acqua	5811 NO. 3 RD	Both
		7911 ACKROYD RD	
	Copper Sky East and West	4500 WESTWATER DR	Both
		4600 WESTWATER DR	
	Emporio	6351 BUSWELL ST	Both
	Magnolia and Casaurina	9180 HEMLOCK DR	Both
		9188 HEMLOCK DR	
	Meridian Gate	9199 TOMICKI AVE	Both
		9288 ODLIN RD	
		9299 TOMICKI AVE	
	Ocean Walk	7535 ALDERBRIDGE WAY	Both
		7555 ALDERBRIDGE WAY	
		7575 ALDERBRIDGE WAY	
	Paloma 1	6068 NO. 3 RD	Both
	Red2	9233 FERNDALE RD	Household Survey
	The Fullerton	9171 FERNDALE RD	Both
	The Village at Imperial Landing	4111 BAYVIEW ST	Household Survey
		4211 BAYVIEW ST	
		4233 BAYVIEW ST	
		4280 MONCTON ST	
	Lotus	5900 ALDERBRIDGE WAY	Both
		5908 ALDERBRIDGE WAY	
		7371 WESTMINSTER HWY	
		7373 WESTMINSTER HWY	
Surrey	Access 1, 2	10838 CITY PKY	Both
		10866 CITY PKY	
	Access 3	10822 CITY PKY	Household Survey
	Escada	10058 153 ST	Both
		10066 153 ST	
		15322 101 AVE	
		15388 101 AVE	
	Maxxine Wright	13733 92 AVENUE	Both
	Quattro 2	13789 107A AVE	Both
	The Morgan	15918 26 AVE	Both
		15988 26 AVE	
	The Observatory	10899 UNIVERSITY DR	Both

Municipality	Site Name	Address	Parking Facility Survey and/or Household Survey
	The Villas at Strawberry Hill	12088 75A AVE	Household Survey
UBC	Chaucer Hall	2250 WESBROOK MALL	Both
	Galleria	5568 KINGS RD	Both
		5632 KINGS RD	
		5692 KINGS RD	
Vancouver	600 Drake	600 Drake	Both
	Avila	1550 COAL HARBOUR QUAY	Both
		502 CARDERO ST	
		506 CARDERO ST	
		510 CARDERO ST	
		560 CARDERO ST	
	Brava	1155 SEYMOUR ST	Both
		1199 SEYMOUR ST	
	City Gate Housing Co-op	188 MILROSS AV	Both
	Collingwood House Co-op	3547 EUCLID AV	Household Survey
		5398 TYNE ST	
	Europa	63 KEEFER PL	Both
	First	1808 1ST AVE W	Both
	Fraser Pointe I	3033 N.E. KENT AVENUE	Both
	Fraser Pointe II	3083 N.E. KENT AVENUE	Parking Facility Survey
	Heather Place	706 13th Avenue West	Both
		714 13th Avenue West	
		725 14th Avenue West	
		726 13th Avenue West	
		733 14th Avenue West	
		734 13th Avenue West	
		744 13th Avenue West	
		745 14th Avenue West	
		754 13th Avenue West	
		755 14th Avenue West	
		764 13th Avenue West	
		774 13th Avenue West	
		785 14th Avenue West	
	Lanesborough	3088 41ST AVE W	Household Survey
		3188 41ST AVE W	
	Loft 495	495 6TH AVE W	Both
	Mayfair	189 ONTARIO PL	Household Survey
	Olympic Village Parcel 5	122 WALTER HARDWICK AVE	Household Survey
	Olympic Village Parcel 9	80 WALTER HARDWICK AVE	Household Survey
	Residences on Seventh	228 7 AVE E	Both
	Solo, Duo, Treo	2228 MARSTRAND AVE	Both
		2288 MARSTRAND AVE	
		2688 VINE ST	
	Strathearn Court	1873 Spyglass Place	Both
		1893 Spyglass Place	
	Tapestry	2851 HEATHER ST	Both
		750 12TH AVE W	
	The 501	501 PACIFIC ST	Both

Municipality	Site Name	Address	Parking Facility Survey and/or Household Survey
	The Bradford	3535 CROWLEY DR	Both
	The Carina	1233 CORDOVA ST W	Both (Parking Facility Survey counted Calisto; shared parkade)
	The Hudson	610 GRANVILLE	Parking Facility Survey
	The Melbourne	3433 CROWLEY DR	Both (Parking Facility Survey counted Alexander Court; shared parkade)
	The Remington	3528 VANNESS AVENUE	Parking Facility Survey
	The Rise	425 8TH AVE W	Both
		450 7TH AVE W	
		485 8TH AVE W	
	The View	2150 HASTINGS ST E	Both
	The Vine	2228 BROADWAY W	Both
		2268 BROADWAY W	
		2288 BROADWAY W	
	The Westridge	4170 NANAIMO ST	Both
		4180 NANAIMO ST	
	Wessex Gate / Earls Court	3408 CROWLEY DR	Both
		3428 CROWLEY DR	
	Miramar Tower A	15152 RUSSELL AVE	Both
White Rock	Miramar Tower B	1473 JOHNSTON RD	Both

APPENDIX 7: Household Survey Instrument

Metro Vancouver Regional Residential Parking Study

metrovancouver

Metro Vancouver (the Greater Vancouver Regional District) is conducting a study of multi-unit residential buildings regarding parking usage. Your household has been selected to be part of this important study. The study will provide information to municipalities and developers on the appropriate amount of parking supply for new multi-unit residential developments. We appreciate your participation, and all responses will be kept confidential.

When you complete the questionnaire, either on the Internet or the paper form, you will be entered into a draw for a chance to win 1 of 3 prize bundles.

We recommend completing this questionnaire online at: www.MVStudy.ca/parking

If you wish to complete the paper questionnaire, please identify your preferred prize bundle, and mail the questionnaire to:

Acuere Consulting
Box 401
141 – 6200 McKay Ave.
Burnaby, B.C. V5H 4M9
Attention: "Parking Study"

☐ **Prize Bundle 1: Vancity mytreat Visa Gift Card + dinner gift card + TransLink faresaver tickets**

☐ **Prize Bundle 2: TransLink 1-month transit pass + shopping mall gift card**

☐ **Prize Bundle 3: Mountain Equipment Co-op gift card + spa gift card + TransLink faresaver tickets**

i. ACCESS CODE (see introductory letter) ☐☐ – ☐☐☐☐☐ – ☐☐☐

ii. Building Name & Address: _____ Unit #: _____

iii. Name (optional): _____ iv. Phone (optional): _____
(your name and phone number is required only if you wish to be entered into the prize draw)

Resident Parking

1. **How many vehicles does your household have (not including car share program)?** (Please include all cars, vans or light trucks that are brought home and parked overnight, but not motorcycles / scooters or bicycles.) ☐

2. **Where do you usually park your vehicle(s) overnight? Please note number of vehicles:**

☐ Vehicles in my building's parking facility (parking lot or garage).
☐ Vehicles on the street near building.
☐ Vehicles in a nearby parking facility (parking lot or garage).
☐ Not applicable - I do not have a vehicle.

3. **If you OWN your apartment/townhouse, how many of your parking space(s) in the building are:**

☐ Included in the unit purchase price ☐ Purchased separately ☐ Rented separately ☐ I don't have any parking

4. **If you RENT your apartment/townhouse, how many of your parking space(s) in the building are:**

☐ Included in the unit rent ☐ Rented for an extra fee ☐ I don't have any parking

5. **How many of your parking spaces in the building do you rent out to other people?** ☐

Visitor Parking

6. **A) Typically, where do your visitors park? (Select all that apply)**
- ❑ In my building's designated visitor parking area
- ❑ In one of the stalls I own/rent in my building
- ❑ On the street near building (paid)
- ❑ On the street near building (free)
- ❑ Nearby parking facility
- ❑ Not applicable

B) Typically, how often do your visitors have difficulty finding a parking space in your building's parking facility? (Select one)
- ❑ Almost never (under 25% of the time)
- ❑ Occasionally (25-49% of the time)
- ❑ Often (50-74% of the time)
- ❑ Almost always (75-100% of the time)
- ❑ Not applicable

Transportation Choices

7. Is your household a member of a car share program, such as car2go, Modo, Zipcar, or through your strata?

❑ Yes ❑ No

8. How many people in your household regularly use transit on 3 or more days per week? ☐

9. A) How many bicycles does your household own? ☐

B) If your household owns 1 or more bicycles, does your household use the building's bicycle parking facility?

❑ Yes ❑ No – please explain: ☐

Apartment/Townhouse Choices

10. Which features were most important to you when you chose your current apartment/townhouse? (select top 3)

❑ Purchase/rent price
❑ Close to friends and family
❑ Close to job
❑ Close to school
❑ Close to public transit - choose all that apply:
  ❍ Close to Bus routes
  ❍ Close to SkyTrain/SeaBus
  ❍ Close to West Coast Express
❑ Close to road access
❑ Close to parks and recreation
❑ Close to shops, services, and entertainment
❑ Building or unit amenities
❑ Availability of parking in building's parking facility
❑ Availability of visitor parking in building's parking facility
❑ Other – please specify: ☐

11. If provided the opportunity, would you have purchased/rented your current apartment/townhouse <u>without</u> a parking stall, if it meant having a lower purchase/rental price for your unit?

❑ Yes ❑ Maybe/unsure ❑ No

Household Information

12. How many bedrooms are in your apartment/townhouse?

❑ 0 (bachelor suite) ❑ 1 ❑ 2 ❑ 3 ❑ 4 or more

13. How large is your apartment/townhouse (excluding balcony/patio)?

❑ Under 400 sqft
❑ 400-499 sqft
❑ 500-599 sqft
❑ 600-699 sqft
❑ 700-799 sqft
❑ 800-899 sqft
❑ 900-999 sqft
❑ 1,000-1,099 sqft
❑ 1,100-1,199 sqft
❑ 1,200-1,299 sqft
❑ 1,300 and higher sqft
❑ Unsure

14. How many people in your household are within the following age groups (note numbers)?

☐ 0-15 years ☐ 25-34 years ☐ 65+ years
☐ 16-24 years ☐ 35-64 years

15. Any additional comments:

☐

metrovancouver

Thank you for completing the questionnaire!

APPENDIX 8: Parking Demand in Urban Centres (Household Survey Responses)

Regional City Centres (29 sites; excluding Metro Core Peninsula)

Unit Type		Stalls per Household	Vehicles per Household	Parked Vehicles per Household
1-Bedroom	Outside RCC (n=234)	1.14	1.11	0.97
	Inside RCC (n=85)	1.08	1.16	1.02
2-Bedroom	Outside RCC (n=588)	1.44	1.37	1.25
	Inside RCC (n=161)	1.35	1.30	1.19
3-Bedroom	Outside RCC (n=71)	1.90	1.55	1.39
	Inside RCC (n=36)	1.75	1.64	1.36

Richmond Regional City Centre (8 sites)

Unit Type		Stalls per Household	Vehicles per Household	Parked Vehicles per Household
1-Bedroom	Outside RCC (n=18)	1.17	1.11	0.83
	Inside RCC (n=28)	1.14	1.18	1.07
2-Bedroom	Outside RCC (n=76)	1.49	1.50	1.34
	Inside RCC (n=64)	1.41	1.28	1.22
3-Bedroom	Outside RCC (n=13)	1.85	1.46	1.38
	Inside RCC (n=16)	1.81	1.63	1.56

Municipal Town Centres (22 sites)

Unit Type		Stalls per Household	Vehicles per Household	Parked Vehicles per Household
1-Bedroom	Outside MTC (n=139)	1.14	1.05	0.92
	Inside MTC (n=95)	1.13	1.19	1.03
2-Bedroom	Outside MTC (n=328)	1.38	1.34	1.22
	Inside MTC (n=260)	1.52	1.42	1.28
3-Bedroom	Outside MTC (n=50)	1.96	1.58	1.40
	Inside MTC (n=21)	1.76	1.48	1.38

Brentwood, Lougheed, Edmonds Municipal Town Centres (11 sites)

Unit Type		Stalls per Household	Vehicles per Household	Parked Vehicles per Household
1-Bedroom	Outside RCC (n=34)	1.18	1.15	1.06
	Inside RCC (n=60)	1.13	1.15	1.02
2-Bedroom	Outside RCC (n=75)	1.36	1.39	1.25
	Inside RCC (n=135)	1.35	1.36	1.23
3-Bedroom	Outside RCC (n=17)	1.88	1.65	1.41
	Inside RCC (n=13)	1.69	1.62	1.54

APPENDIX 9: Regular Transit Usage and Parking Demand (Household Survey Responses)

"How many people in your household regularly use transit on 3 or more days per week?"

Strata Sites (excluding Metro Core Peninsula)

Proximity to FTN	At least one regular transit user	Stalls per Household	Vehicles per Household	Parked Vehicles per Household
Beyond FTN	No (n=223)	1.43	1.49	1.30
	Yes (n=84)	1.30	1.30	1.13
FTN Bus	No (n=256)	1.45	1.41	1.25
	Yes (n=159)	1.38	1.08	1.01
FTN Station	No (n=198)	1.37	1.39	1.24
	Yes (n=286)	1.29	1.15	1.08

Profile of households in strata sites with at least one regular transit user

	Owner-Occupied	Renter-Occupied
Beyond FTN (n=84)	65	19
FTN Bus (n=159)	105	54
FTN Station (n=286)	219	67

APPENDIX 10: Bicycle Ownership and Storage (Household Survey Responses)

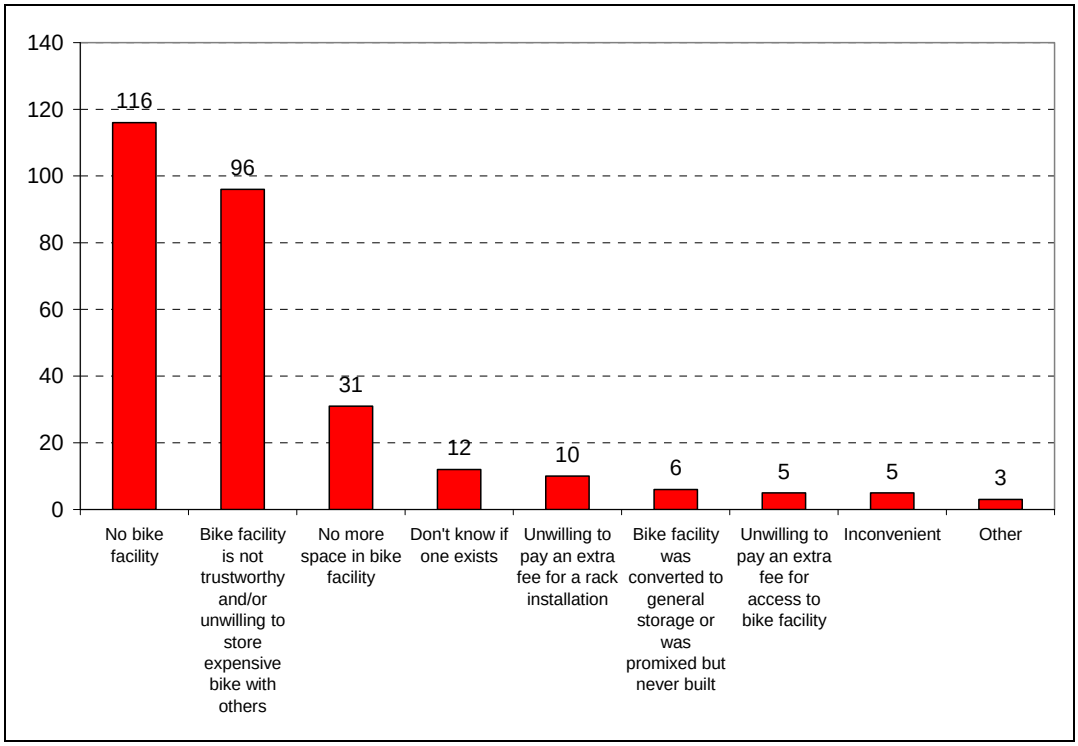
"How many bicycles does your household own?"

Subregion	No Bicycles	1 or more bicycles
Burnaby/NW (n=384)	58%	42%
North Shore (n=100)	56%	44%
Northeast Sector+ (n=190)	45%	55%
Richmond (n=218)	61%	39%
South of Fraser (n=121)	57%	43%
Vancouver/UBC (n=364)	32%	68%
Metro Core Peninsula (n=170)	44%	56%
Total (n=1,547)	49%	51%

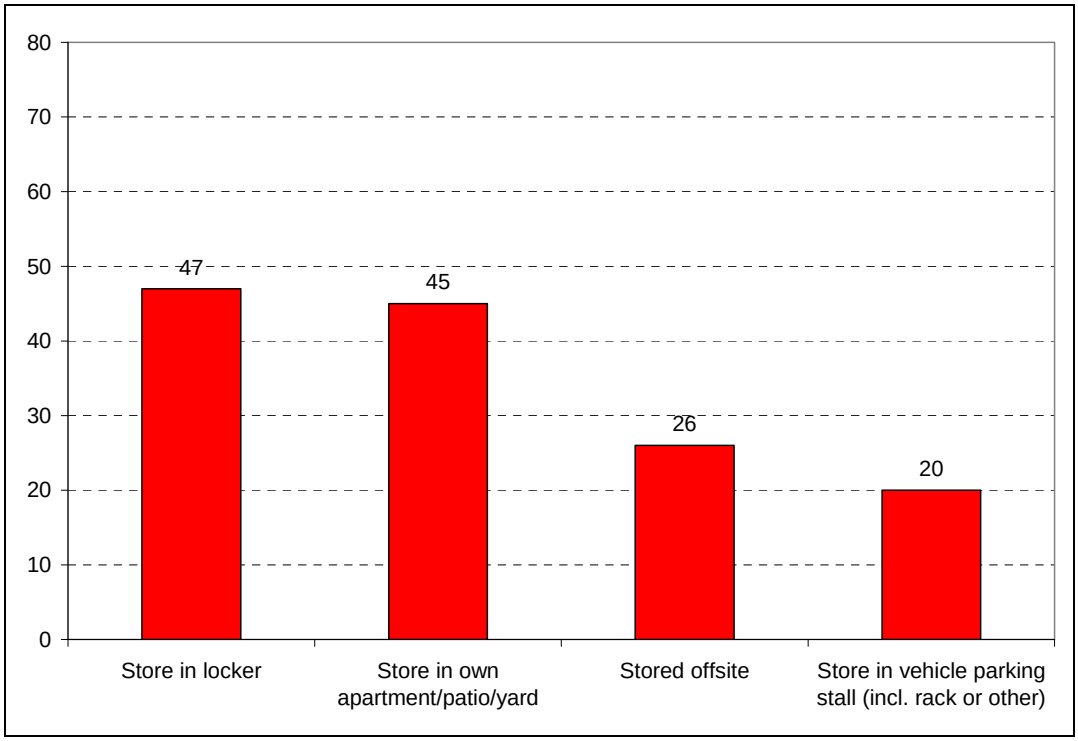
"If your household owns 1 or more bicycles, does your household use the buildings' bicycle parking facility?" (Yes, No – please explain)

Subregion	Yes	No
Burnaby/NW (n=160)	60%	40%
North Shore (n=44)	30%	70%
Northeast Sector+ (n=105)	45%	55%
Richmond (n=86)	34%	66%
South of Fraser (n=52)	52%	48%
Vancouver/UBC (n=246)	25%	75%
Metro Core Peninsula (n=95)	53%	47%
Total (n=788)	41%	59%

Frequency of stated reasons for not using the bicycle parking facility (note: 73 households did not specify a reason):

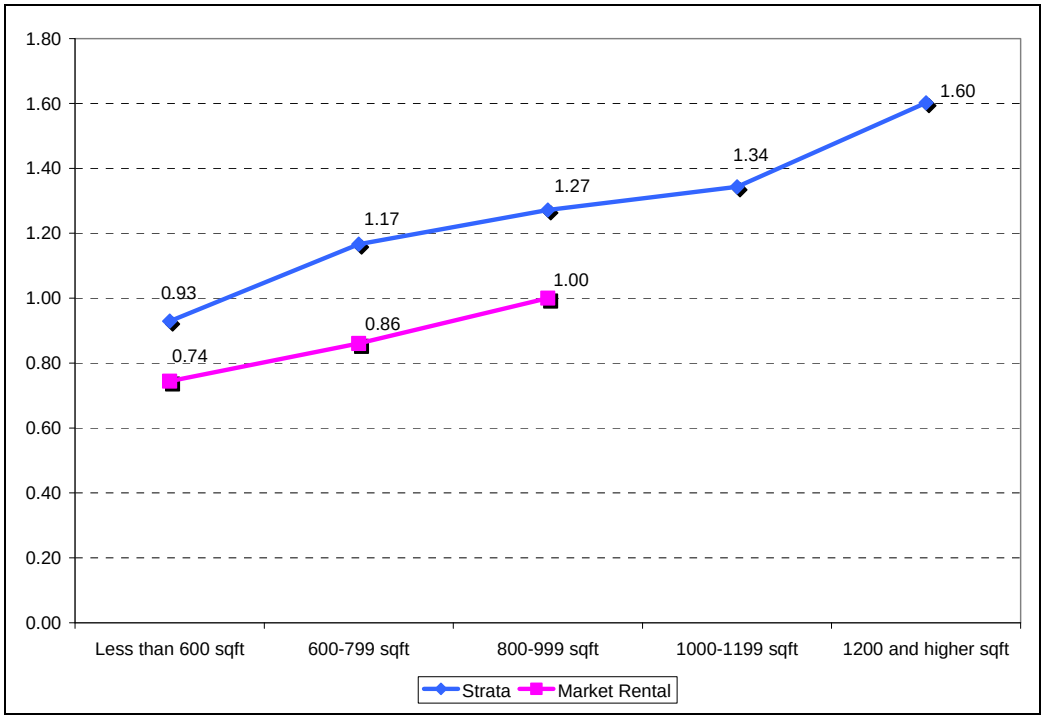


Places where people store their bicycles, if not in a bicycle facility (note: 187 households did not specify a storage location):

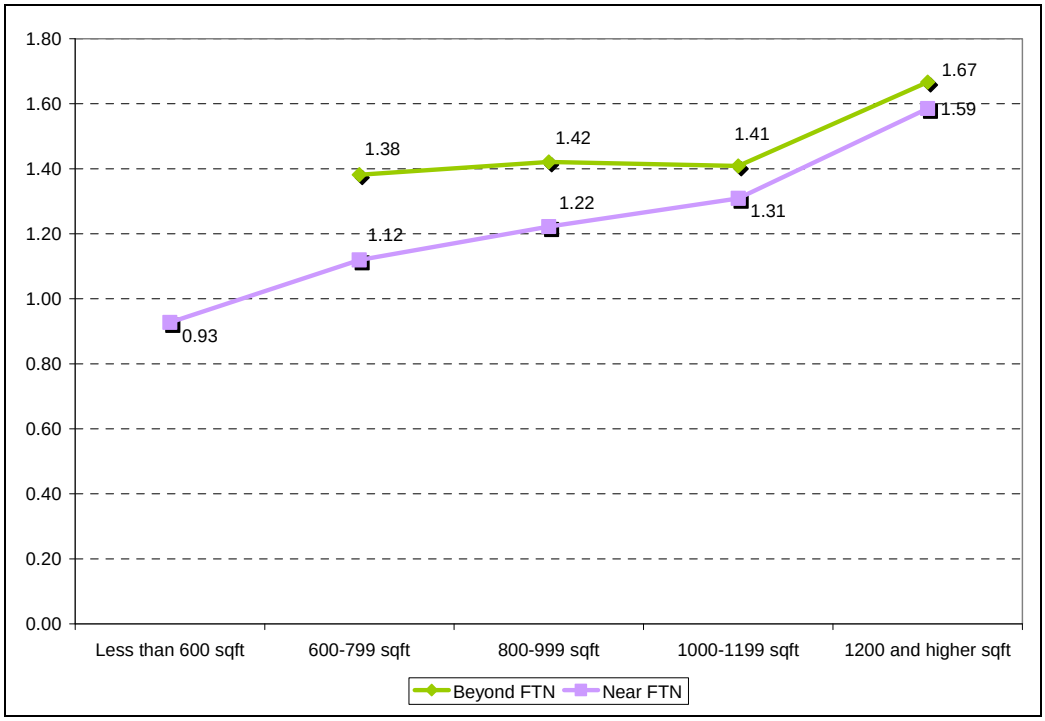


APPENDIX 11: Apartment Floorspace v. Vehicles Per Household (Household Survey Responses)

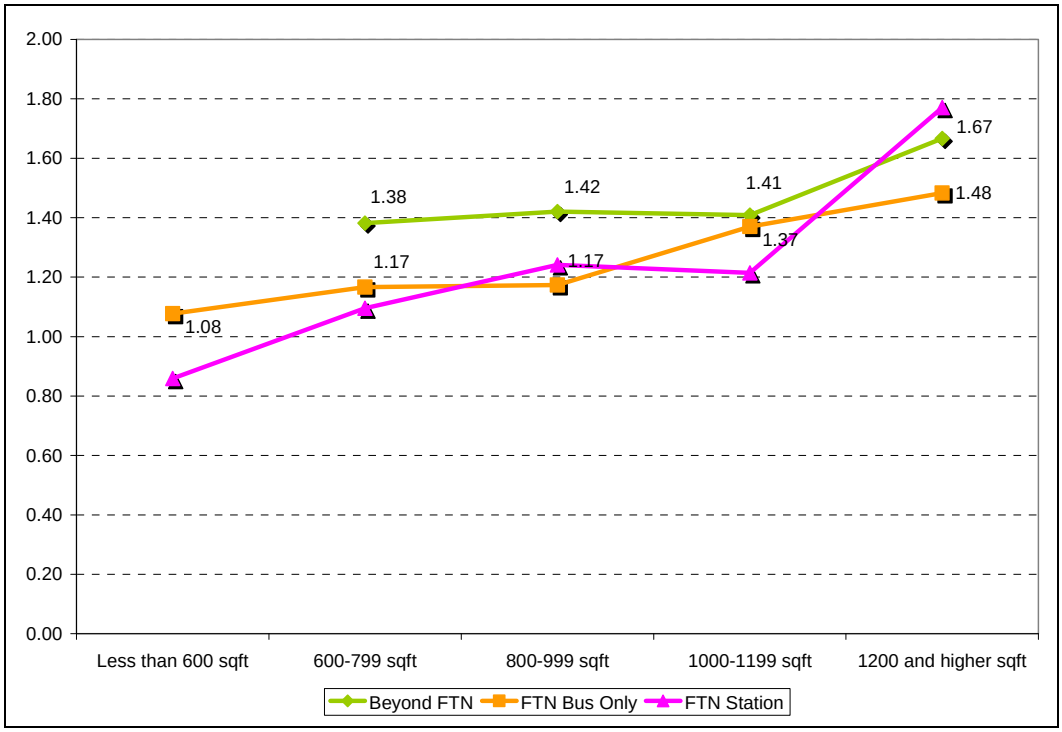
Strata versus Market Rental



Strata Sites by the Frequent Transit Network



Strata Sites by the Frequent Transit Network (disaggregated by “FTN Bus Only” and “FTN Station”)



APPENDIX 12: Demographics and Parking Demand (Household Survey Responses)

One-Person Households in Strata Sites				
Age Cohort	**Number of Households**	**Stalls per Household**	**Vehicles per Household**	**Parked Vehicles per Household**
25-34 years	132	1.07	0.92	0.87
35-64 years	207	1.16	0.94	0.90
65+ years	67	1.19	0.91	0.88

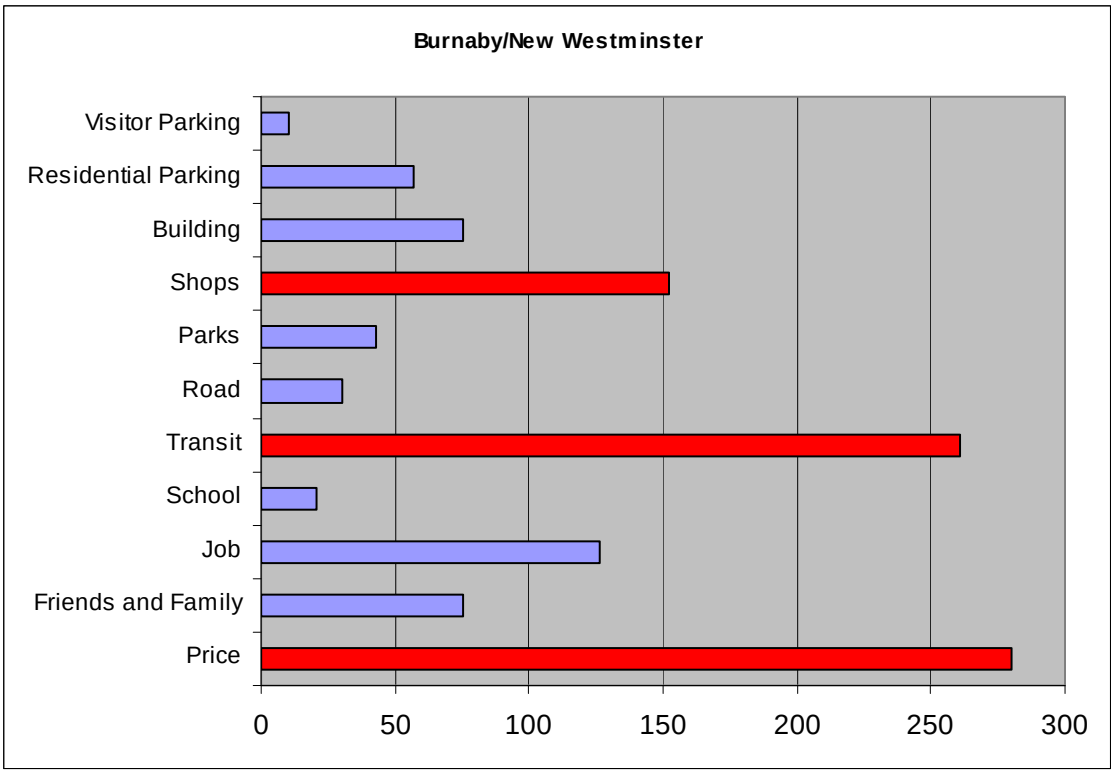
Two-Person Households in Strata Sites				
Age Cohort	**Number of People in Age Cohort**	**Stalls per Household**	**Vehicles per Household**	**Parked Vehicles per Household**
25-34 years	One (n=103)	1.38	1.44	1.22
	Two (n=207)	1.39	1.47	1.25
35-64 years	One (n=122)	1.41	1.39	1.25
	Two (n=171)	1.45	1.39	1.27
65+ years	One (n=36)	1.56	1.33	1.28
	Two (n=82)	1.57	1.38	1.29

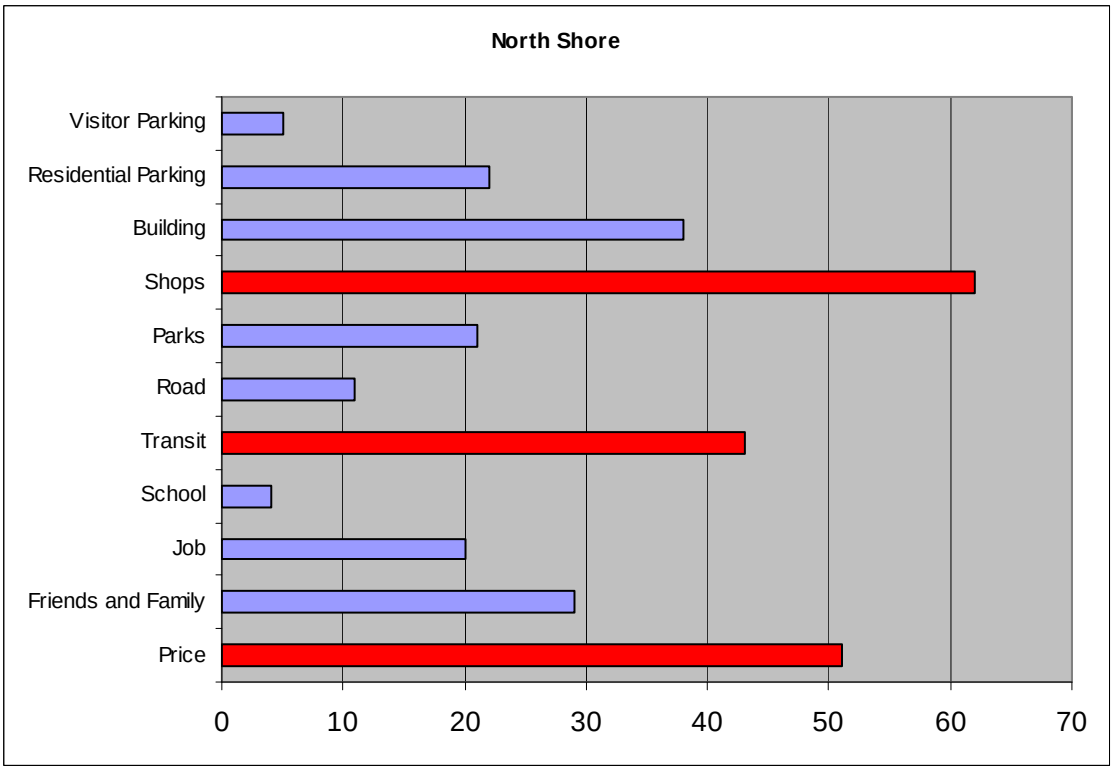
Three-Person Households in Strata Sites				
Age Cohort	**Number of People in Age Cohort**	**Stalls per Household**	**Vehicles per Household**	**Parked Vehicles per Household**
25-34 years	One (n=40)	1.60	1.60	1.38
	Two (n=66)	1.42	1.47	1.27
35-64 years	One (n=44)	1.43	1.39	1.27
	Two (n=86)	1.60	1.57	1.36
65+ years	One (n=13)	1.54	1.77	1.46
	Two (n=8)	1.88	1.88	1.75

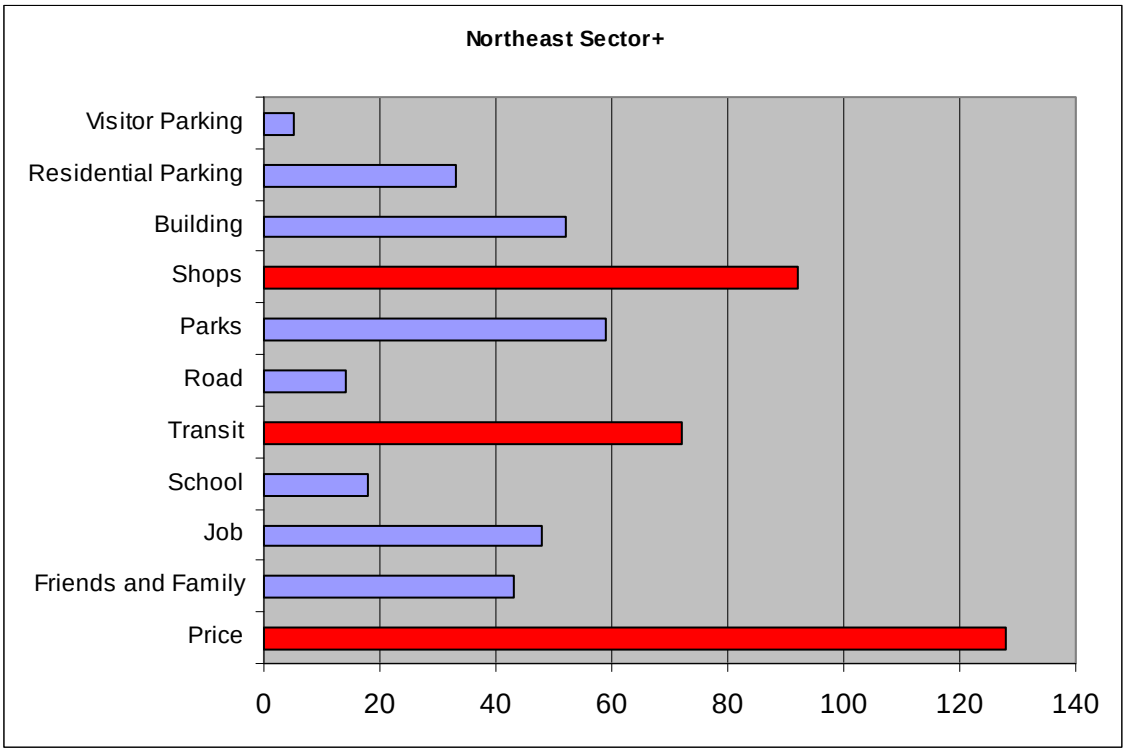
APPENDIX 13: Street Parking (Household Survey Responses)

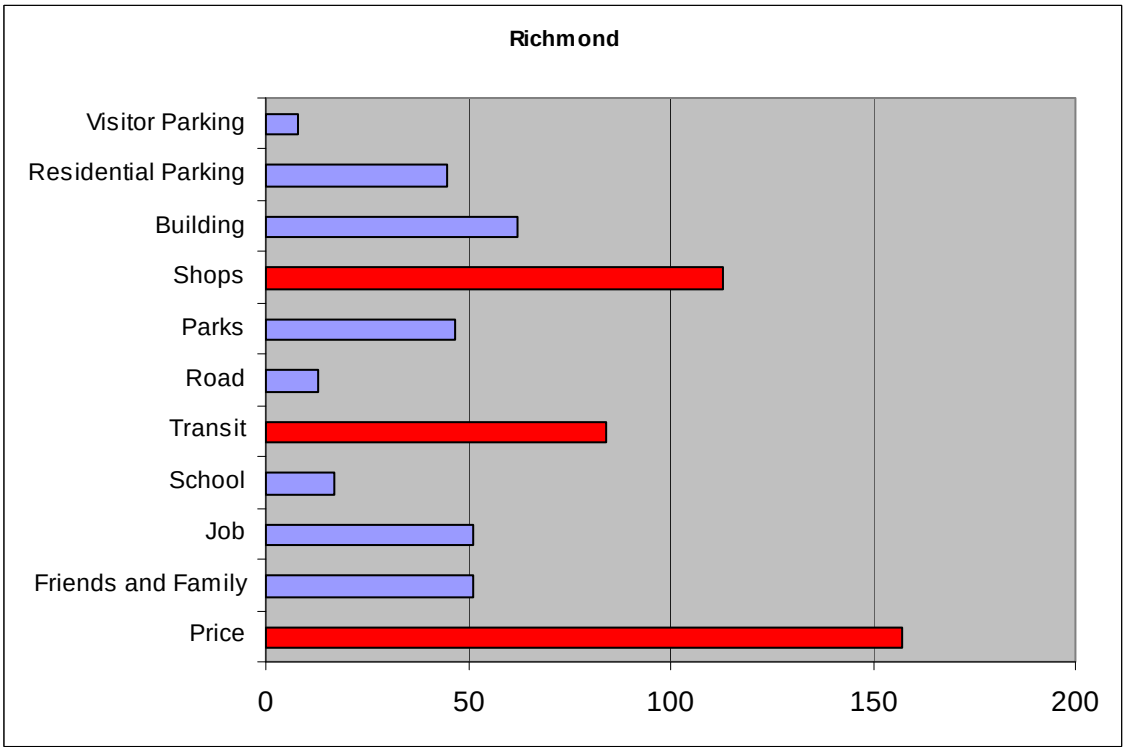
Subregion	Percent of Strata Households with at least one vehicle parked on a nearby street
Burnaby/NW (n=369)	12%
North Shore (n=97)	12%
Northeast Sector+ (n=183)	15%
Richmond (n=204)	10%
South of Fraser (n=117)	15%
Vancouver/UBC (n=167)	7%
Metro Core Peninsula (n=111)	8%
Total (n=1,248)	11%

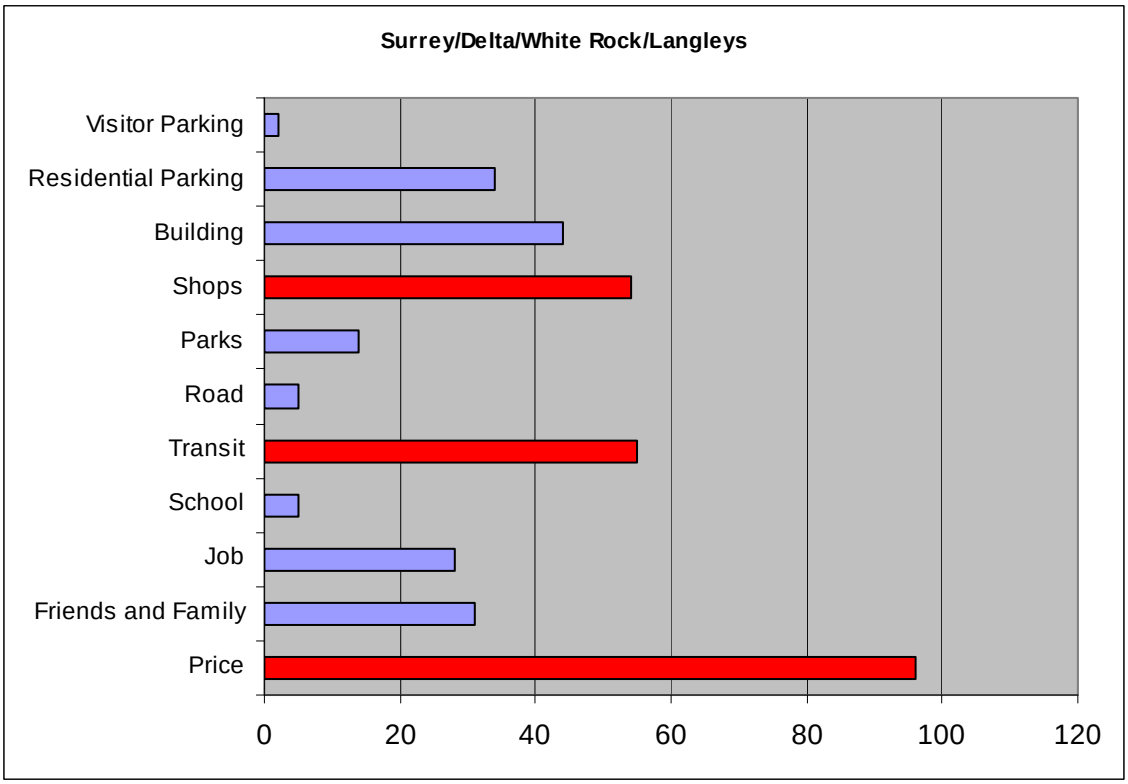
APPENDIX 14: Frequency of Factors Cited as Most Important for Choosing Current Home (Household Survey Responses)

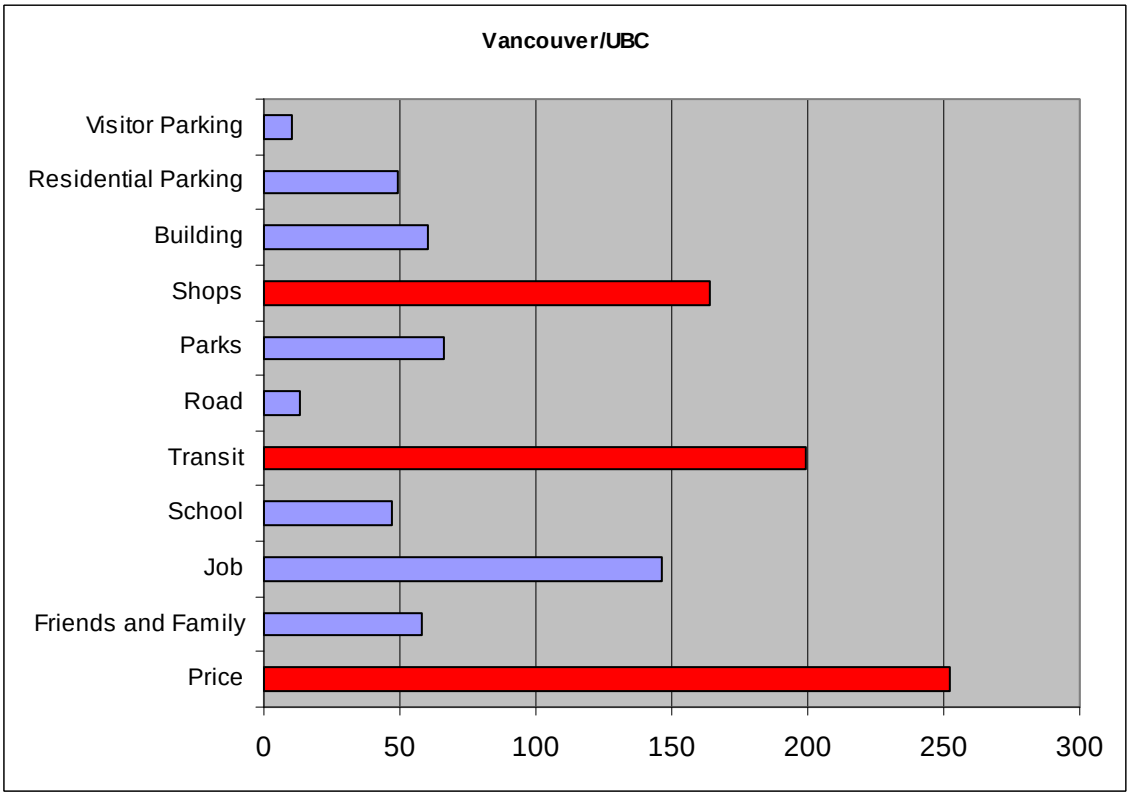


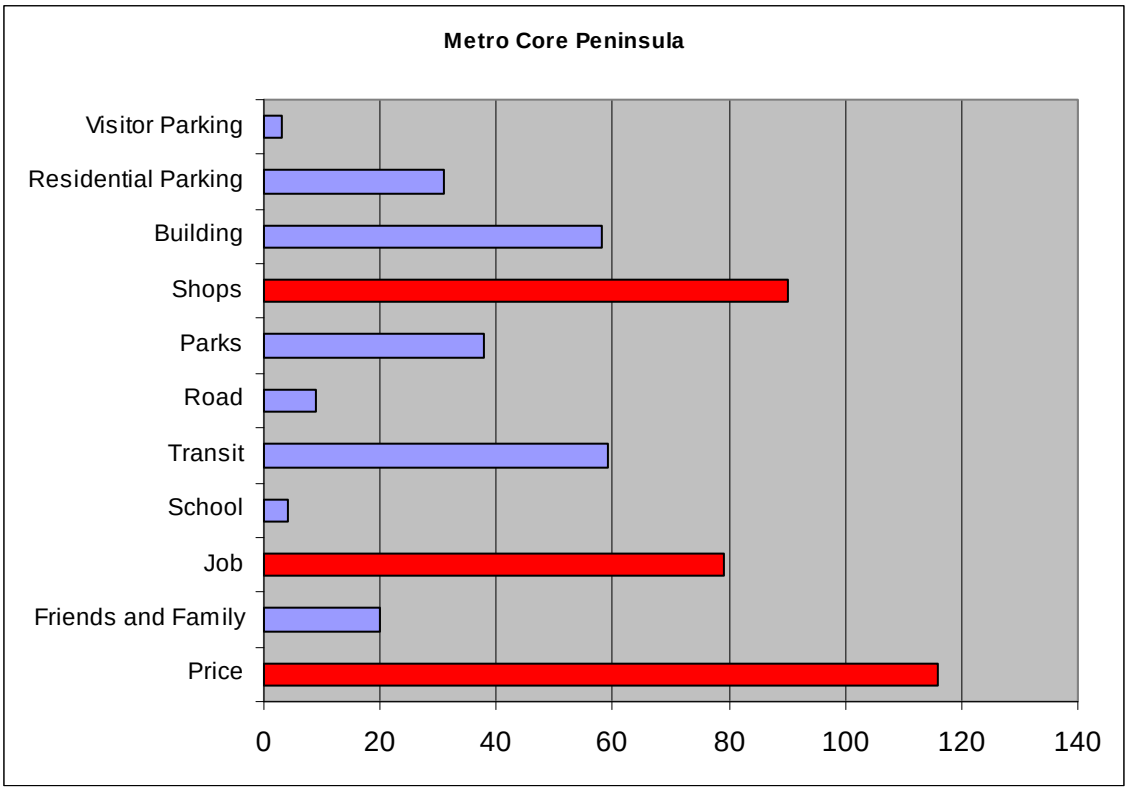



Northeast Sector+
Visitor Parking
Residential Parking
Building
Shops
Parks
Road
Transit
School
Job
Friends and Family
Price
0
20
40
60
80
100
120
140


Richmond
Visitor Parking
Residential Parking
Building
Shops
Parks
Road
Transit
School
Job
Friends and Family
Price
0
50
100
150
200


Surrey/Delta/White Rock/Langleys
Visitor Parking
Residential Parking
Building
Shops
Parks
Road
Transit
School
Job
Friends and Family
Price
0
20
40
60
80
100
120


Vancouver/UBC
Visitor Parking
Residential Parking
Building
Shops
Parks
Road
Transit
School
Job
Friends and Family
Price
0
50
100
150
200
250
300


Metro Core Peninsula
Visitor Parking
Residential Parking
Building
Shops
Parks
Road
Transit
School
Job
Friends and Family
Price
0
20
40
60
80
100
120
140

6256423