

# **Assessing the Liveability of Vancouver for Seniors:**

An analysis of the affordability, accessibility, and safety of neighbourhoods

GEOB 270

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## **Abstract**

In this project, a study was conducted to examine the most affordable, accessible and safest areas for senior citizens to live in Metropolitan Vancouver. The primary purpose of our analysis was to determine which neighbourhood in the City of Vancouver is “most liveable” for seniors. We established that these three factors - affordability, accessibility and safety, were the most important factors of liveability. We illustrated these three factors on individual maps to show the risk of residential break and enters by neighbourhood, the median cost of housing by neighbourhood and the access to three amenities - community centres, medical centres and rapid transit stops - by neighbourhood. The report provides a description of the data, a methodology of the analysis, discussion of the results, before providing information on uncertainty and error, and recommendations for further research. The report emphasizes the complexity of finding neighbourhoods that are simultaneously safe, accessible and affordable; demonstrating a core difficulty for senior citizens living in Metropolitan Vancouver. The report does not offer a full account of the liveability of neighbourhoods for senior citizens, but instead seeks to offer the foundations for providing seniors with detailed information of Metropolitan Vancouver.

## **Data Description**

This project studies the area of Metropolitan Vancouver. The areas of Stanley Park and the University of British Columbia were excluded from our analysis because data availability was inconsistent. The project seeks to help senior citizens make informed decisions on the most desirable areas to live, by providing information on amenities, housing costs, and crime rates in each neighbourhood of Metro Vancouver. As such, this project seeks to assess the most affordable, accessible and safest neighbourhoods for senior citizens, and recognizes the different needs of seniors. The project focuses on access to three amenities: community centres, medical centres, and rapid transit stops. The project presents two further maps; the first utilizes crime data from Vancouver, in particular ‘Residential Break and Enters’, to demonstrate, which neighbourhoods have the lowest number of these crimes and are thus deemed ‘safer’. We solely selected ‘Residential Break and Enters’ because we felt that this was the most relevant threat to senior citizens, in particular because they tend not to own cars or commercial properties. The second map utilizes census tract and median housing cost data to illustrate the average median housing cost by neighbourhood, thus portraying which neighbourhoods are most affordable. This project has three separate maps, and one additional map with the neighbourhood names, to illustrate the difficulties of finding an affordable, accessible, safe neighbourhood in Vancouver. Rather, it seeks to offer senior citizens the opportunity to choose to prioritize what is most important when deciding where to live. Each map is divided by neighbourhood to offer a broad distinction on where best to live, yet acknowledges that there is variation even within neighbourhoods. Therefore, this project provides information on the most affordable, accessible

and safe areas, analyzing the data to emphasize the complexity of finding ‘the most liveable’ place to live.

Data Name	Vancouver_Mask
Source	G drive
Description	Vancouver_Mask shows the municipality of Vancouver, including Stanley Park and the University of British Columbia.
Year Collected	Unknown
Resolution/Aggregation Level	Vector file
Projection	NAD_1983_UTM_Zone_10N
Format	File Geodatabase Feature Class
Attributes/Content	Shape_Area

Data Name	Community_Centres
Source	City of Vancouver
Description	Community_Centres contains the names and addresses of all of the community centres in the City.
Year Collected	2009
Resolution/Aggregation Level	Vector File
Projection	NAD_1983_UTM_Zone_10N
Format	SHP
Attributes/Content	Name, address, and latitude and longitude of each community centre

Data Name	Healthcare
Source	G drive
Description	Healthcare contains the names and addresses of all of the medical centres including hospitals, long-term care facilities etc.
Year Collected	Unknown
Resolution/Aggregation Level	Vector File
Projection	NAD_1983_UTM_Zone_10N
Format	SHP
Attributes/Content	Name, address, and latitude and longitude of each medical centre

Data Name	Rapid_Transit_Stations
Source	City of Vancouver
Description	This data set contains rapid transit stations. Only those within the boundaries of the City of Vancouver are shown.
Year Collected	Not Provided
Resolution/Aggregation Level	Vector File
Projection	NAD 1983 UTM Zone 10N
Format	SHP
Attributes/Content	N/A

Data Name	Local_Area_Boundary
Source	City of Vancouver
Description	This data set contains the boundaries for the City's 22 local areas (also known as local planning areas). These are the neighbourhood boundaries used for our analysis.
Year Collected	Not available
Resolution/Aggregation Level	Vector File
Projection	NAD 1983 UTM Zone 10N
Format	SHP
Attributes/Content	Official Name and Boundaries

Data Name	Crime
Source	City of Vancouver
Description	Crime data including residential break and enters, commercial break and enters, mischief, theft from vehicle, offense against a person, and other theft
Year Collected	2015
Resolution/Aggregation Level	Vector File
Projection	NAD 1983 UTM Zone 10N
Format	SHP
Attributes/Content	Type, Year, Month, Hundred_Block, Neighbourhood, X, Y

Data Name	Median_Value_of_Dwellings_Table
Source	CHASS <a href="http://datacentre.chass.utoronto.ca/census/">http://datacentre.chass.utoronto.ca/census/</a>
Description	Median shelter cost (\$) by census tract
Year Collected	2011
Resolution/Aggregation Level	Attribute
Projection	NAD_1983_UTM_Zone_10N
Format	Tabular
Attributes/Content	Median value of dwellings (\$), census tract name

Data Name	Roads
Source	G Drive
Description	All roads including expressways, major roads, primary highways, secondary highways and local roads
Year Collected	Unknown
Resolution/Aggregation Level	Lines
Projection	NAD_1983_UTM_Zone_10N
Format	SHP
Attributes/Content	25 classes of road types

Data Name	Canada_Census_Tracts
Source	Abacus Dataverse Network
Description	The 2011 Census Boundary Files depict boundaries of standard geographic areas established for the purpose of disseminating census data. Cartographic boundary files depict the geographic areas using only the shorelines of the major landmass of Canada and its coastal islands
Year Collected	2011
Resolution/Aggregation Level	Vector
Projection	NAD_1983_UTM_Zone_10N
Format	SHP
Attributes/Content	Name, shape_area

## **Methodology of Analysis**

Our approach was to systematically create three independent maps that could be correlated against one another to establish the safest, most affordable and most accessible neighbourhoods in Vancouver.

Each map included the Vancouver Mask data, Local Area Boundaries and Roads, so as to provide a consistent foundation with landmarks that could be compared. With roads, we consistently reclassified the roads to include only the Major Roads in Vancouver, so as not to occupy the primary focus of the map.

### *Map 1 - Accessibility*

For this map, we sought to carry out an analysis of which neighbourhoods were within 720 metres of two or more amenities, which included: community centres, medical centres and rapid transit stops. A 720 metre buffer was used as an 'accessible' distance for seniors based on the results of a BBC report (Lever, 2012). This report considers that senior citizens walk at approximately 0.8 metres per second. For the purpose of our analysis, we considered a 15 minute walk to be an appropriate distance for most seniors. Thus, accessible amenities would be within a walking distance of approximately 720 metres. We combined the buffers of all three amenities on one map, to illustrate which neighbourhoods have the greatest access in Vancouver.

Our raw data was initially manipulated to conserve a consistent coordinate system and projection, using a UTM coordinate system for zone 10 and the 1983 North American datum, which is typically used to project the Vancouver region. Due to the spatial extent of our data, we had to do some clipping to restrict our analysis to the neighbourhood boundaries (the Local\_Area\_Boundary layer). It is important to note that Stanley Park and the University of British Columbia have been excluded from our analysis. The flowchart depicted in figure 1, illustrates this method.

Once we had all the points on the map, we established the buffer of 720 metres around each individual amenity, clipping the buffers to the City of Vancouver boundaries. Subsequently, we dissolved the buffers, and intersected the buffer layers of community centres, medical centres, and rapid transit stops to create one new buffer layer - ammenity\_buffer.

We decided the best approach to display this data was to give each layer a different colour, so that the map represented areas with at least two buffers, and then clearly illustrated where all three amenities overlapped.

### *Map 2 - Safety*

For this map, we sought to analyse crime in each neighbourhood of the city of Vancouver. After manipulating the data, and clipping the spatial extent of our data, as we had with our map of

amenities, we reclassified the crime data to portray just “Residential Break and Enters”. Subsequently, we made a new layer, as we felt that these crimes were the most pertinent for senior citizens deciding which area to live in.

This reclassification still meant that there were numerous individual points, thus we performed a spatial join with the neighbourhood polygons. We summed the break and enters in each neighbourhood to classify the different neighbourhoods based on the number of thefts.

We symbolized the new polygon feature class by symbolizing with quantities using pink/purple as a colour gradient and manual breaks of 0-500, 501-1500, 1501-3000, 3001-6000, >6000 in order to emphasize which areas had the greatest number of residential break and enters and which areas had very few.

### *Map 3 - Affordability*

For this map, our aim was to display the most affordable areas of Vancouver by averaging the median housing cost in each neighbourhood. Once again, we manipulated and clipped the data to the local area boundaries of the City of Vancouver. Next, we joined the Median Housing Cost attribute table with Census Tracts, saving this as a new layer.

We recognized the need to portray this layer by neighbourhood so that citizens could draw comparisons between the maps, and thus spatially joined local area boundary polygons with the new layer of Census\_Tract\_Median\_Cost. This provided us with an average for the median housing cost in each neighbourhood.

After careful consideration, we decided to use manual breaks instead of natural breaks; keeping the values similar to natural breaks but making the numbers slightly more aesthetically pleasing and simpler for the general public to understand.

By providing the data on three different maps, we provided consistent comparisons between neighbourhoods, so that senior citizens had the foundations for understanding these three core factors to decide where to live.

## **Results**

Based on viewing the three maps: accessibility to amenities, crime break-ins, and affordability, the most liveable neighbourhood for senior citizens would be Renfrew Collingwood followed by Strathcona and the eastern portion of Marpole. Renfrew-Collingwood has the most accessibility to the three amenities (rapid transit stations, community centres and health facilities) while still maintaining a lower cost of housing and moderate security. Strathcona and the eastern portion of Marpole have the second best accessibility to amenities, both maintain mid-level numbers of break-ins but Strathcona is cheaper than Marpole. Killarney has the possibility of becoming a desirable living area for seniors if more major transit links were made available. It maintains desirable access in all other categories: easy access to hospitals, community centres and is in the

second lowest bracket of housing costs and maintains the second lowest bracket of break-ins. However, the lack of rapid transit stations would be relatively isolating for senior citizens.

In terms of areas that would be the least suitable for seniors, the entire west side, (neighbourhoods: West Point Gray, Dunbar-Southlands, Arbutus-Ridge, Kerrisdale and Shaughnessy) are not recommended as there is little access to the three amenities while the housing costs are also quite high. Similarly, Sunset and Victoria-Fraserview had little to no access to the amenities.

Having areas that met all three conditions was difficult as often places with walkable accessibility to amenities were in areas that were either too expensive or were a security issue as they contained a large number of break-ins. Kitsilano, South Cambie and Oakridge all had great access to amenities and were relatively safe but were all in the higher housing cost levels. In comparison, Downtown and the West-End had great access to amenities and had low housing costs; they were in areas with a large number of reported break-ins.

## **Discussion**

We felt it was important to provide three separate maps to help with both planning and the suitability of an area based on an understanding that the circumstances that caused a senior citizen to look for housing would be quite variable. Secondly, we concluded that senior citizens might value certain factors above others, which may influence their preferences. For example, Downtown has excellent amenity support but very poor security, while South Cambie exemplifies an area that is safe, yet expensive. By providing the three maps the senior could make their own decision based on their unique set of circumstances and decide which condition to sacrifice, if necessary.

For the purpose of our analysis, we placed the greatest importance upon the amenities map. We assumed that overall, access to amenities is valued by senior citizens over both crime and housing costs. We chose the three amenities based on a number of assumptions. Firstly, that as we age our health declines and therefore access to healthcare facilities is more important. 75% of seniors in BC had at least one chronic health problem (Chapman KR, Tashkin DP, Pye DJ, 2001). Secondly, according to census data collected in 2006, 27% of seniors live alone (BC statistics, 2008) and that those who live alone or have small social networks are more likely to have lower mental health well-being (Cloutier-Fisher, D Kobayashi, K,M, A.P Smith 2008). With this in mind, we included proximity to community centres as an important amenity because they typically have social and physical programs for seniors. Lastly, with the assumption that fewer senior citizens are able to drive due to age (United Way, 2011), we added the “amenity” of access to the major transit stations - specifically the sky train. This provides the greatest access to Vancouver so that seniors can visit parks, culturally significant areas and visit friends and family. Holding the assumption of seniors’ decreasing rates of driving, we created the buffer of 720 m, which correlated to 15 minutes of walking to these three amenities. This meant that those who did not drive could still have access to these amenities.



We created a number of different options for amenity accessibility, the most desirable being walking distance to all three. However, we also displayed areas that were within walking distance to 2 out of the 3 amenities. This illustrates potential areas that a senior could live depending on their own circumstance. For example, someone who is in poor health may prioritise walking access to hospitals and community centres for physical rehabilitation rather than access to transit.

Having affordability as a separate map was important, as a senior's income can be extremely variable. Some may have a greater need for cheaper housing whereas others may have more access to income. Currently it is not possible to find accurate data on a senior's income and/or access to money. One would have to account for a senior's pension, investments, possible part-time jobs, possible access to a life-insurance plan and/or inheritance from a deceased partner, added income of a partner and also whether or not they are either supporting a dependant or being supported by a dependent. Those in higher income brackets would have the ability to choose some of the more expensive areas like Kitsilano, South Cambie and Oakridge and may want to sacrifice more income towards housing to have the easy access to amenities in secure areas with fewer break-ins. However, for individuals where monetary funds are of concern, we assumed security may be of less importance. Secondly, the issues of safety could be rectified by a more secure housing alarm system to negate the potential of a break and enter occurring. Many areas that have amenities and are more affordable (downtown, west end) are represented as very insecure due to the high number of break-ins but would otherwise be quite suitable.

This section emphasizes the opportunity for further analysis, and the importance of providing senior citizens with this data, due to the complexity of liveability within Vancouver.

### **Error and Uncertainty**

Upon the completion of the project, there were a few errors that we encountered. An important error to consider is our spatial join of median housing cost by census tract with neighbourhood boundaries. In doing so, we averaged the cost of housing across the entire neighbourhood. This simplified the data by portraying the neighbourhoods as having dwellings of only one price. As such, our analysis missed the intricacies of neighbourhood housing affordability. Housing costs may vary drastically within neighbourhoods, yet this is ignored in the map's portrayal of dwelling values. It is possible that some areas of neighbourhoods may be more or less affordable than our map displays.

Moreover, further uncertainty was generated due to the classification methods used. When deciding how to classify data, such as our use of manual and natural breaks, a degree of bias could have been involved, so that the results matched our predictions. For this reason, we avoided using both standard deviation and equal interval classification, as these maps portrayed Vancouver as highly unaffordable or unsafe.

A potential source of error may have occurred with our decision to create a buffer of 720 metres. We based this buffer off one article, and manually calculated the buffer distance. Not only could our information be incorrect, our buffers do not account for sidewalks and routes that individuals could take. Perhaps, a network analysis would have more accurately illustrated the areas that are within a 15-minute walk, as we assumed that these networks would be readily available within the buffer zone.

Temporal error and precision can occur if the data is not completely up to date (Mceachren, 2005), and since we could not use 2016 data as that is the contemporaneous present year and using it would have been inaccurate. We had to use the most recent data available and it varied between datasets and did not account for the growth of Vancouver and subsequent changes in neighbourhoods. For instance, some neighbourhoods may have become significantly more expensive.

Furthermore, edge-matching issues occurred when overlaying the neighbourhood edges on the Vancouver\_Mask layer. Therefore, data imprecision may have also occurred when overlaying other data sets. These disparities would be minimal, however it does illustrate a degree of uncertainty with results on boundary lines.

Human error can and has significantly altered our results' accuracy and exactitude. Firstly, some break and enters were not recorded within a specific neighbourhood in Vancouver (some coordinates were located in the ocean). Other data points were located on neighbourhood boundary lines. We excluded these points from our analysis rather than editing or checking their 'proper' positions. Additionally, the data presented may be biased depending on who collected it. The data could be purposely biased and recorded in favour of a specific neighbourhood at the disservice of another. For example, in the case of crime, those collecting data could make a neighbourhood appear as if there are higher crime rates than other neighbourhoods to suit the purpose of their data.

### **Further Research/Recommendations:**

We displayed our analysis for use by real estate agents and prospective residents of Vancouver aged 65 and over. This project aimed for a clear, simplified presentation of maps to enable effective communication and easy understanding.

A more in-depth analysis could be performed, by extending the range of data inputs considered in our research. For instance, it may be practical to include a wider variety of popular senior amenities (e.g. locations of major grocery stores, parks, and major bus routes). We strongly recommend surveying senior citizens to understand which amenities are most highly valued. Our analysis could also be adapted to other projects that focus on seniors' accessibility and the liveability of Vancouver. We would recommend expanding accessibility analysis for physically disabled citizens, considering ramp access, railing access, handicapped parking and elevator data if available. Future research could also consider how accessibility and liveability change when seniors have access to a vehicle.

This project would benefit from a more comprehensive analysis of neighbourhood crime rates. Future research could consider a wider variety of crime data, including instances of assaults and automobile theft, etc. Furthermore, the crime analysis of our project could potentially be extended to explore which neighbourhoods might require higher police presence and security system installation.

Despite being targeted for seniors, businesses and the municipal government of Vancouver might find value in our analysis. This could be particularly useful when determining potential locations for new services and amenities, such as new seniors' residential homes. Our analysis could also be used for transportation planning; certain shuttles could be offered to seniors in areas that have less access to transit, such as Killarney.

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# Amenities Flow Chart

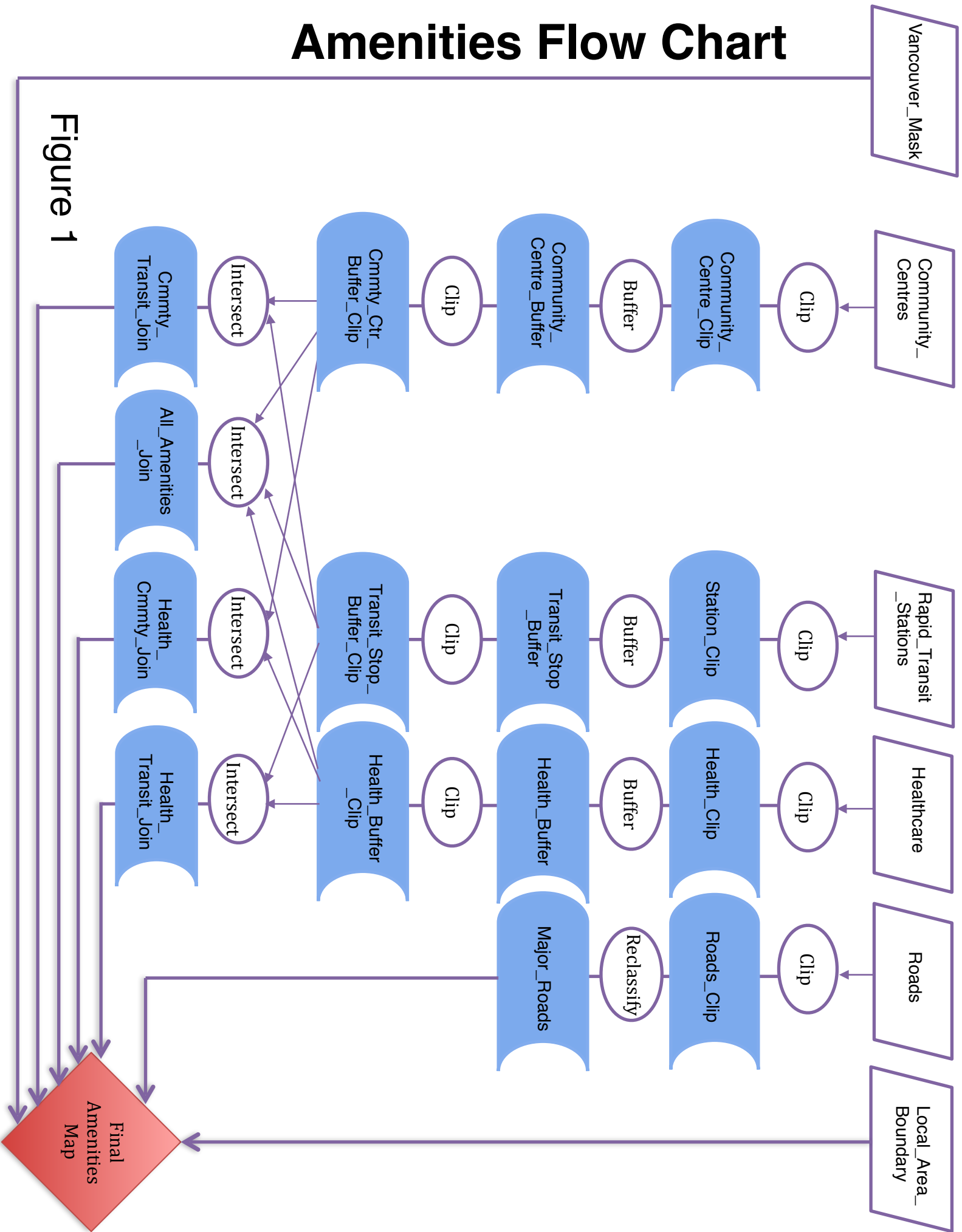


Figure 1

# Crime Flow Chart

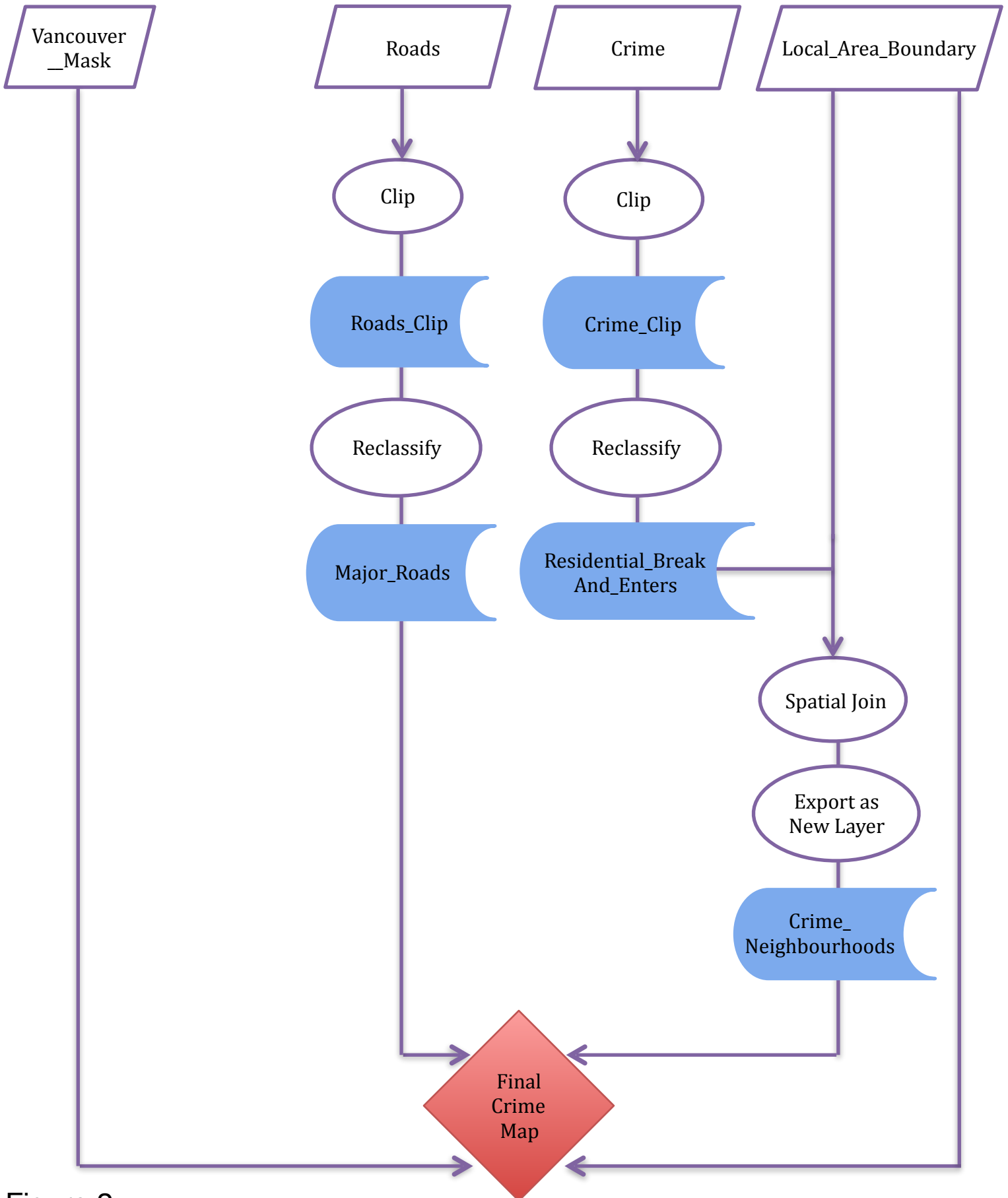


Figure 2

# Housing Affordability Flow Chart

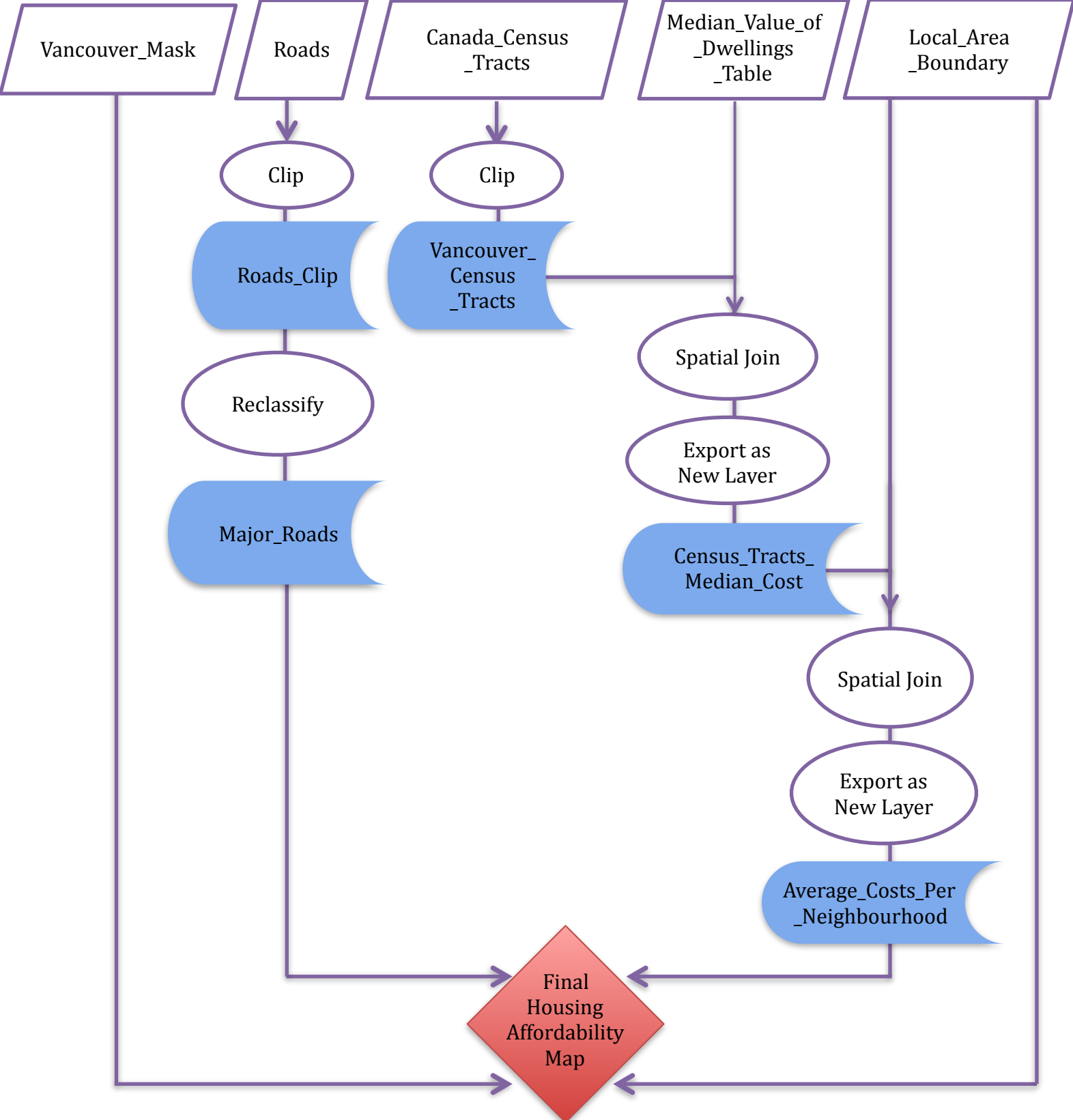
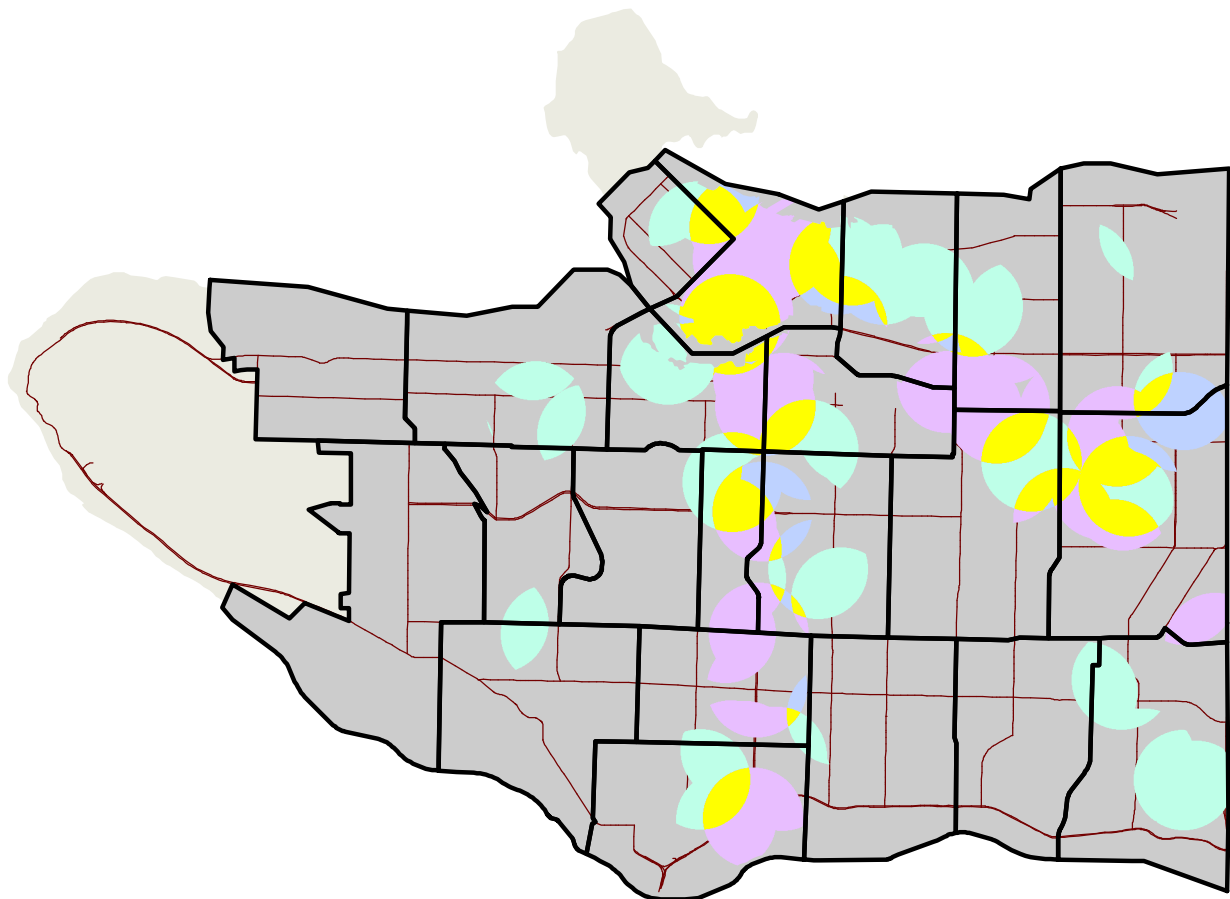


Figure 3

# Accessible Amenities for Seniors

## Areas within a 15 Minute Walk of Multiple Amenities



### Areas within 720m of Multiple Amenities

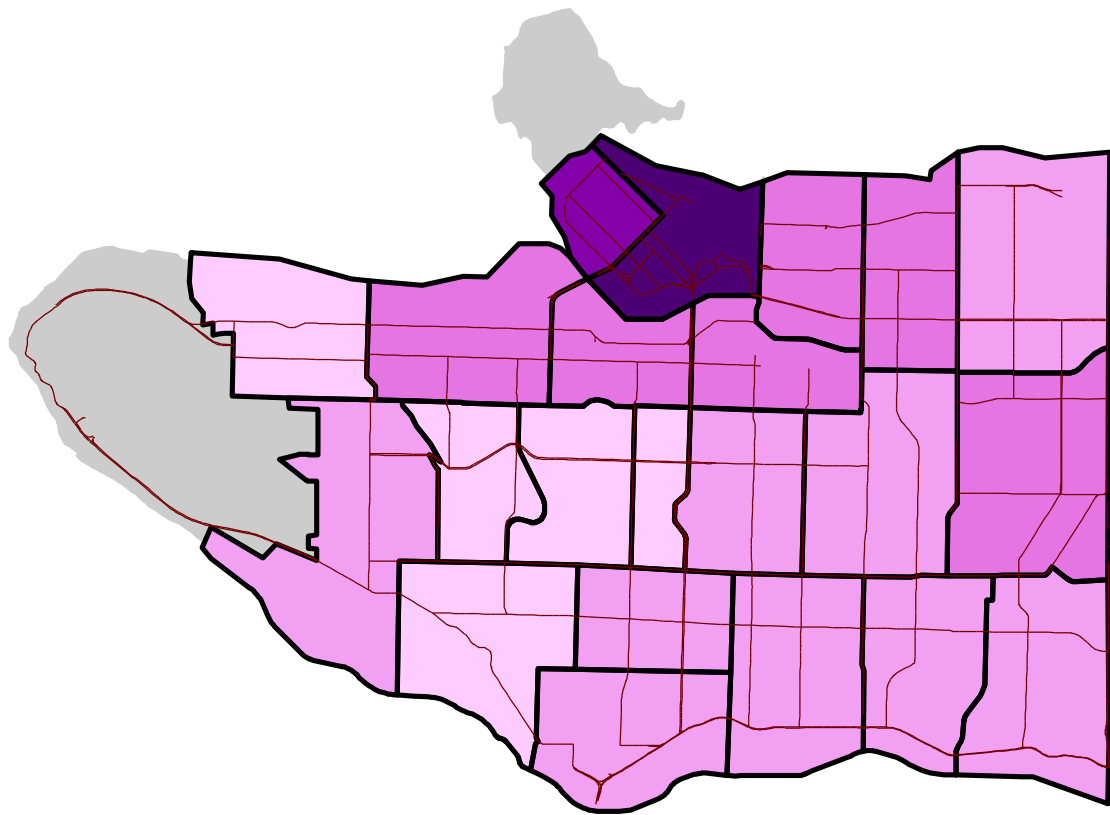
-  Neighbourhood Boundaries
-  All Amenities
-  Community Centres & Rapid Transit Stations
-  Health Facilities & Rapid Transit Stations
-  Health Facilities & Community Centres
-  Major Roads
-  Excluded Areas

0 1.25 2.5 5 Kilometers





# Residential Break and Enters by Neighbourhood, 2015



## Residential Break and Enters

— Major Roads

▭ Neighbourhood Boundaries

## Number of Residential Break and Enters in 2015

396 - 500

501 - 1500

1501 - 3000

3001 - 6000

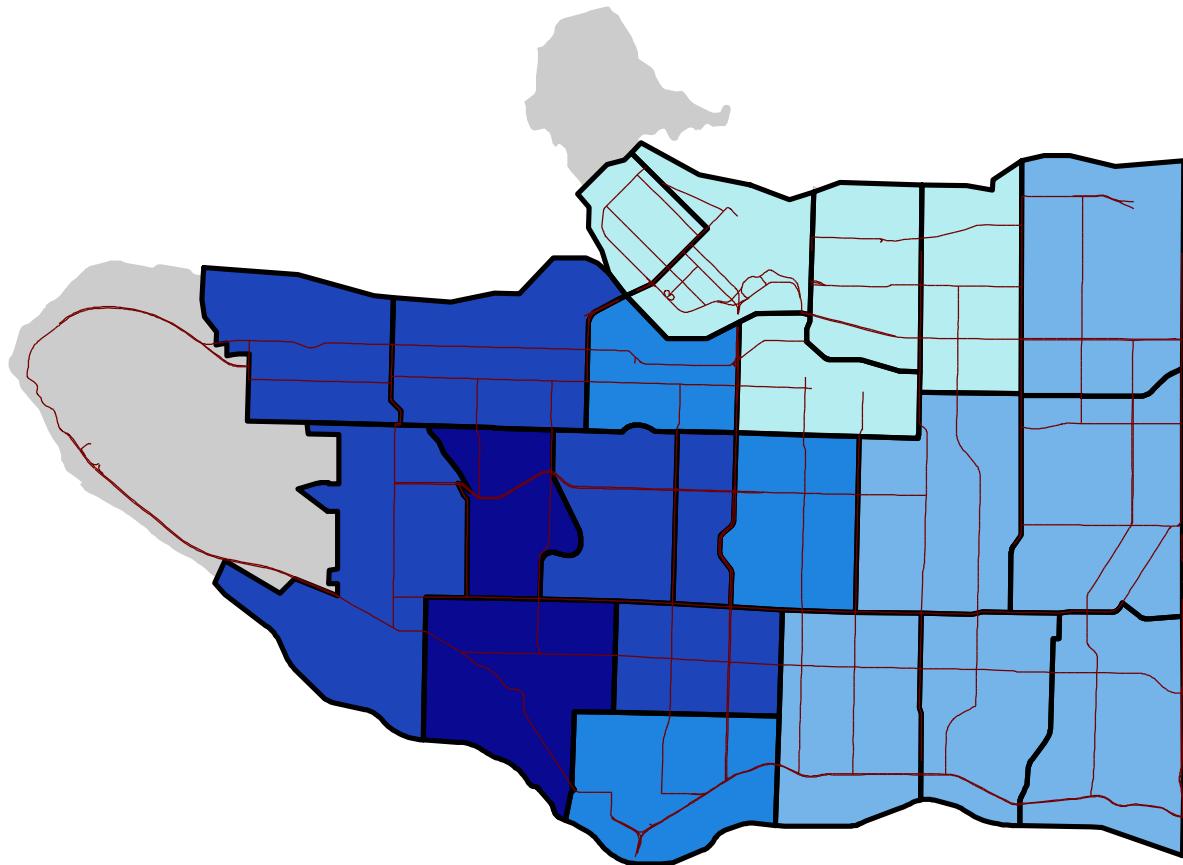
6001 - 9600

Excluded Areas

0 1.25 2.5 5 Kilometers



# Average Median Housing Cost by Neighbourhood



## Vancouver Housing

— Major Roads

▭ Neighbourhood Boundaries

### Average Housing Cost (\$)

461,327 - 615,731

615,731 - 803,477

803,477 - 915,353

915,353 - 1,425,460

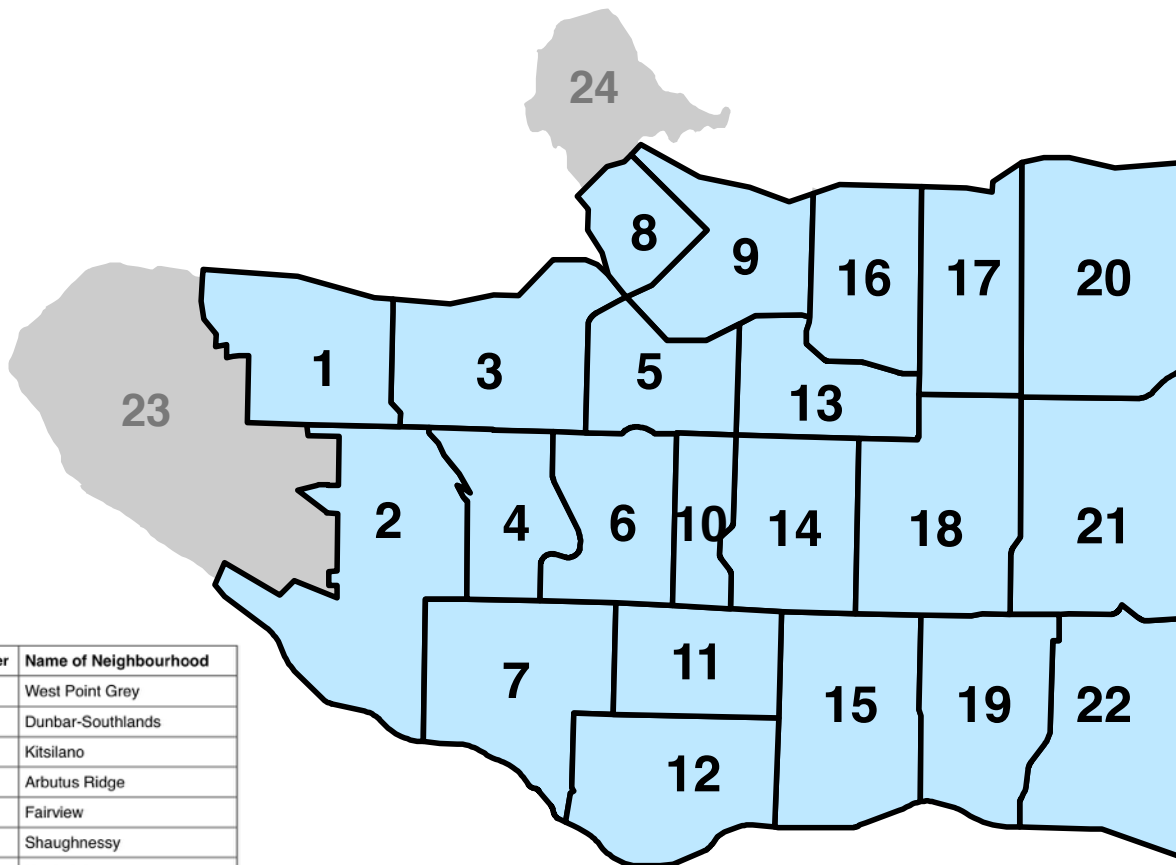
1,425,460 - 1,698,823

Excluded Areas

0 1.25 2.5 5 Kilometers



# Names of Neighbourhoods in Vancouver



Number	Name of Neighbourhood
1	West Point Grey
2	Dunbar-Southlands
3	Kitsilano
4	Arbutus Ridge
5	Fairview
6	Shaughnessy
7	Kerrisdale
8	West End
9	Downtown
10	South Cambie
11	Oakridge
12	Marpole
13	Mount Pleasant
14	Riley Park
15	Sunset
16	Strathcona
17	Grandview-Woodland
18	Kensington-Cedar Cottage
19	Victoria-Fraserview
20	Hastings-Sunrise
21	Renfrew-Collingwood
22	Kilarney
23	Excluded Area
24	Excluded Area

0 1.25 2.5 5 Kilometers

