

GEOB 270 Final Project Report: Identifying a new Safehouse Location in Vancouver

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Abstract

In our report, we provide suitable locations to build a new safehouse in Vancouver, in which we identified the three most suitable locations from Site A to Site C. Due to constraints (lack of data on overdose locations), we determined income and marginalized communities (including First Nation communities and minority groups) as the two most relevant factors for involvements with illegal drugs, hence increasing association and likelihood of drug overdoses. Furthermore, we chose our locations based on being within a 500m radius of a healthcare facility and at least 500m away from any educational institutions. We emphasized that the importance of safehouses should not be undermined, as safehouses can act as a lifeline for particularly vulnerable populations (drug users) and prevent early death. However, we do not hope that safehouses are relied on as the sole solution to this growing epidemic, and rather we recommend that Vancouver address the societal structures that are contributing to such issues.

Description of Project, Study Area, and Data

This report will identify the most suitable locations to build a new safehouse for drug users in Vancouver. We have been hired by the BC government for this task because of the increasing epidemic of drug overdoses in Vancouver from adulterated drugs with fentanyl (estimated to be 30-50 times more potent than heroin and appeals to drug abusers).¹ Despite the increased risks of drug use today (due to this adulteration), many drug users continue to consume drugs, thus it is important to provide safe spaces for drug users where they can obtain clean needles, use reliable resources to check for fentanyl-laced drugs, consume drugs and receive immediate medical attention in the case of an overdose.

Currently there are only two supervised injection sites in Vancouver (InSite and Powell Street Gateway), and despite much controversy they have proved useful and essential in protecting drug users from a variety of risks including death.² Clean needles stop the spread of infections like HIV, and daily access to medical staff is extremely important for this vulnerable population. InSite, North America's first legal supervised injection site, opens at 10 a.m. and runs steadily for 18 hours until 4 a.m. Since opening in 2003, Insite has seen over 3.6 million clients and intervened in 6,440 overdoses without any deaths.³ For the people that use this space, it often acts as a lifeline and is growing in popularity.

GIS helps us to answer the “where” or “place-based” questions, so in this instance based on the factors we chose to consider, GIS will help us locate a new safehouse for the city of Vancouver. We will consider the following factors in our decision on the optimum location: income, marginalized communities, and proximity to healthcare and education facilities. Our study area is

¹ Hull, M. J., Juhascik, M., Mazur, F., Flomenbaum, M. A., & Behonick, G. S., “Fatalities Associated with Fentanyl and Co-administered Cocaine or Opiates,” *Journal of Forensic Sciences* 52, no.6 (2007): 1383, doi:10.1111/j.1556-4029.2007.00564.x.

² “Safe injection site and needle exchange,” City of Vancouver, accessed December 1, 2017, <http://vancouver.ca/people-programs/safe-injection-site-and-needle-exchange.aspx>.

³ “Insite user statistics,” Vancouver Coastal Health, accessed December 1, 2017, <http://www.vch.ca/public-health/harm-reduction/supervised-injection-sites/insite-user-statistics>.

Vancouver and we have conducted our analysis using data retrieved from CHASS University of Toronto and UBC's Department of Geography.

Methodology of Analysis

Our methodology of analysis entailed a few distinct steps. Firstly, according to NCCHP the “illegal nature of drug use drives it underground and marginalizes those who use drugs. This impacts the ability to collect valid, consistent data”.⁴ Since there is a dearth of data regarding specific location of opioid overdoses in the Vancouver area, we had to find other factors that are relevant in predicting where overdoses can potentially occur. “Other factors” can be a range of variables from age, gender, ethnicity, family life, support networks, income and much more. Due to the limited time span and our basic knowledge of GIS, it was not a foreseeable possibility for us to do a multivariable analysis of all these possible factors, thus we had to narrow down to only two. Additionally, while other factors like individual's age, whether the individual suffers from abuse, neglect or a mental illness can also be deemed as quite relevant, these factors also have limited collected data due to privacy barriers in Canada.

In light of the constraints on our project, we determined income and marginalized communities (including First Nation communities and minority groups) as the two most relevant factors for involvements with illegal drugs, hence increasing association/likelihood of drug overdoses. We acquired data on income (Median after-tax income in 2015 among recipients (\$)), population of First Nations (Total - Aboriginal identity for the population in private households - 25% sample data) and finally, population of minority groups (Total - visible minority for the population in private households - 25% sample data) from CHASS Data Centre of University of Toronto. Once the data was retrieved, we had to *clip* these three layers to our Vancouver layer before using the *polygon to raster* tool to further our analysis. We used NAD 1983 UTM Zone 10N as our coordinate system, Universal Transverse Mercator as our projected system and North American 1983 as our datum.

According to Census Canada, individuals in the low-income measure are household earnings of less than half the national median income - \$22,133 for a single person.⁵ Additionally, the BC Centre for Excellence in HIV/AIDS at Insite discovered that “more than twice as many overdoses occurred on or immediately after ‘cheque day.’ In B.C., income assistance cheques are typically issued on the last or third Wednesday of each month,” and are given to people living in poverty so long as they check off certain criteria.⁶ Based on the aforementioned statistics and research we believe that income is a factor that correlates with increased drug use. For our analysis, we used a scoring system from 1 to 5, where 5 was the most suitable. We used

⁴ Diana L. Gustafson, Lesley Goodyear, Fran Keough, “When the dragon's awake: A needs assessment of people injecting drugs in a small urban centre,” *International Journal of Drug Policy* 19, no.3 (2008): 190, doi.org/10.1016/j.drugpo.2008.01.005.

⁵ Jordan Press, “Census: children make up one quarter of 4.8M Canadians living in poverty,” *CTV News*, September 13, 2017, <http://www.ctvnews.ca/canada/census-children-make-up-one-quarter-of-4-8m-canadians-living-in-poverty-1.3587472>.

⁶ Jesse Tahirali, “‘Cheque day’ linked to drug overdose risk in B.C.,” *CTV News*, May 11, 2011, <http://www.ctvnews.ca/health/cheque-day-linked-to-drug-overdose-risk-in-b-c-study-1.2021631>.

our research in order to *reclassify* our income data, where a score of 5 was individuals with an income between \$0 to \$22,133, and a score of 1 was individuals with the highest income.

Additionally, social status is another indicator of probable drug use. Socially marginalized groups of people like those who are poor, undereducated and of a low-status ethnic group, are at greater risk of becoming a victim of addiction.⁷ By analyzing user statistics from InSite, we were able to confirm that in 2016, “17.9% of participants were aboriginal.”⁸ For both our data layers on First Nations and minority groups (together being our socially marginalized population), we used the *reclass* tool to create 5 classes with equal intervals. We gave a score of 1 to 5 for the classes, 5 being the highest marginalized population and 1 being the lowest marginalized population. Next, we used the *weighted sum* tool to sum up these three layers (income, minority groups and First Nations) and expected to obtain scores ranging from 3 (minimum) to 15 (maximum). Our actual results gave us scores ranging from 4 to 11. We then *reclassified* the results into five ranks again from 1 to 5 where 4 to 6 were reclassified as 1 (being the least suitable) and 9 to 11 as 5 (being the most suitable) to normalize and simplify our values rather than having 8 different values on our map. We believed having more than 5 ranks would make it hard to differentiate the scores when using a sequential colour scheme for our map.

Furthermore, we downloaded the ‘education’ and ‘healthcare’ data from the UBC Department of Geography because we believe that the proximity to healthcare and distance from educational institutions are two other important factors when deciding where to place a safehouse. For both layers, we filtered out irrelevant data by *clipping* them to a mask of Vancouver. We then used the *buffer* tool to create an area of 500m away from each healthcare and educational institution in Vancouver. Having a healthcare facility within 500m would be extremely valuable since the epidemic of overdoses are often life or death situations which often requires immediate medical help. Additionally, we thought that the location of the safehouse should not be too close to any educational institutions (including elementary, middle and high schools) because it could make the surrounding areas feel unsafe, influence student accessibility to drugs, permeate school life, and contribute to noise pollution (e.g. ambulances), which could be distracting. Once we created a 500m *buffer* for all education facilities, we used the *erase* and *clip* tool in order to find all areas outside this 500m range. In order to combine our two queries together, we *intersected* those layers to obtain prospective locations which satisfy our requirements of being within 500m to a healthcare institution and at least 500m away from any educational institutions.

Finally, we combined our potential locations (being within 500m to a healthcare institution and 500m away from any educational institutions) and our weighted factors (combined layers of our factors ranking from 1 to 5) using the *extract by mask* tool which gave the potential safehouse locations a ranking - 1 being the least suitable place and 5 being the most suitable. We chose the three most suitable locations (Site A, B & C) by identifying the areas with the largest areas which had a score of 5 based on our analysis.

⁷ Hans A. Baer, Merrill Singer and Ida Susser, *Medical Anthropology and the World System* (Westport, Conn: Praeger, 2003).

⁸ “Insite user statistics,” Vancouver Coastal Health, accessed December 1, 2017, <http://www.vch.ca/public-health/harm-reduction/supervised-injection-sites/insite-user-statistics>.

Discussion and Results

Through our analyses, we were able to identify three locations (Sites A, B, and C illustrated in our final map - see Appendix B for map) that we regard as the most suitable locations for a new safehouse. We only settled on three locations despite there being a need for safehouses in other locations. This is because safehouses are quite controversial as people are actively using illegal drugs, and as such we don't want to promote widespread drug use for non-users. Moreover as aforementioned, there are already two existing safe injection sites in the Downtown Eastside (Insite and Powell Street Gateway). Finally, due to the limited funds and resources allocated by the BC government for this project, we have narrowed our potential sites down to three. From there, we hope this will aid the BC government in choosing a final location based on a multitude of additional factors.

Due to privacy restrictions on many of the potential factors we were considering, we were compelled to focus on income and marginalized groups as our two major factors, rather than on other factors such as whether the individual suffers from abuse or a mental illness which would have a stronger correlation and importance with drug usage. The scores represent the areas with the highest number of marginalized groups and the lowest income. As seen in the map, our results illustrate huge differences in the sizes and shapes of potential locations. Particularly for the sites that we did *not* select, some of these areas encompass an extremely small area, or a thin strip of land that would realistically not be a feasible location for a safehouse. Since we used the buffer tool for our education and healthcare facilities, our final map showed isolated areas with their scorings rather than a gradual variation of suitability all across the map of Vancouver.

It is also important to contextualize these three potential locations based on external variables and the existing landscapes that are within these sites. Since we did not retrieve healthcare and education data for areas outside of Vancouver city, such as Burnaby and Richmond, this may impact the areas of sites bordering these boundaries. For example, Site C is located next to Boundary Road. Without knowing the location of healthcare and education facilities in Burnaby, it is hard to guarantee the suitability of Site C. Furthermore, while looking at the health care services for Site C, we discovered that this healthcare facility was in fact a healthcare home for individuals with complex health and cognitive needs. Although this may still possess potential benefits for nearby drug users, we are unable to confirm that this facility provides emergency support that may be directly linked with overdoses.

While evaluating Site B, we encountered potential drawbacks in terms of its suitability as a safehouse location. When taking into consideration the landscape of Vancouver, we noticed that a large proportion of the site is near and/or within Trout Lake, a popular recreational area for families (including children and the elderly) and the surrounding community. With the existing land use of this area, including a community centre, beach and recreational area, and a weekend farmers markets, the practicality of placing a safehouse here maybe highly controversial. Furthermore, one of the two nearby healthcare facilities is a nursing home, which would not be beneficial for drug users in the case of an emergency. While the map shows a very ideal location in terms of our four factors, considering other variables that were not included in our analysis helps us rank the suitability of each location better.

Finally, Site A is located mostly within a residential area, but is close to major roads including West Broadway, Cambie Street and West 6th/2nd Ave. Site A benefits from being in close proximity to major transit lines, particularly the 99 B-Line bus route, compared to less frequent and further transit lines near Site B and C. Since income is one of our major factors, we believe accessibility using public transport is a major advantage for a safehouse location. Site A's location also makes it close to Downtown Vancouver, providing more nearby options for existing users who visit InSite and Powell Street Gateway. Additionally, although we created 500m buffers around each healthcare facility, Site A is about a 10-15 minute walk away from Vancouver General Hospital. VGH is optimal for critical emergency cases with a 24 hour emergency service. Analyzing these additional factors around each site helped us rank Site A as the best choice, and Site C being the least suitable out of the three sites.

After weighing up the pros and cons for all three sites, we came to the consensus that Site A is the most suitable location for a new safehouse. While Sites A-C also rate number 5 on our suitability scale, Site A has the least disadvantages in terms of its contextual location (e.g. is not located at Boundary road nor Trout Lake). However, one important thing to note is that Vancouver has some of the most expensive real estate in the world and because Site A is located in the Central Business District (CBD) it will come at a high cost to buy this land. This suggests that a significant amount of government funding will be necessary for this project and cannot simply be funded through small fundraisers. Site A is also located mostly in a residential area, hence, building a safehouse should begin with consulting members of the community and existing users at InSite at Powell Street Gateway.

Upon deciding on the location of the new safehouse (Site A), it is crucial to think about the implications of the safehouse in the near and far future. For example, we must consider how it will affect the community, how existing community members will react to it, how future policies and practices will change, and the potential long-term negative impacts on this area. Safehouses are still a highly controversial topic and could potentially create a negative stigma for a certain area. While it has many benefits for users in that space, the larger surrounding area could potentially be impacted in the long run. While mostly a residential area, Site A is in very close proximity to a lot of the local businesses that run all throughout the area and on major roads.

Nonetheless, some important implications in the short term relate to issues such as noise pollution (due to construction) which may be a concern for nearby businesses/residents. However, this will not be an issue in the long term. The safehouse will appear quite subtle in its appearance with an attempt to minimize its distraction to visitors to the area. For example, the name of the safehouse will be written on the outside of the building, however it will not appear flashy nor advertised in a manner that attracts foreign visitors (those who not actually in need of this facility) and unnecessary publicity. This is an attempt to minimize the negative affects of having this kind of unique institution in the CBD as we do not want the safehouse to have a negative toll on existing businesses in the area. In terms of the policy in Vancouver, since there are already two existing safehouses, policies are already in place to allow for a third supervised centre. However, due to the controversial nature of a safehouse, there will likely be some opposition (possibly in the form of protests) which could cause some community and political

unrest. Thus, it is important to recognize these obstacles in advance so that actions to reduce any negative or harmful effects can take place.

Despite these barriers to the construction of the safehouse it is important to recognize the many advantages that a safehouse would bring to the area. Consequently, the importance of safehouses should not be undermined. As aforementioned, safehouses can act as a lifeline for particularly vulnerable populations (drug users) and prevent early death. The proposal of a new safehouse location is thus crucial in helping protect this vulnerable population from spreading diseases (via needle sharing), and dying due to overdose, amongst other things. However, it should be clearly emphasized that we do not hope for safehouses to become the sole solution to this growing epidemic.

Error and Uncertainty

Data quality describes the overall fitness and suitability of data for a specific purpose. It can be assessed by understanding several factors including error and uncertainty. An important source of error, however one that is difficult to control, is data quality. University of Toronto's CHASS Data Centre and UBC's Department of Geography are the two main sources of where we got our data from. We can say with a reasonable amount of certainty that these two sources are accurate and reliable.

However, since we had to rely on external data sources, certain information may have been purposely left out that could have been useful or important to know for our analysis. The income and marginalized population data from CHASS had no indication in their metadata of the quality or resolution of the data. This can lead to the mixed pixel problem. A mixed pixel is a picture element representing an area occupied by more than one ground cover type (e.g. agricultural fields). However, classification of mixed pixels can lead to certain problems like making area estimations. This is because the classification of pixels implies 'pure', for example, consisting of a single ground cover type, when actually this is not the case. The possibilities of data that was either left in or out create a certain level of ambiguity.

Additionally, our data on health care consisted of a broad range of facility types, including residential care homes and centres for individuals with complex health and cognitive needs. Although this may still be of some benefit to drug users at a nearby safehouse, some facilities may not be able to provide emergency care in the case of a drug overdose. Since we did not attempt to rank the types of healthcare facilities as part of our analysis, it was important for us to contextualize Sites A, B, and C manually in attempts to rank the suitability of our top three sites.

During our analysis, we also came across several potential areas of error and inaccuracy. In order to *reclassify* and carry out a *weighted sum* analysis, we had to change three of our vector layers (medium income, first nations communities and minorities) to raster. As a result, our data would have reduced slightly in accuracy as certain boundaries and regions are now represented as pixels rather than polygons. Additionally, we have to also take in account potential areas of human error. Since spatial data was unavailable for the existing safehouse locations, we had to create

our own layer using the *editing* tool and manually draw these onto our map. Hence, the location of these facilities on the map may be slightly off.

While we took into consideration the most common factors linked to drug use, we could have examined Vancouver's land use in a more comprehensive way. Areas that are designated as recreational parks and lakes may have a high concentration of children and youth that use this space. Additionally, identifying neighbourhood houses and community centres, would also be important as this would be another area that would have an increased number of children and elderly (e.g. day care programs and community events). For example, Site A is near Creekside Community Recreation Centre and Mount Pleasant Community Centre, while Site B is within/near Trout Lake and Trout Lake Community Centre. Hence, it would have been beneficial for our analysis to take these types of spaces into account. However, recreational parks are potential sites of concentrated drug use - more research on this area would need to be conducted, particularly in the context of Vancouver.

One essential source of error is the fact that there is no public overdose data and consequently we chose the indicators we thought that best predicted overdoses. However, this in itself is very limited because it was based on some research (some of which were not conducted in Vancouver or Canada) but there are many exceptions to these generalizations.

Further Research and Recommendations

As previously mentioned in our report, data on the location of overdoses or overdose treatments are not widely available to the public due to privacy restrictions. In order to increase the accuracy and reliability of a GIS analysis on this issue, we recommend the BC Government release this data to the public (or at least licensed institutions). This data will allow location of a potential safehouse to be more true to the population that needs it most. Alternatively, a more comprehensive analysis could include other important factors associated with drug use, such as age, gender, family life and whether the individual has suffered from abuse, neglect or a mental illness. Moreover, further research could be made regarding what types of resources people who are having these overdoses need, and possibly making infographics and maps that are posted in downtown for ease and accessibility. GIS would be incorporated into making these maps.

We hope that the safehouse and the current two safehouses only act as a temporary solution while Vancouver society works on changing the structural formations that have created this problem. For some background, in the 1980s Vancouver closed Riverview Hospital which housed many mentally ill patients. These patients were relocated into host families with the hope of integrating them into society. However, the sense of community these patients had at the hospital was immediately taken away from them and consequently many of them fled to the streets.⁹ Today there is a sincere need for proper housing and other amenities for these people who are the large majority of the people overdosing. This is just one way in which Vancouver could make a structural adjustment to help improve the quality of life for these individuals.

⁹ Mike Laanela, "Riverview Hospital: a brief history," *CBC News*, December 17, 2014, <http://www.cbc.ca/news/canada/british-columbia/riverview-hospital-a-brief-history-1.2876488>.

While our report has recommended the three most suitable locations based on our analysis (Site A being the most suitable and Site C being our last preferred option), we strongly encourage further examination of these locations through field and participatory research. Since opening a safehouse may cause significant changes to the existing surroundings and geography, it is vital that potential implications and further benefits for the local community is taken into consideration.

Appendix A

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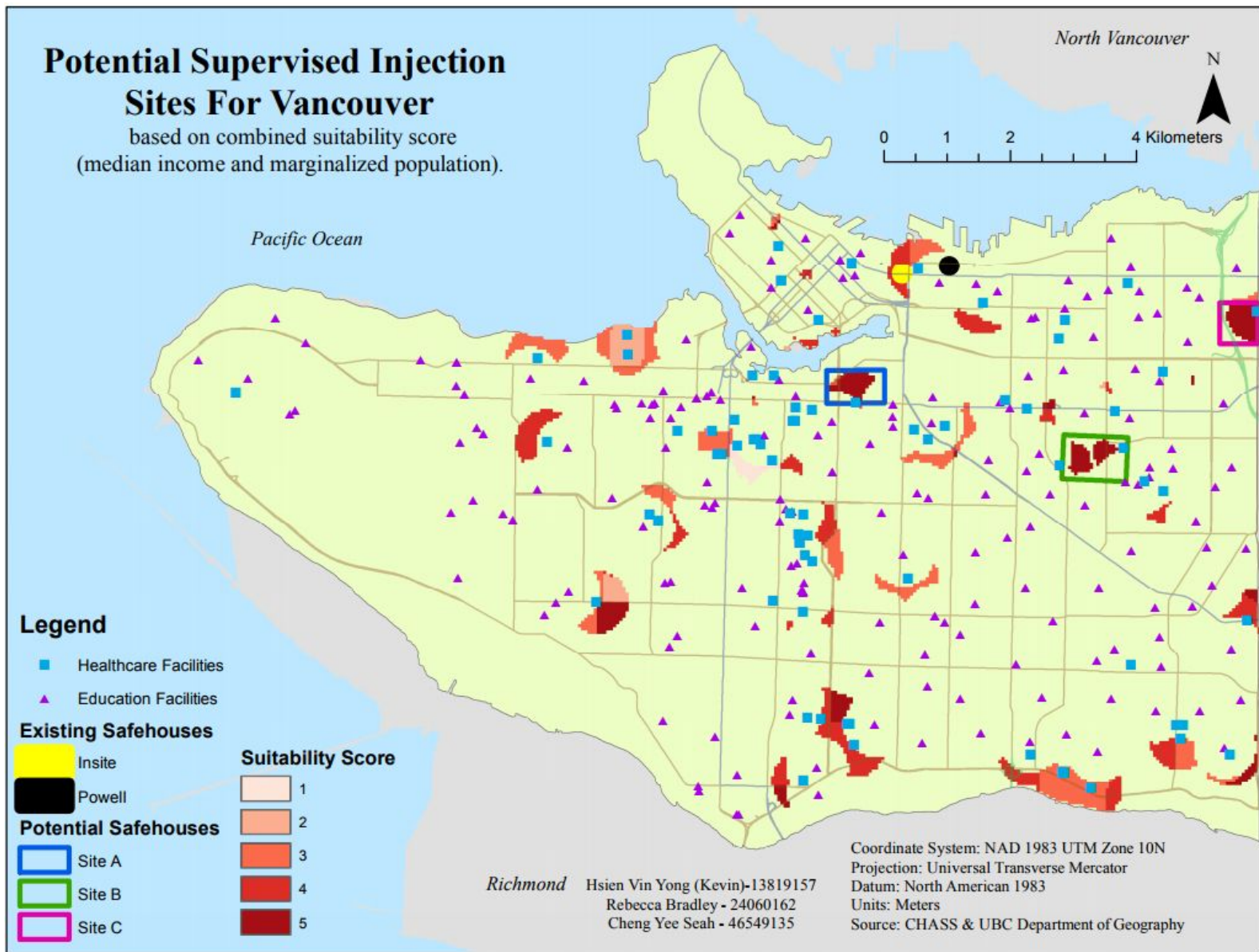
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Appendix B: Final Map



Appendix C: Flowchart

