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Stability in Vancouver's Housing Unit Occupancy

Analysis of Housing Occupancy in the City of Vancouver
Using Electricity Meter Data Analytics

Prepared for the Vancouver Affordable Housing Agency

February 2016

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Ecotagious helps utilities and municipalities turn smart meter data into insights and energy conservation. In addition to helping municipalities develop housing policy, Ecotagious helps utility customers meet their energy savings targets which are put in place by regulators to keep energy prices low for consumers. Ecotagious' software-as-a-service offering drives conservation by providing utilities' residential customers with a breakdown of their electricity and natural gas use by major appliance, and then providing relevant tailored recommendations on how to save electricity and natural gas. The results are industry-leading energy savings and residential customer satisfaction.

Ecotagious Inc. is a private company based in Vancouver, Canada. For more information, please visit www.ecotagious.com

Introduction

Every week seems to bring the publication of a new article on housing issues in Greater Vancouver. Many of these articles try to address topics related to the social discussion taking place in our community, such as housing affordability, low rental vacancy rates, non-occupied homes and associated impacts on neighbourhood vibrancy.

Vancouver City Council has expressed a desire to understand the extent of these issues. While research into some of these topics is starting to be undertaken and publicly released, very little information is available on housing occupancy.

Given the potential impact of housing occupancy on rental unit stock, associated vacancy rates, housing affordability and neighbourhood vibrancy, the City of Vancouver retained Ecotagious to undertake this study of the occupancy rates of residential housing units in the city and region. Ecotagious studied and analyzed anonymized electricity consumption data provided by BC Hydro and has included the results of that analysis in this report.

Electricity consumption data can deliver significant insights into housing occupancy because it is collected from every home in Greater Vancouver through a consistent methodology. However, the reader should be aware that there are limitations to the data and its analysis, and is encouraged to read the Methodology section of this report for more details. The reader is furthermore encouraged to:

- Consider the information provided in this report as a single contribution to the literature on housing occupancy in the City of Vancouver,
- Incorporate other sources of housing information to provide a more complete perspective on the issue,
- Place more attention on the relative occupancy trends over time and less attention to absolute occupancy values at any given time presented in this report.

Key Findings

The analysis of electricity consumption data in the City of Vancouver (CoV) between 2002 and 2014 reveals:

- The Non-Occupancy rate¹ across all CoV housing units has been flat (4.9% in 2002, 4.8% in 2014)
- The CoV's Non-Occupancy rate is consistent with and tracks the Non-Occupancy rate for the rest of the Greater Vancouver Regional District (not including the CoV)
- The number of Non-Occupied housing units has grown from 8,400 in 2002 to 10,800 in 2014. This increase has been driven entirely from the growth in the overall housing stock
- Apartments, which represent 60% of CoV's residential housing mix, are driving Non-Occupancy in the City at 7.2% in 2014
- The Non-Occupancy rate for Apartments has been consistently 2% higher in the CoV than in the rest of the GVRD
- Single Family and Duplex Housing Units show low and relatively stable Non-Occupancy rates of 1% between 2002 and 2014
 - The CoV rate is in-line with the rate for the rest of the GVRD
- Similarly, Rowhouses also show low and relatively stable Non-Occupancy rates of 1%
 - The CoV rate is in-line with the rate for the rest of the GVRD
- All five of the city geographic sectors² analyzed show similar rates of Non-Occupancy by housing type, with no significant divergence over time with the exception of the Downtown Peninsula that has seen a drop in Non-Occupancy from 6.9% in 2002 to 6.0% in 2014
- Non-Occupancy rates increase as the period of Non-Occupancy shortens from 12 months (4.8%) to 4 months (6.0%) to 2 months (10.3%)
 - The non-Occupancy rates for each of these periods has remained stable between 2002 and 2014

¹ Non-Occupancy is defined as a housing unit that is not occupied for at least 25 days out of every month for a year. See the Methodology section for more details. Note that Non-Occupancy differs from Vacancy in that a Vacant housing unit holds no significant personal belongings while a Non-Occupied housing unit may either be Vacant or have significant personal belonging but no one residing there on a frequent basis.

² The 5 city geographic sectors are the Downtown Peninsula, Northeast Vancouver, Southeast Vancouver, Southwest Vancouver and Northwest Vancouver. See map on page 23.

- An analysis of Non-Occupancy intensity (days per month that a unit is unoccupied) shows that there are 2x as many units that are unoccupied at least 15 days per month over 12 months as there are units unoccupied for at least 25 days per month

This report provides an extensive analysis of electricity consumption data on housing occupancy in the City of Vancouver, and the findings are consistent with those from other studies by the Urban Futures Institute and Andy Yan at BTAsworks.

However, the findings are not comprehensive and bring forth additional questions that may warrant additional research using complementary sources of information.

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Background

Housing occupancy can have a significant impact on rental unit stock, associated vacancy rates, housing affordability and neighbourhood vibrancy. Existing research into housing occupancy has been limited to date to a few oft-cited reports:

- 'Much Ado About Nothing' released in 2013 by the Urban Futures Institute report noted that the 6.7% of apartments in the CoV that were unoccupied was in-line with the rate of 6.2% in the Vancouver CMA and 7.0% average across all 33 CMAs in Canada³
- 'Ownership, Occupancy, and Rentals: An Indicative Sample Study of Condominiums in Downtown Vancouver' released in 2009 by Andy Yan at BTAWorks noted that, based on the electricity consumption between January 2006 and December 2007 of a sample of Downtown condos, 5.5 – 8.5% of Downtown condos were unoccupied⁴

In order to gain additional insight into the issue of housing occupancy, the City of Vancouver commissioned this study with the primary research objectives of determining:

- The residential Non-Occupancy rate in the City of Vancouver over time
 - By housing type
 - By geographic sector within the City
 - In relation to the rest of the GVRD
- The number of Non-Occupied housing units in the City of Vancouver
- The Non-Occupancy rates by duration (e.g. 2 months, 4 months and 12 months)
- Whether there has been a change in the occupancy intensity of homes (i.e. occupied fewer days per month)

At the City of Vancouver's request, BC Hydro kindly provided anonymized electricity consumption for residential units in the City of Vancouver and the rest of the GVRD.

The City of Vancouver retained Ecotagious to study and analyze the anonymized electricity consumption data provided by BC Hydro, and Ecotagious has included the results of that analysis in this report.

³ Urban Futures Institute, 'Much Ado About Nothing', 2013 (<http://www.urbanfutures.com/foreign-unoccupied-pdf/>).

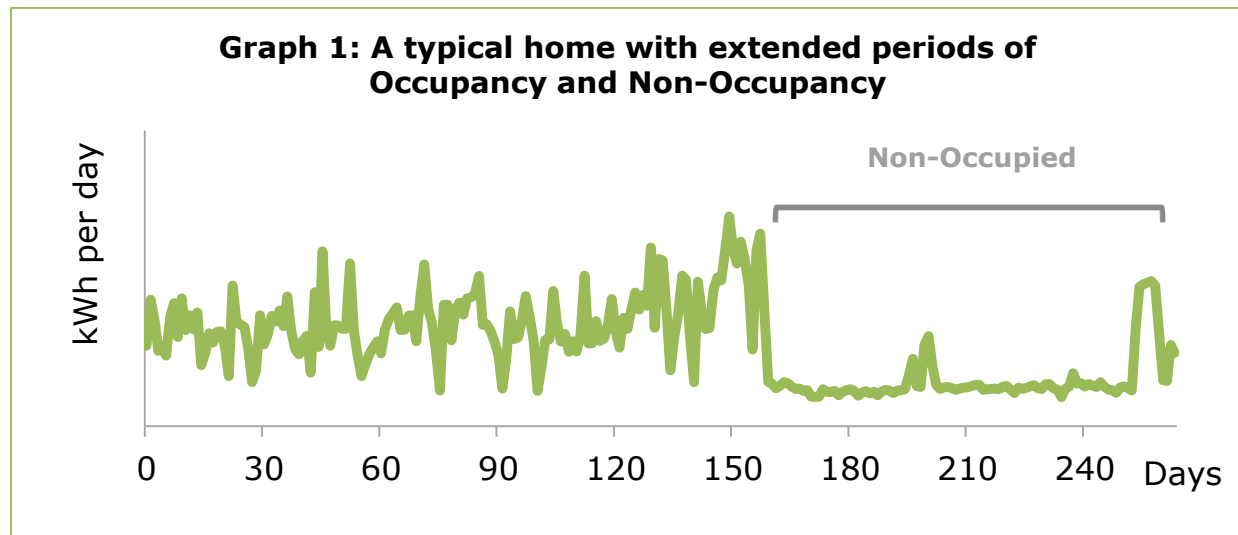
⁴ Andrew Yan (BTAWorks), 'Ownership, Occupancy, and Rentals: An indicative Sample Study of Condominiums in Downtown Vancouver', 2009 (http://www.btaworks.com/wp-content/uploads/2009/12/btaworks_condo_study_report_final2.pdf).

Methodology

Because every home in Greater Vancouver generates electricity consumption data and that data is collected in a consistent method and in a consistent format by a single organization (BC Hydro), residential electricity consumption data offers an opportunity to deliver insights on housing occupancy across the GVRD.

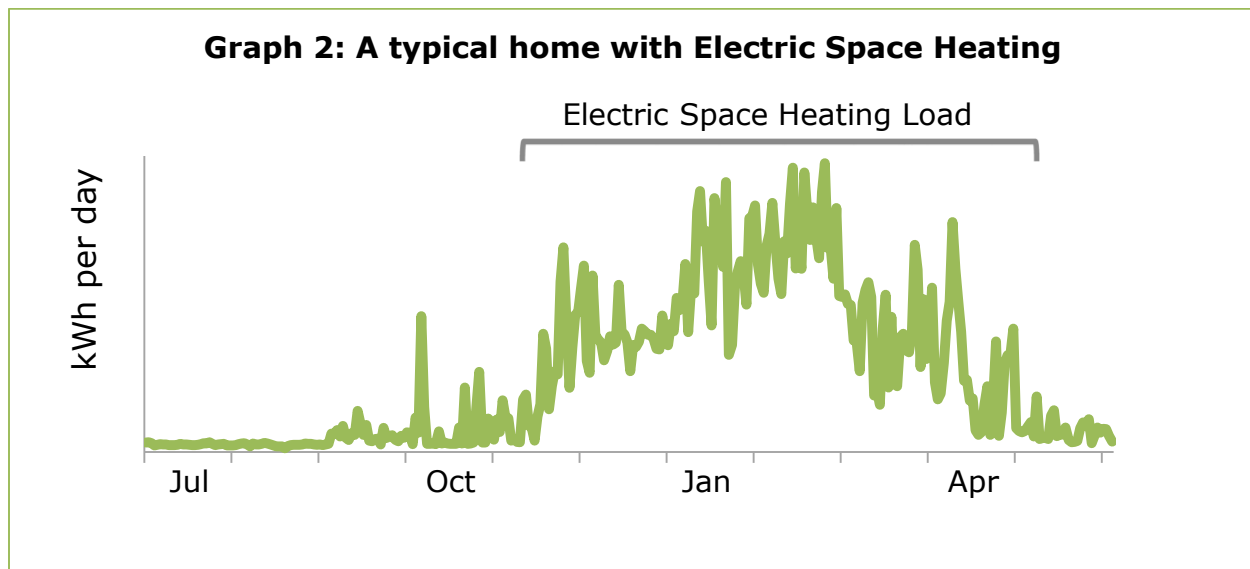
Occupied homes tend to use more electricity than non-occupied homes, and that electricity use varies significantly more from day to day than in non-occupied homes.

The graph below shows a home that is occupied from Day 0 through 160, followed by a period of non-occupancy through Day 250. The period of non-occupancy shows lower electricity consumption and lower variability in day to day consumption than the period of occupancy.



When identifying occupancy, the variability in electricity consumption is a more effective indicator than the average amount of electricity consumption over a given period.

The presence of electric space heating in a home, however, can confound the identification of occupancy. The graph below shows the electricity consumption by day of a home with electric space heating. As can be seen in the winter between Day 160 and 330, the electric space heating dominates the other daily loads on a consumption basis and on a day-to-day variability basis.



While the electric space heating load is highly correlated with the outside temperature, it is highly variable on a day to day basis. In addition, the electric space heating load can vary significantly from home to home based on a number of factors, including the presence of other heating sources. For example, surveys run by Ecotagious show that in some jurisdictions between 50 and 70% of homes have multiple heating sources, e.g.:

- A natural gas furnace for the primary suite and electric baseboard heaters for the secondary suite
- A natural gas furnace for most of a single family dwelling and electric baseboard heaters for the new addition or the garage
- A condo with electric space heaters supplemented by a natural gas fireplace

As a result, it becomes more difficult to remove the effects of electric space heating in order to identify occupancy during heating (winter) months.

To identify the Non-Occupancy rates presented in this report, Ecotagious applied its proprietary algorithms to the anonymized electricity consumption data provided by BC Hydro. The algorithm detects Occupancy by analyzing a number of factors, the most important of which is the variability in electricity consumption over time.

In defining Non-Occupancy, Ecotagious analyzed Non-Occupancy separately for periods of 2 months, 4 months and 12 months (see Graph 12). Based on the results of that analysis and the CoV's focus on using the information to inform housing policy, the analysis was completed using 12 months as the period over which to evaluate Occupancy.

For the purposes of this study and in order to minimize the distortive impacts of electric space heating during the winter months on the ability to detect Non-Occupancy, Ecotagious defined a housing unit as Non-Occupied in a given year when that unit was unoccupied for each of the 4 months during the non-heating

season (August, September, and the following June and July). A unit was deemed unoccupied in a given month when the unit was unoccupied for 25 or more days in that month.

The selection of the threshold of 25 or more non-occupied days each month allows for cases of infrequent use of the home (e.g. a domestic worker coming in once a week – 4x per month) without identifying the home as Occupied. An example of infrequent use of the home during a period of extended non-occupancy can be seen in Graph 1 above where the period of non-occupancy is briefly interrupted by a small window of use.

An analysis of Non-Occupancy when defined as 15 or more non-occupied days each month has also been included in the report (see Graph 13).

In addition, newly built homes of all types can distort the aggregated Non-Occupancy rates as they may potentially remain unoccupied for a period of time while the home is being constructed, while the unit is being sold and before occupation. Therefore, to remove the potentially distortive impact of new builds on the Non-Occupancy rate, the first year of electricity data was removed for each home in the CoV data.

The analysis was completed:

- From 2002 to 2014
- For each of 5 geographic sectors within the CoV (as identified by staff at the CoV given the geocoding possible with the anonymized electricity consumption data; see map on page 23 for boundaries)
 1. Downtown Peninsula
 2. Northwest Vancouver
 3. Northeast Vancouver
 4. Southwest Vancouver
 5. Southeast Vancouver
- For each of the three major housing types that make up over 99% of the housing units:
 1. Apartments: High-Rise and Low-Rise Purpose-Built Rental Units and Condominiums
 2. Rowhouses
 3. Single Family Dwellings and Duplexes

Note: Other Home Types, representing <1% of the housing unit population, were not included in the analysis due to their small population

While electricity consumption data has significant benefits as a data source to evaluate non-occupancy, it also has some inherent limitations that should be noted. The Non-Occupancy rates identified by analyzing electricity consumption data can be impacted by a number of factors, e.g.:

- **Secondary suites** in Single Family Dwellings will reduce the Non-Occupancy rate as suites often share the same meter as the primary suite, and therefore the unit will be identified as Occupied even if only one of the suites is occupied.

- The **frequent presence of visitors/domestic workers** in an otherwise unoccupied home may reduce Non-Occupancy rates.
- The **accuracy of the input data**. Prior to delivery to Ecotagious, the electricity consumption data was kindly prepared by BC Hydro. That preparation included a number of processes, included but not limited to the manipulation of the data to account for missing data. Like any data cleaning and preparation activity, the process can introduce unintended errors into the algorithm processing that may increase or decrease Non-Occupancy rates.
- The **accuracy of the algorithm**. In analyzing the high volume of electricity consumption data (big data) associated with this project in the combination of formats in which it was provided, Ecotagious selected algorithm processes that prioritized consistent application across the data sets. While this may result in lower accuracies in the absolute Non-Occupancy rate and count values, it results in more accurate relative longitudinal trends over time.
- The analysis of non-heating season months only (August, September, and the following June and July) to determine 12 month Non-Occupancy will fail to identify any changes in **winter-based seasonal occupancy changes** (i.e. a change in occupancy isolated to heating months only).
- The **housing stock population** used in the analysis is based on the population of BC Hydro accounts by home type in the CoV and the rest of the GVRD. This population does not include multi-unit dwellings that are metered in aggregate (e.g. one meter for multiple apartment units), therefore the number of apartment units presented in this report and used to calculate non-occupancy rates may be lower than the actual population of apartment units.

Due to the inherent limitations of the data and the analytics, the reader is encouraged to:

- Place more attention on the relative occupancy trends over time and less attention to absolute occupancy values at any given time,
- Consider the information provided in this report as a single contribution to the literature on housing occupancy in the City of Vancouver,
- Incorporate other complementary sources of housing information to provide a more complete perspective on the issue, particularly information that may address the drivers of Non-Occupancy.

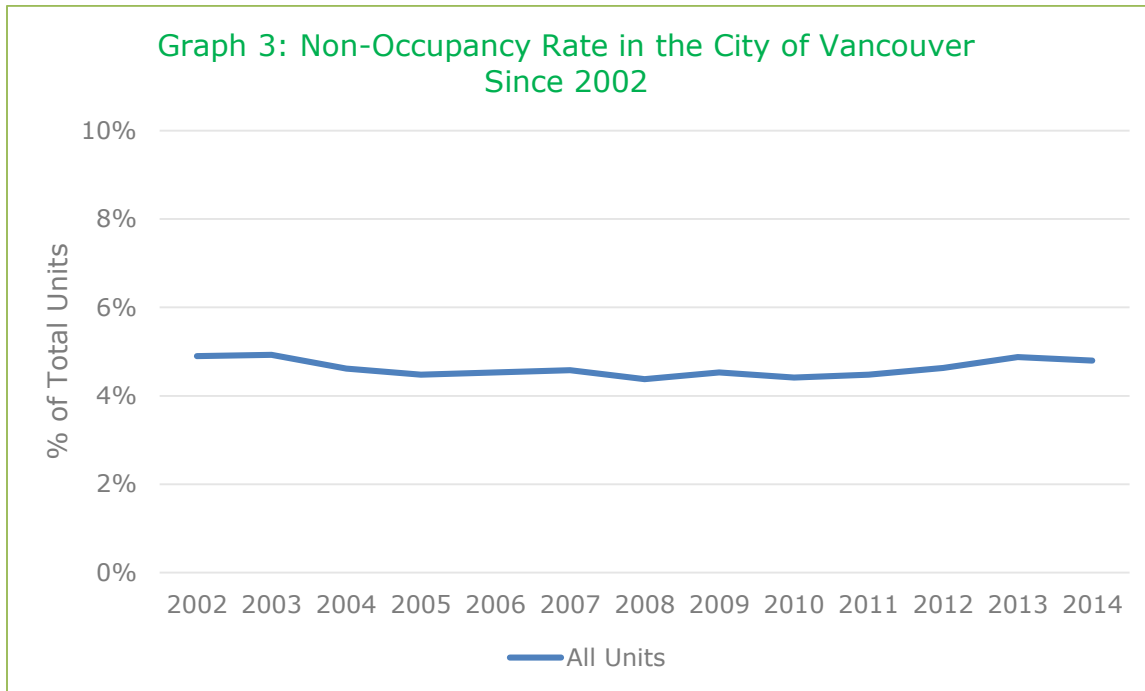
It should also be noted that the analytics used in this study are effective at detecting occupant-driven electricity consumption, and not necessarily *Vacancy*. A Vacant housing unit holds no significant personal belongings nor does anyone reside within it. Meanwhile, a Non-Occupied housing unit may either be Vacant or have no one residing there on a frequent basis but still hold someone's significant personal belongings. Therefore, the term '*Non-Occupancy*' has been used in this report in place of the more familiar term '*Vacancy*'.

Results

The analysis of electricity consumption data in the City of Vancouver (CoV) between 2002 and 2014 reveals:

The Non-Occupancy rate across all CoV housing units has been flat

The Non-Occupancy rate across all housing types in the CoV was 4.9% in 2002 and 4.8% in 2014.

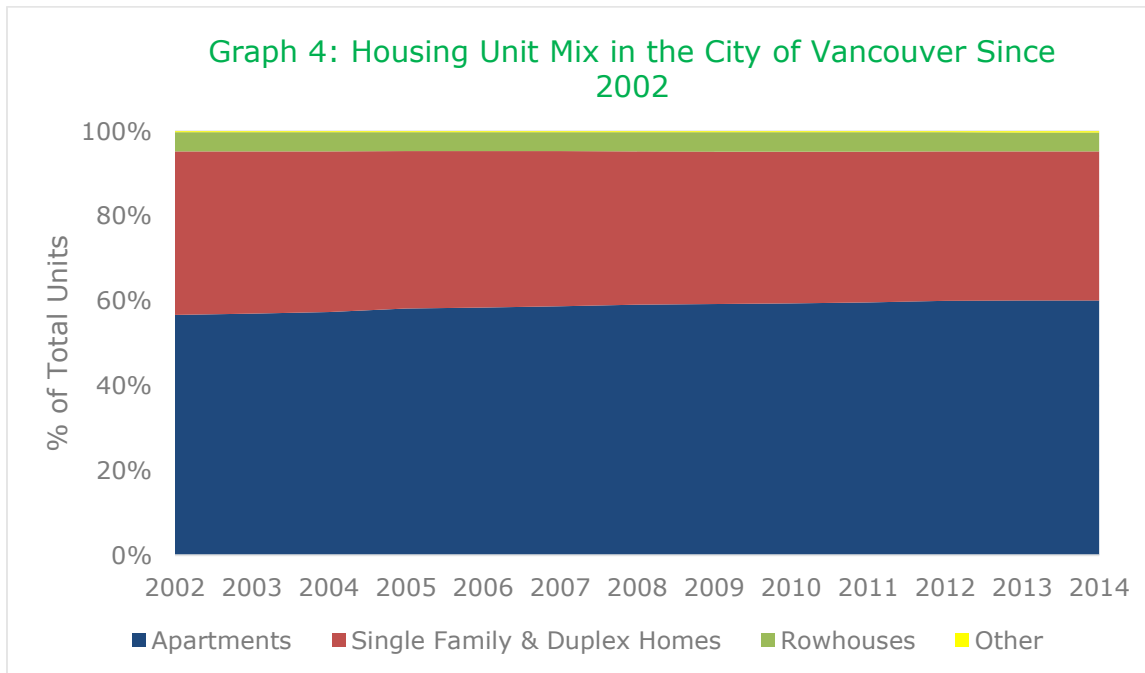


Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

Apartments, Single Family Dwellings and Duplex Housing Units make up over 95% of the CoV’s housing stock

Apartments continue to grow as a proportion of the total housing stock⁶ in the CoV, from 57% in 2002 to 60% in 2014. Single Family & Duplex Housing units contributed an additional 35% and Rowhouses made up 4.5% in 2014, with Other housing type units making up the remaining 0.5%. As a result of the small size of the Other housing category, it has not been included in the rest of the analysis presented in this report.



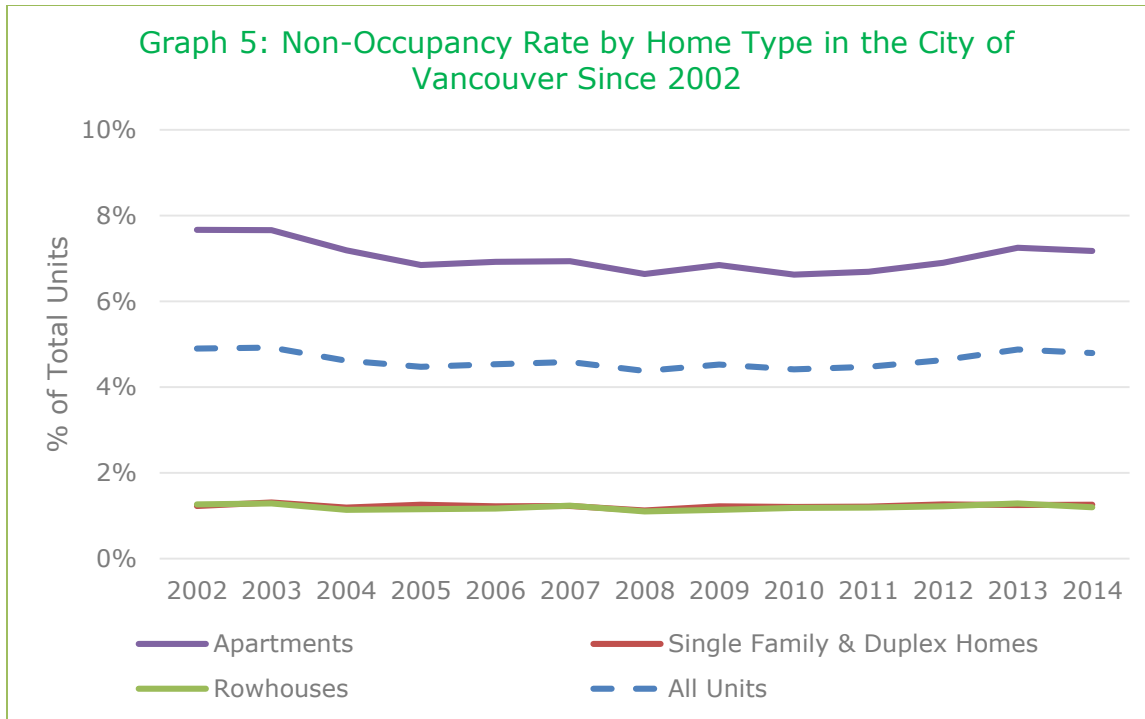
Note: Apartments include purpose-built rental units and condominiums.

Source: Ecotagious analysis of anonymized daily and monthly residential account smart meter data.

⁶ The housing stock population used in the analysis is based on the population of BC Hydro accounts by home type in the CoV and the rest of the GVRD. This population does not include multi-unit dwellings that are metered in aggregate (e.g. one meter for multiple apartment units), therefore the number of apartment units presented in this report and used to calculate non-occupancy rates may be lower than the actual population of apartment units. See the Methodology section for more detail.

The CoV's aggregate Non-Occupancy rate is driven by Apartments

Apartment Non-Occupancy has remained relatively flat (7.7% in 2002; 7.2% in 2014), yet is significantly higher than the rates for Single Family & Duplex Housing Units, and Rowhouses.

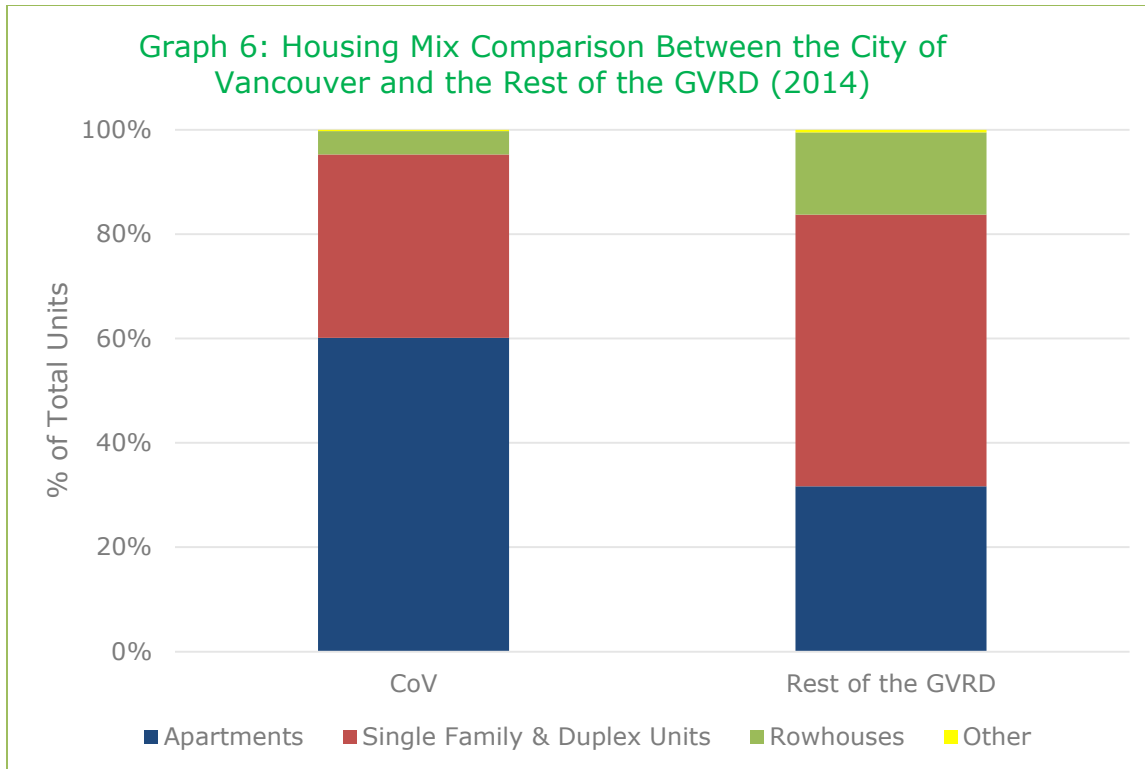


Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Apartments include purpose-built rental units and condominiums.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

The CoV has a higher proportion of Apartments in its housing mix than the rest of the GVRD

Approximately 60% of the CoV's housing units are Apartments, relative to 32% for the rest of the GVRD.



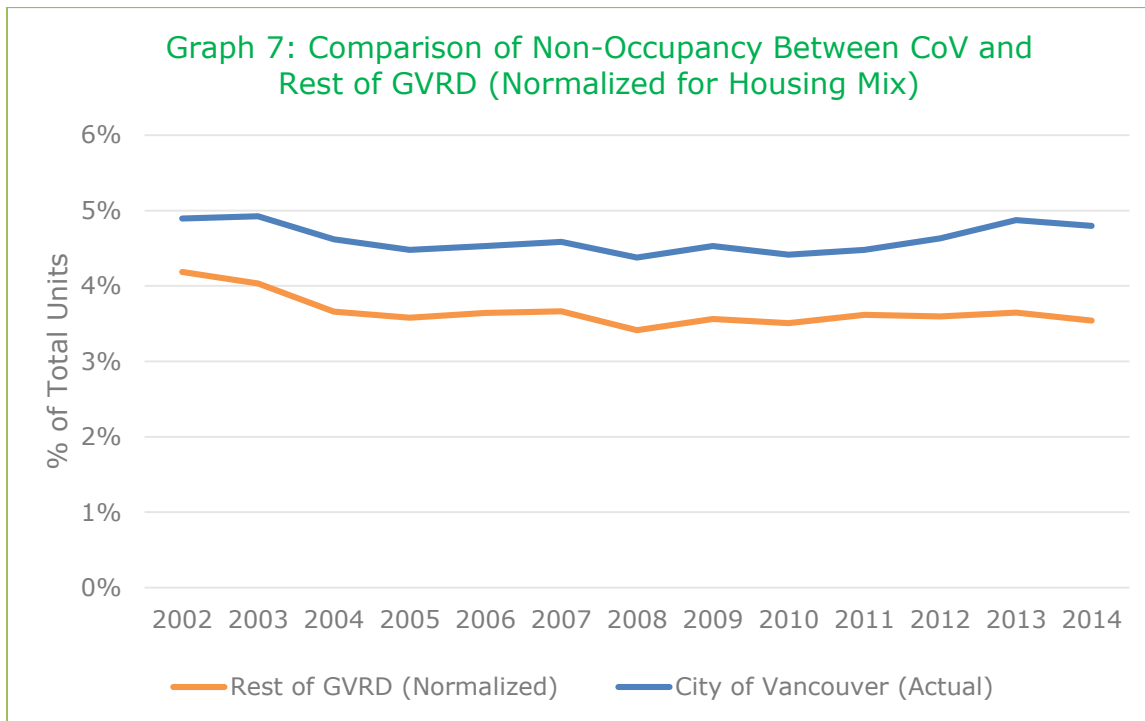
Note: Apartments include purpose-built rental units and condominiums.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

The CoV’s Non-Occupancy rate is consistent with and tracks the Non-Occupancy rate for the rest of the Greater Vancouver Regional District

As seen from the CoV data, Apartments have higher Non-Occupancy rates than other housing types. To compare the overall Non-Occupancy rate between the CoV and the rest of the GVRD, the Non-Occupancy rates for each of the rest of the GVRD’s housing types were weighted by the CoV housing mix and aggregated. The resulting *normalized* Non-Occupancy rate for the GVRD is presented below with the actual CoV rate.

When normalized in such a way for housing stock mix, the CoV and the rest of the GVRD show similarly stable Non-Occupancy rates between 2002 and 2014, with the CoV showing approximately 1% higher Non-Occupancy from 2002 through 2014.

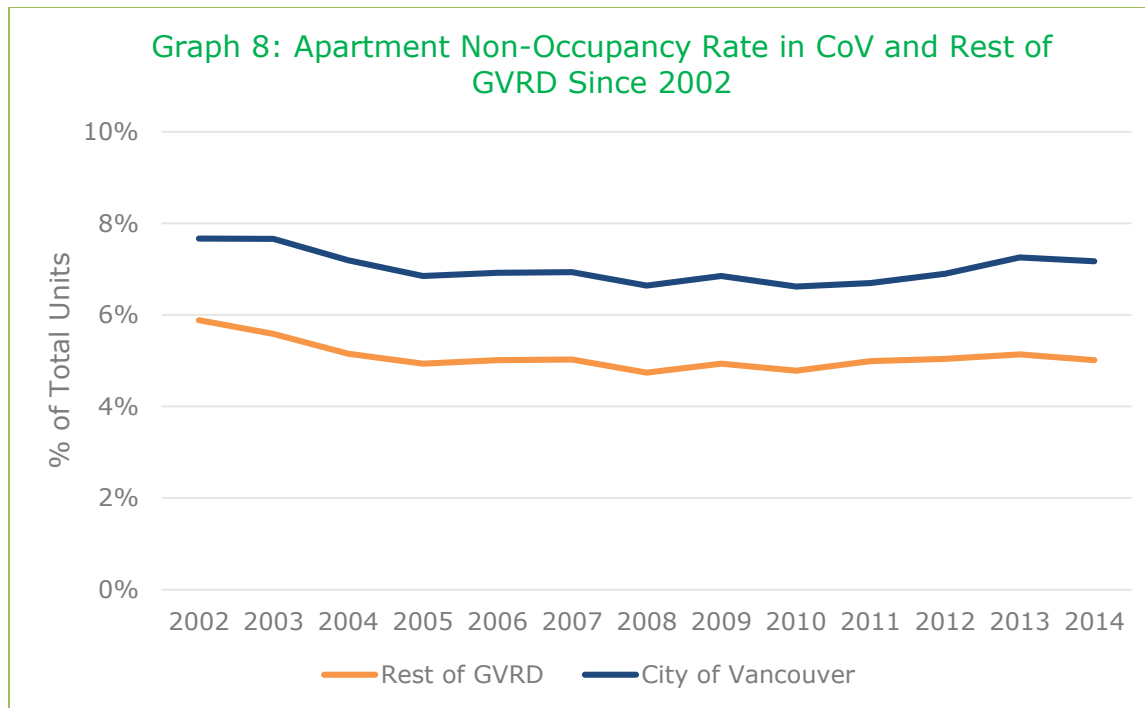


Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Rest of GVRD includes Surrey, Richmond, Burnaby, Coquitlam, Langley, Delta, North Vancouver, Maple Ridge, New Westminister, Port Coquitlam, North Vancouver, West Vancouver, Port Moody, White Rock, and Pitt Meadows. Rest of GVRD figures have been normalized to CoV housing mix.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

The difference in the Non-Occupancy rate between the CoV and the Rest of the GVRD is driven by Apartments

As seen below, Apartments in the CoV have had Non-Occupancy rates 2% higher than seen in the rest of the GVRD since 2002.



Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Rest of GVRD includes Surrey, Richmond, Burnaby, Coquitlam, Langley, Delta, North Vancouver, Maple Ridge, New Westminister, Port Coquitlam, North Vancouver, West Vancouver, Port Moody, White Rock, and Pitt Meadows. Apartments include purpose-built rental units and condominiums.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

It should also be noted that Apartments are much less likely to be owner-occupied (33%) than other home types in the CoV (71%)⁷. And Apartments in the CoV are also much less likely to be owner-occupied than Apartments in the rest of the GVRD (48%). This correlation of higher Non-Occupancy rate in CoV Apartments with lower owner-occupancy may warrant further research.

The Apartment segment is in fact composed of two separate dwelling types: purpose-built rental units and condominiums. The purpose-built rental unit vacancy rate in 2014 was 0.5% in the CoV and 1.0% in the GVRD as a whole⁸. For illustrative purposes, if the purpose-built rental unit vacancy rates are assumed to be 0% over a 12 month period, the implication is that the Non-Occupancy rates for condominiums are 12.6% in the CoV and 7.3% in the rest of the GVRD⁹.

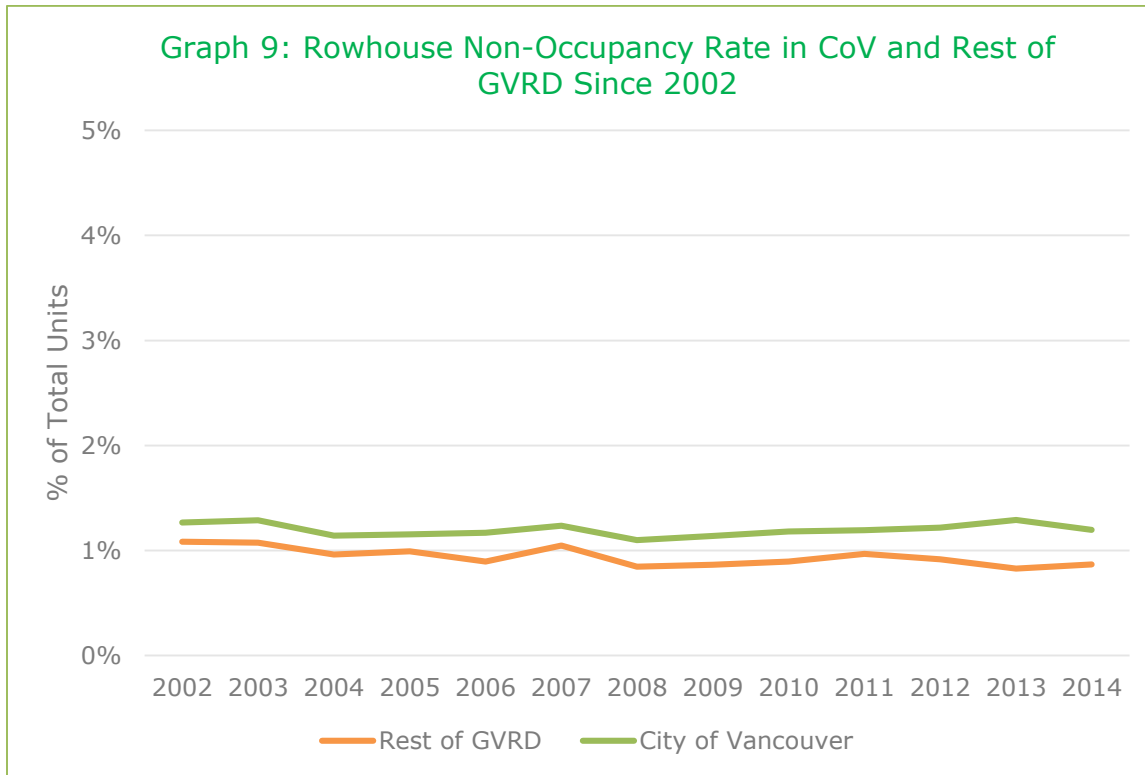
⁷ Source: Custom data from the 2011 National Household Survey (originated from Statistics Canada and provided by City of Vancouver).

⁸ CMHC Rental Market Report for Vancouver and Abbotsford-Mission CMAs, Fall 2014.

⁹ Calculated based on condominium unit population data from the 2011 National Household Survey (originated from Statistics Canada and provided by City of Vancouver).

The Non-Occupancy rates in Rowhouses in the CoV and the Rest of the GVRD are similar and stable

The Non-Occupancy rates in Rowhouses in the CoV and the rest of the GVRD have both been hovering near 1% since 2002.

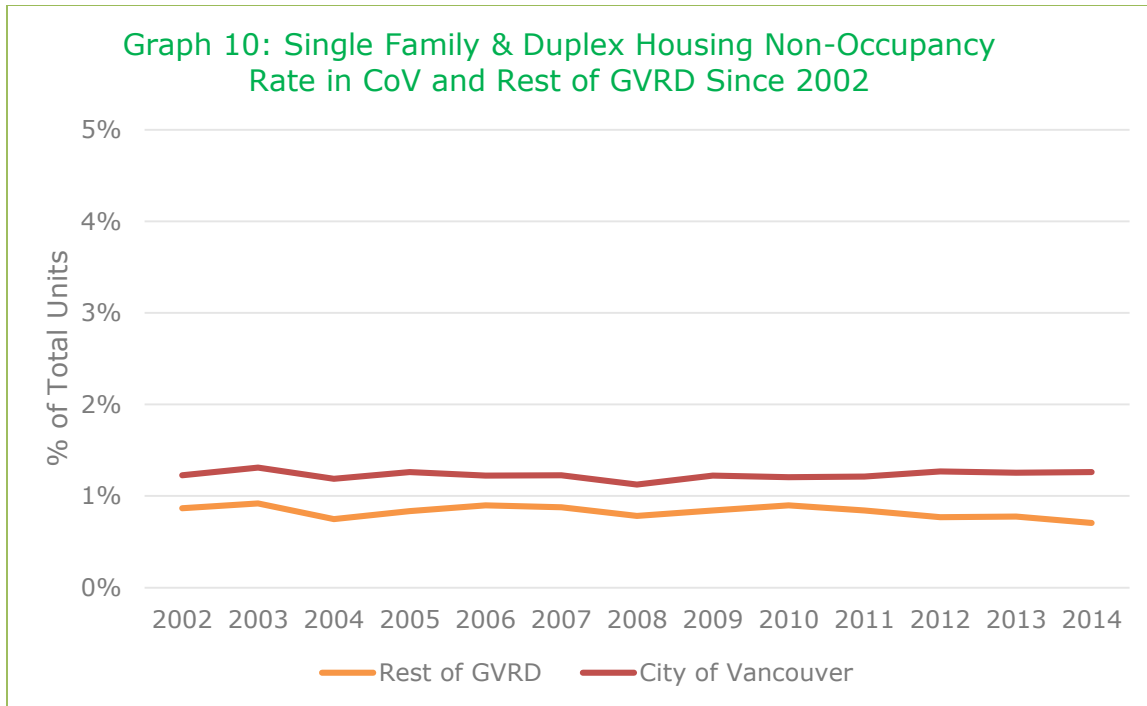


Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Rest of GVRD includes Surrey, Richmond, Burnaby, Coquitlam, Langley, Delta, North Vancouver, Maple Ridge, New Westminister, Port Coquitlam, North Vancouver, West Vancouver, Port Moody, White Rock, and Pitt Meadows.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

The Non-Occupancy rates in Single Family & Duplex Housing Units in the CoV and the Rest of the GVRD are similar and stable

The Non-Occupancy rates in Single Family & Duplex Housing Units in the CoV and the rest of the GVRD have both been hovering near 1% since 2002.

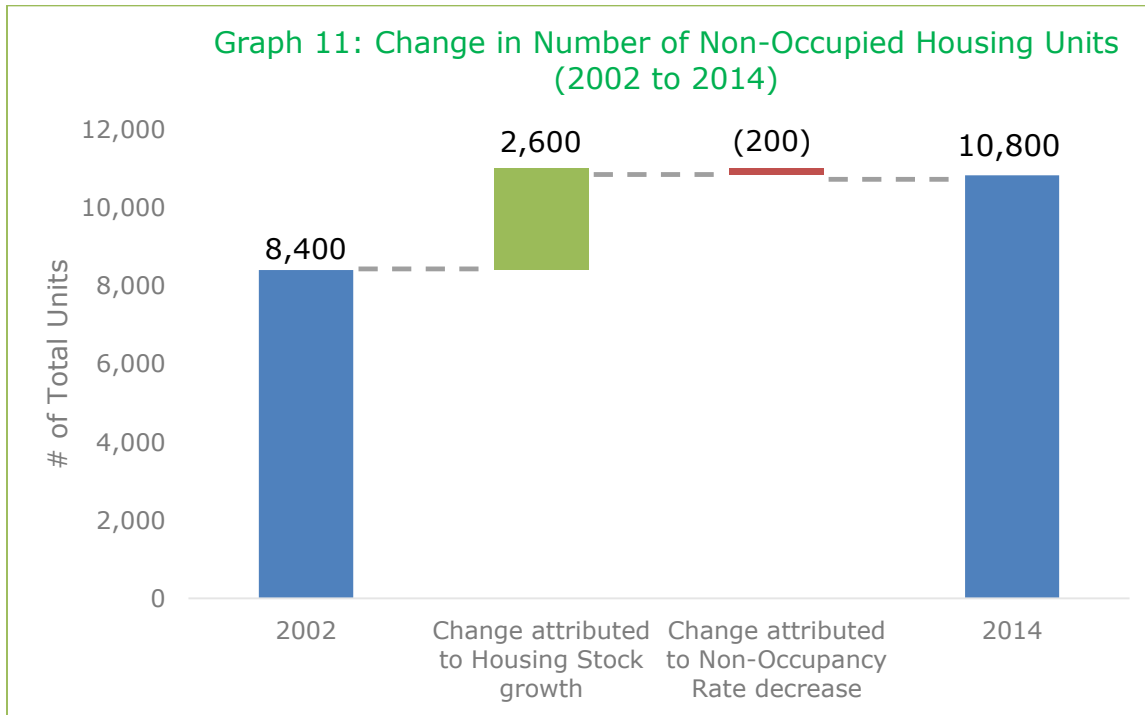


Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Rest of GVRD includes Surrey, Richmond, Burnaby, Coquitlam, Langley, Delta, North Vancouver, Maple Ridge, New Westminister, Port Coquitlam, North Vancouver, West Vancouver, Port Moody, White Rock, and Pitt Meadows.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

The growth in the number of Non-Occupied housing units in the CoV is driven by the overall growth in the housing stock

The number of Non-Occupied housing units in the CoV has grown by 2,400 units, from 8,400 in 2002 to 10,800 in 2014. All of this growth has been driven by the growth in the housing unit stock, while the change in the Non-Occupancy rate (from 4.9% to 4.8%) has reduced Non-Occupancy by a modest 200 units.



Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive.

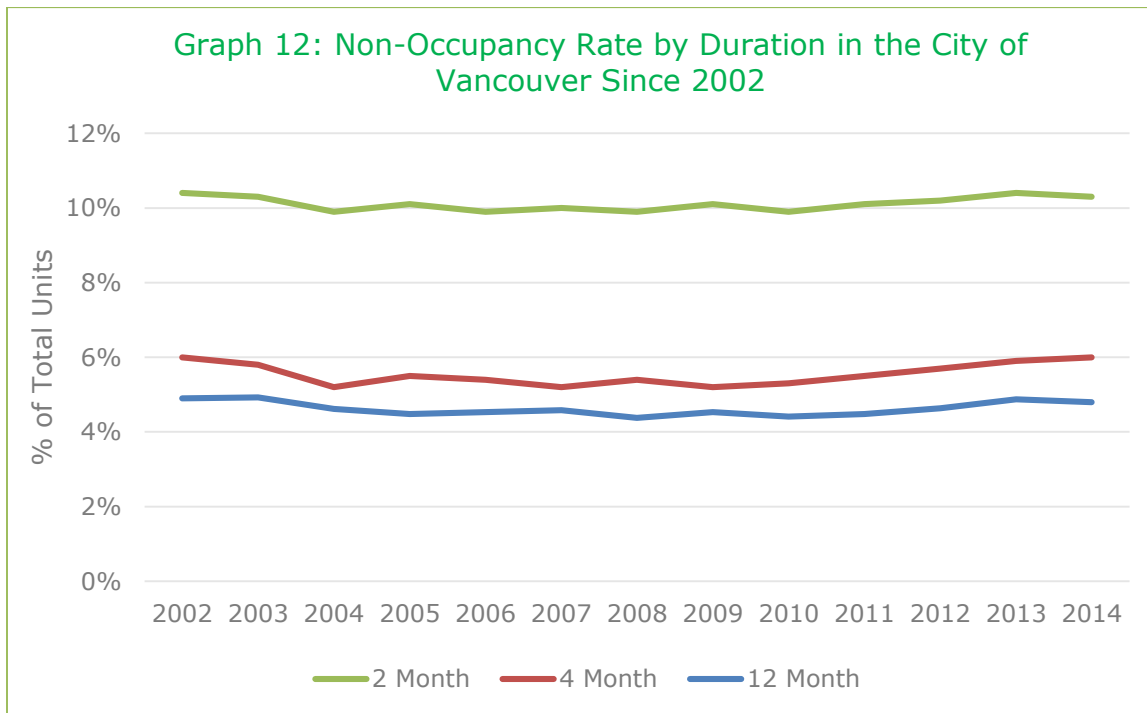
Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

As expected, Non-Occupancy rates increase when the duration of the Non-Occupancy shortens

In defining Non-Occupancy, Ecotagious analyzed Non-Occupancy separately for periods of 2 months, 4 months and 12 months. Based on the results of that analysis and the CoV’s focus on using the information to inform housing policy, the analysis was completed using 12 months as the period over which to evaluate Occupancy.

Since 2002, the rates for:

- Homes unoccupied for 2 months have been stable at 10%
- Homes unoccupied for 4 months have been stable at 6%
- Homes unoccupied for 12 months have been stable at 5%

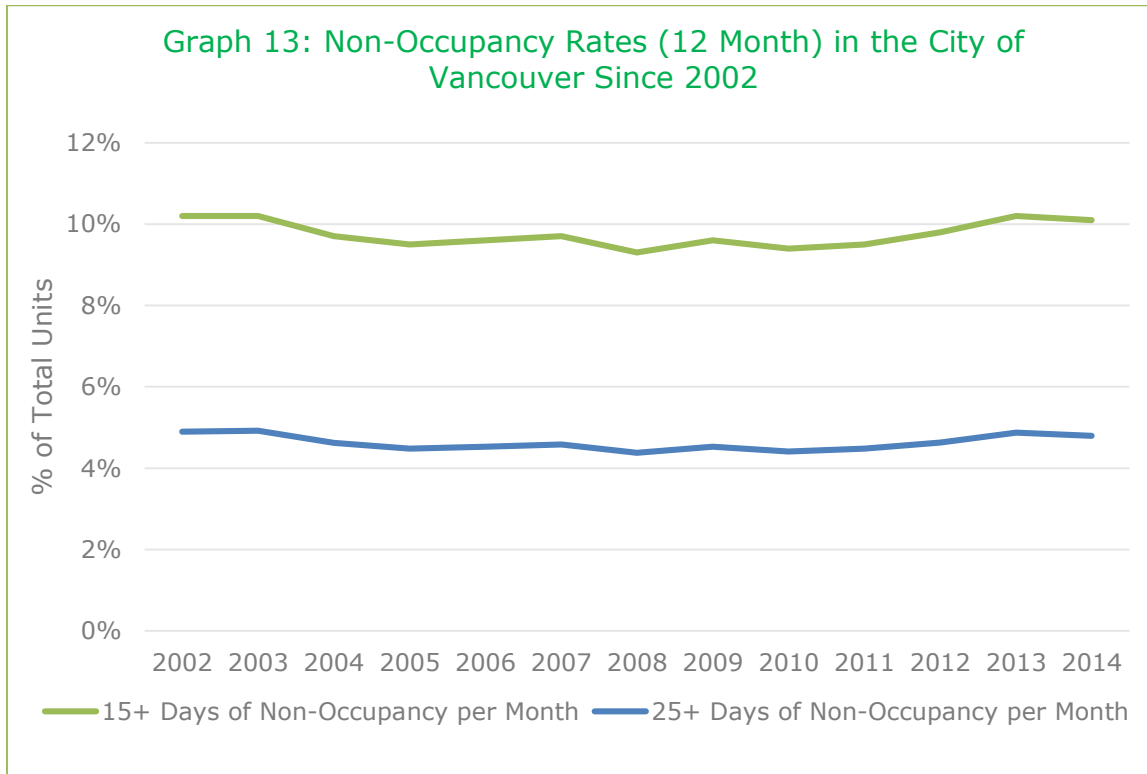


Notes: 2 Month Non-Occupancy period based on analysis of June data. 4 Month Non-Occupancy based on analysis of 4 month period from June to August of each year, inclusive. 12 Month Non-Occupancy analyzed using August, September, and the following June and July to avoid the distortive effects of electric space heating on the analytics.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

Twice as many homes Non-Occupied for at least 15 days per month than for at least 25 days per month

In defining Non-Occupancy, Ecotagious also analyzed Non-Occupancy separately for periods of 12 months when the unit was unoccupied for at least 25 days each month and at least 15 days each month. As expected, twice as many homes are unoccupied at least 15 days per month as are unoccupied at least 25 days per month. Both of these rates have been relatively stable since 2002.



Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

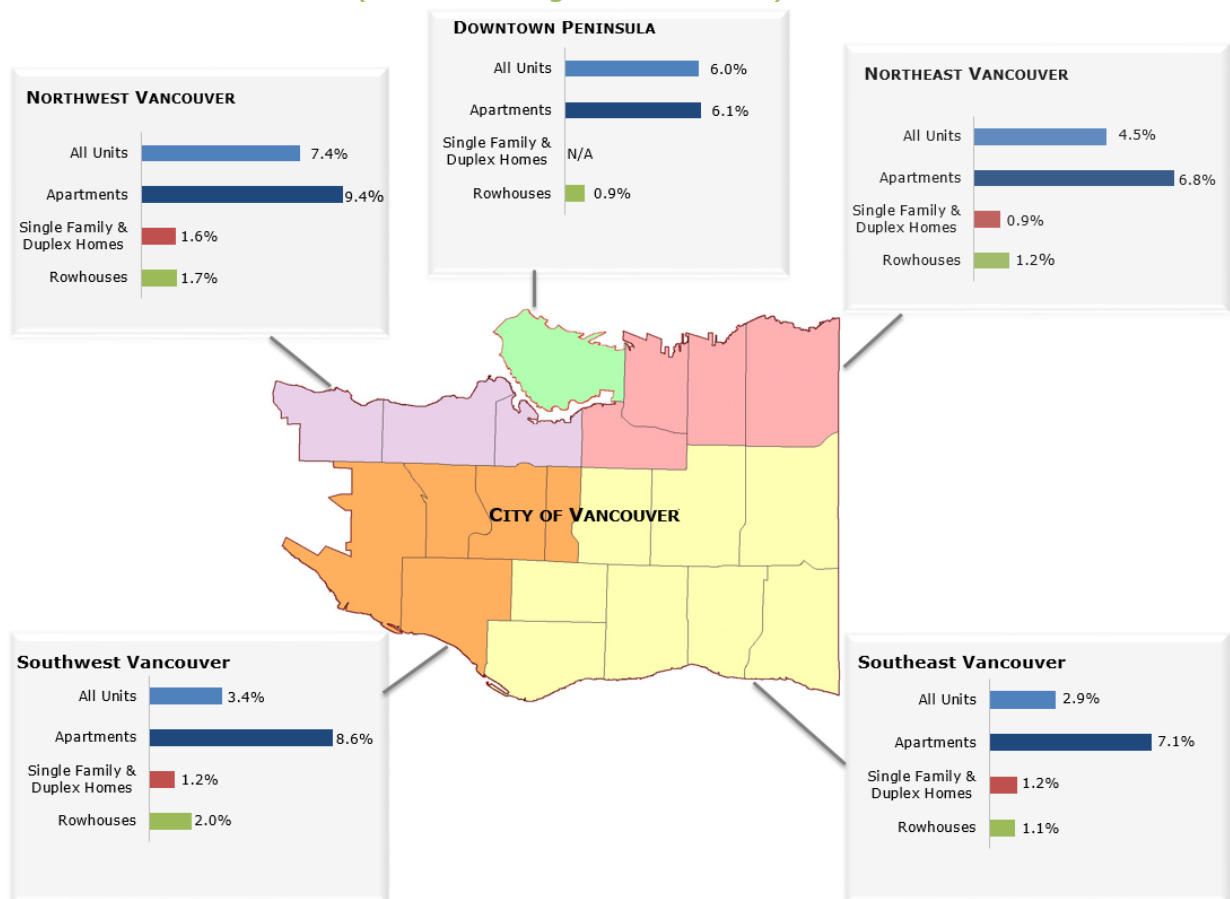
Non-Occupancies rates by housing type consistent throughout City

The Non-Occupancy rates were analyzed for each of the 5 CoV geographic sectors (as identified by staff at the CoV given the geocoding possible with the anonymized electricity consumption data):

- **Downtown Peninsula** includes Downtown and the West End
- **Northeast Vancouver** includes Mt. Pleasant, Strathcona, Grandview-Woodland and Hastings-Sunrise
- **Southeast Vancouver** includes Renfrew-Collingwood, Kensington-Cedar Cottage, Riley Park, Oakridge, Marpole, Sunset, Victoria-Fraserview and Killarney
- **Southwest Vancouver** includes South Cambie, Shaughnessy, Arbutus-Ridge, Dunbar-Southlands and Kerrisdale
- **Northwest Vancouver** includes West Point Grey, Kitsilano and Fairview

The analysis showed little variation in the Non-Occupancy rates by housing type between neighbourhoods. The highest Non-Occupancy rate was found in Northwest Vancouver Apartments where 9.4% of units were unoccupied in 2014.

Figure 1: Non-Occupancy Rates by CoV Neighbourhood by Housing Type
(% of Housing Units in 2014)



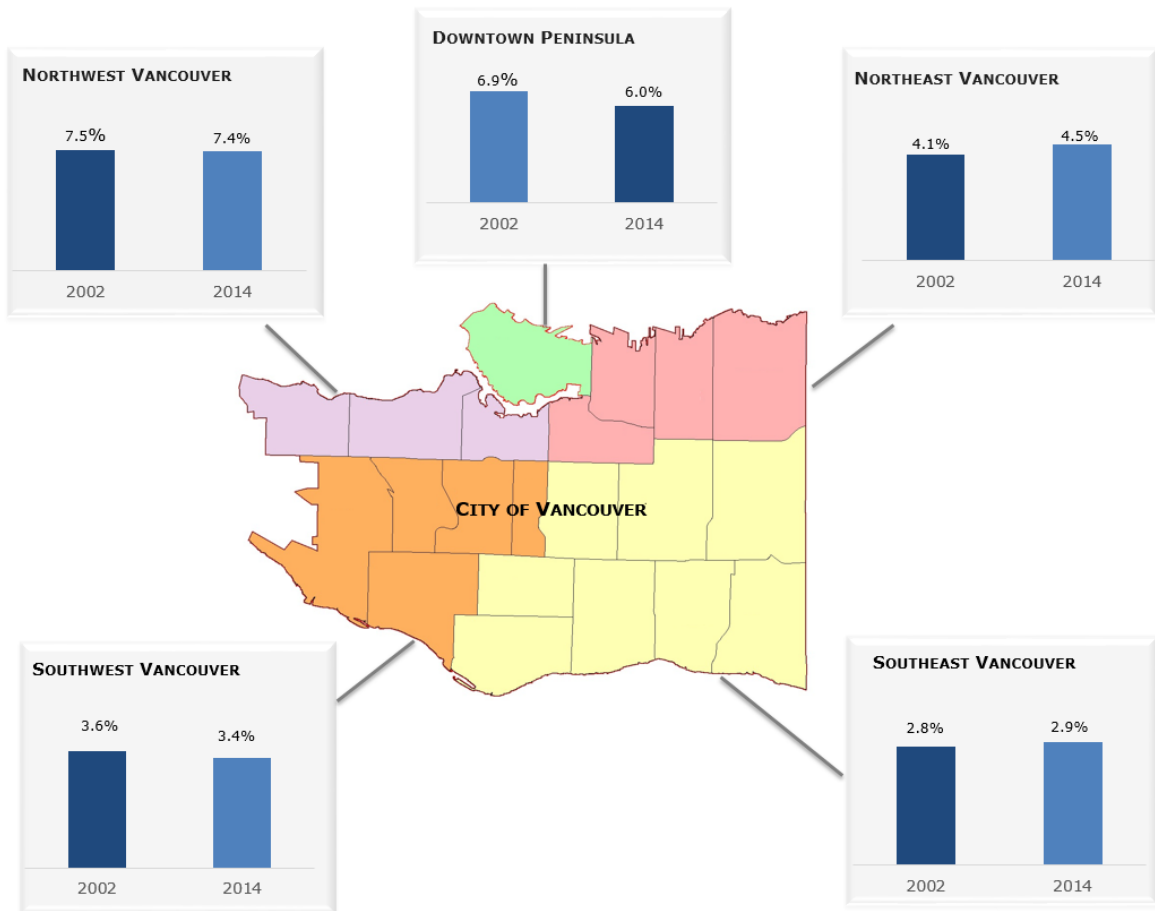
Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Apartments include purpose-built rental units and condominiums.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

Non-Occupancy rates relatively consistent over time throughout City

The analysis showed very little variation in the overall Non-Occupancy rates between 2002 and 2014, with the largest change being a drop in Non-Occupancy of 1% in the Downtown Peninsula (see Graphs 14-18 for additional information on change over time by housing type by geographic sector in the city).

Figure 2: Non-Occupancy Rates by CoV Geographic Sector for 2002 & 2014
(% of Housing Units)

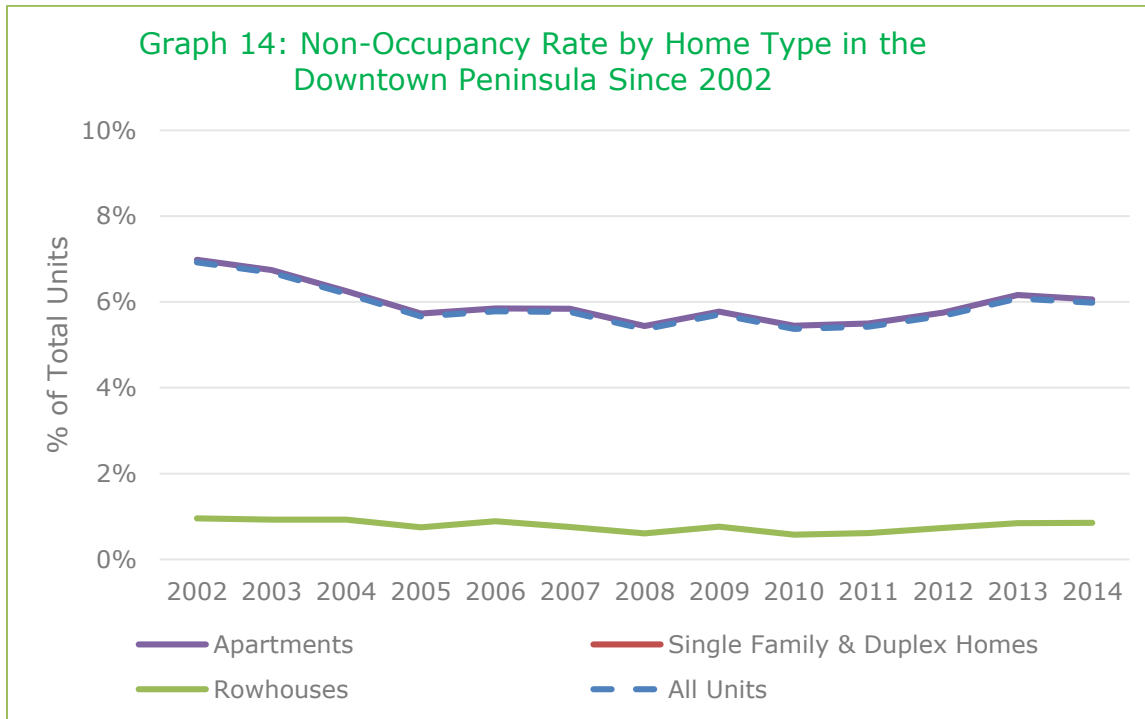


Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

Non-Occupancy in the Downtown Peninsula (dominated by Apartments) has dropped 1%

Apartments, which make up 98% of the housing units in the Downtown Peninsula, have driven a decrease in Non-Occupancy from 6.9% in 2002 to 6.0% in 2014. The Downtown Peninsula includes the West End and Downtown.



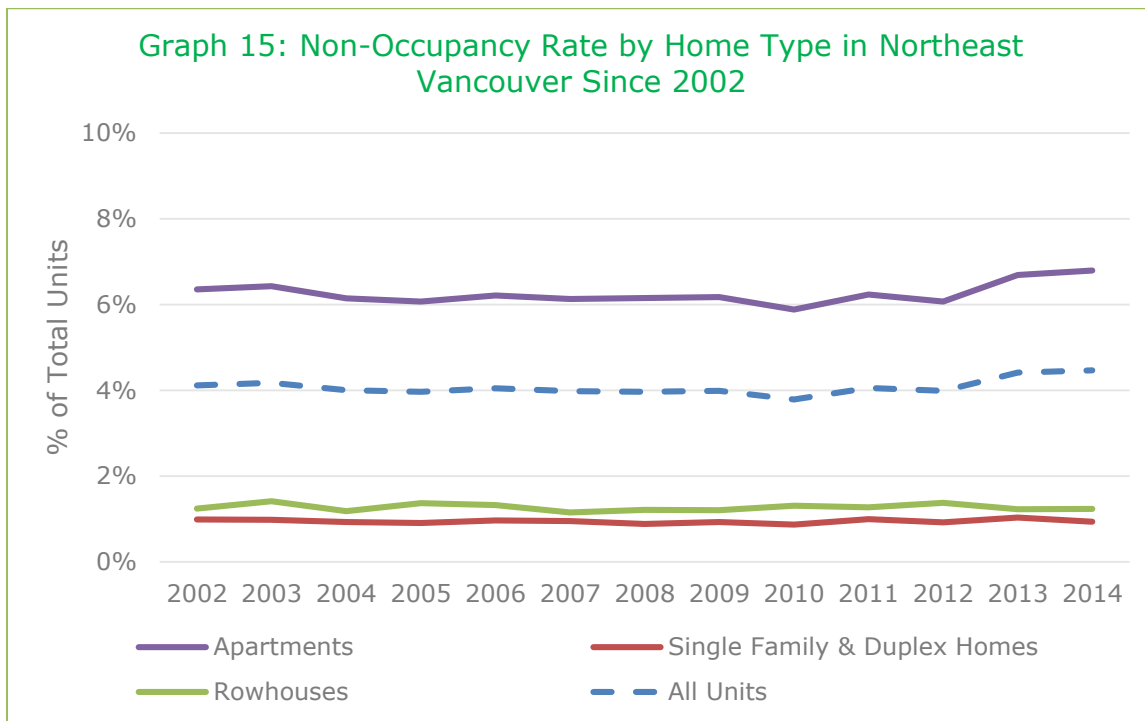
Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Apartments include purpose-built rental units and condominiums.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

Apartments have driven a modest increase in Non-Occupancy in Northeast Vancouver

The overall Non-Occupancy rate in Northeast Vancouver has increased modestly from 4.1% in 2002 to 4.5% in 2014. The increase was driven by Apartments (6.4% in 2002; 6.8% in 2014).

Northeast Vancouver includes the neighbourhoods of Mt. Pleasant, Strathcona, Grandview-Woodland and Hastings-Sunrise.



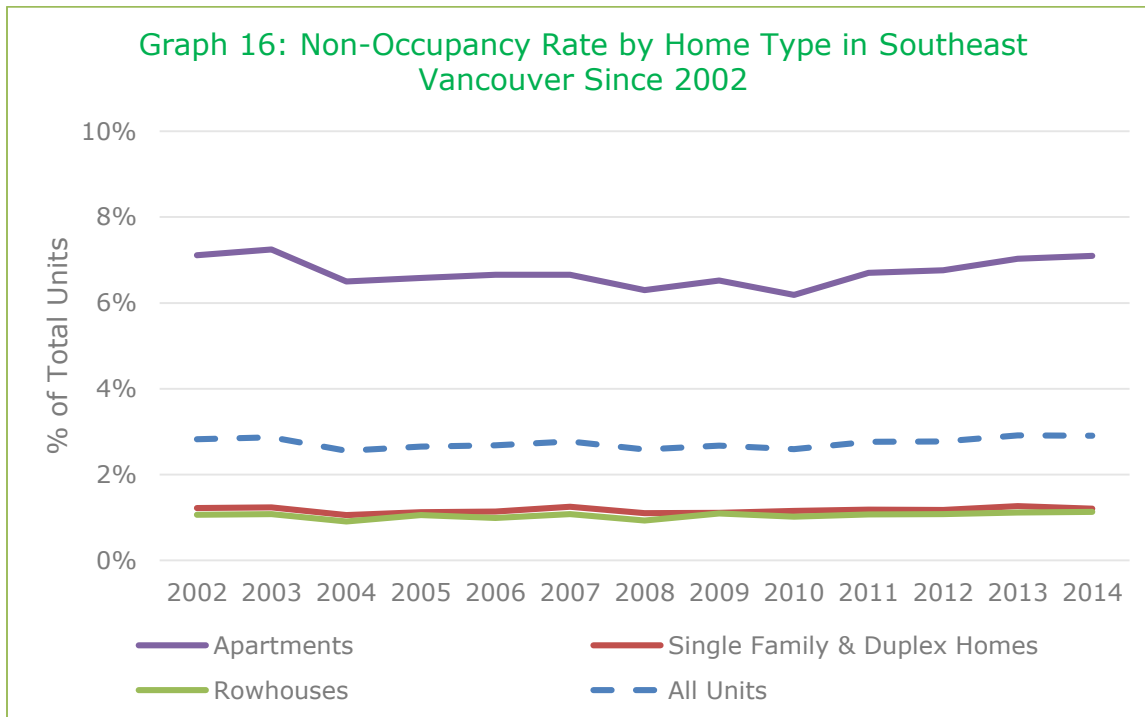
Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Apartments include purpose-built rental units and condominiums.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

Non-Occupancy in Southeast Vancouver has been stable

The overall Non-Occupancy rate in Single Family and Duplex housing-dominated Southeast Vancouver has been stable (2.8% in 2002; 2.9% in 2014).

Southeast Vancouver includes the neighbourhoods of Renfrew-Collingwood, Kensington-Cedar Cottage, Riley Park, Oakridge, Marpole, Sunset, Victoria-Fraserview and Killarney.



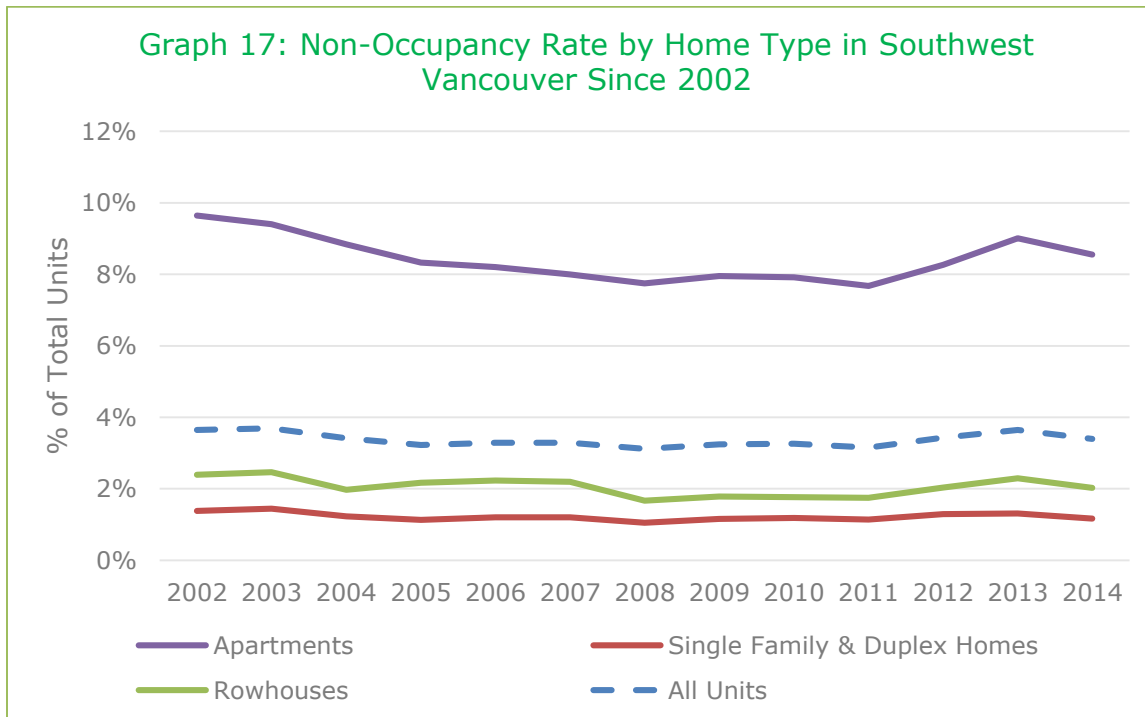
Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Apartments include purpose-built rental units and condominiums.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

Non-Occupancy in Southwest Vancouver has been stable

The overall Non-Occupancy rate in Southwest Vancouver has been stable (3.6% in 2002; 3.4% in 2014). The Non-Occupancy rate of the relatively small population of Apartments, however, has decreased from 9.6% in 2002 to 8.6% in 2014.

Southwest Vancouver includes the neighbourhoods of South Cambie, Shaughnessy, Arbutus-Ridge, Dunbar-Southlands and Kerrisdale.

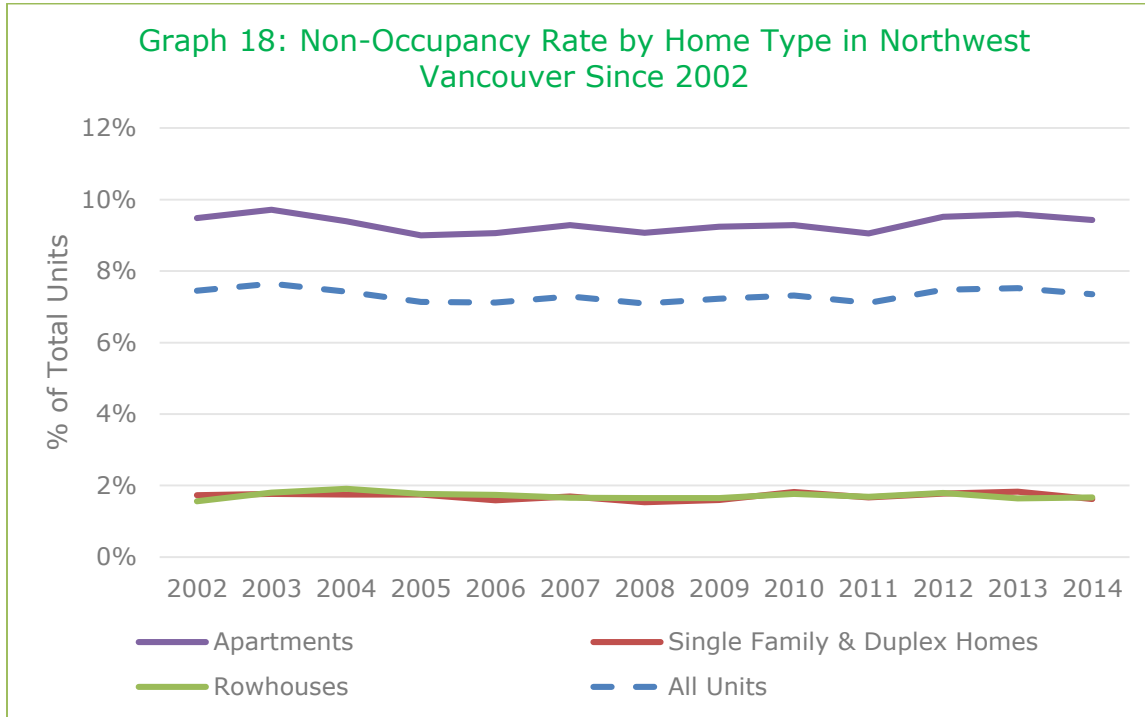


Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Apartments include purpose-built rental units and condominiums.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

Non-Occupancy in Northwest Vancouver has been relatively stable

The overall Non-Occupancy rate in Northwest Vancouver (Fairview, Kitsilano and West Point Grey) has been relatively stable (7.5% in 2002; 7.4% in 2014).



Notes: Non-Occupancy defined as no occupancy for 12 month period from August to July (ending the year noted above), inclusive. Apartments include purpose-built rental units and condominiums.

Source: Ecotagious analysis of anonymized residential electricity consumption data from BC Hydro, 2015.

Conclusion

An analysis of residential electricity meter data in the GVRD, in combination with a number of other data sources, has determined a relatively stable Non-Occupancy rate within the City of Vancouver from 2002 to 2014, at which time it was 4.8%. More detailed analysis, included in this report, shows that the Non-Occupancy rate is in-line with that of the rest of the GVRD, and fairly uniform throughout the geographic sectors of the City. The analysis did show that Apartments, which represent 60% of the CoV's residential housing mix, are driving Non-Occupancy in the City at 7.2% in 2014.

This report provides an extensive analysis of electricity consumption data on housing occupancy in the City of Vancouver, and the findings are consistent with those from other studies. However, the findings are not comprehensive and bring forth additional questions that may warrant additional research using complementary sources of information.

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