

# **Analysis of Bus Stops in Christchurch, New Zealand**

## **Introduction**

There is a saying that New Zealand is a country built on wheels. The meaning of this saying is that (almost) everyone drives a car in New Zealand. However, some individuals do not have a car. In this case, most of them have to use public transport such as buses on a daily basis. Regarding the buses in New Zealand, there are a number of issues. They often fail to their time schedules due to different reasons. Also, some people think bus stops are difficult to find or too far from them. Before buying my car, I also suffered from this sometimes. As a student based in Christchurch, New Zealand, I would like to analyse the location arrangement of the bus stops in Christchurch and make recommendations for improving it. This report can be useful for the Christchurch City Council to improve bus service as well as customer experience.

## **Data Source**

According to the business problem, the data used to solve the problem will be Canterbury open data on bus stops (Canterbury Regional Council, 2021), and it will be obtained through a GeoJSON API.

## **Methodology**

The open data contains information about all bus stops in Canterbury rather than those in Christchurch only (Christchurch is one of the regions of Canterbury, New Zealand). Due to this, the open data will be further processed to select bus stops in Christchurch only, and necessary information should at least be the names, road names, coordinates of bus stops. After completing that step, the processed data will be visualised and clustered using Folium and KMeans. Based on visualisation and the observation of the clustered bus stops, recommendations for improving the location arrangement of bus stops in Christchurch will be accordingly produced.

By pre-processing the data, there are 2,175 bus stops in the Canterbury region in total, and 2,068 of them are in Christchurch. This seems that there are plenty of bus stops in Christchurch. However, the purpose of this report is to analyse the location arrangement of those bus stops and evaluate whether or not it is appropriate. Therefore, the pre-processed data will be further visualised in order to gain a proper understanding of the location arrangement of bus stops in Christchurch.

## **Results**

By processing and visualising the data on bus stops in Christchurch, the map below is generated. As shown, bus stops are densely located in the central part of the map, which is Christchurch city. In terms of northern Christchurch, there are also a number of bus stops. However, they are not located as densely as those stops in Christchurch city. With regard to western and southwest Christchurch, there are much fewer bus stops in comparison to those stops in both Christchurch city and northern Christchurch.

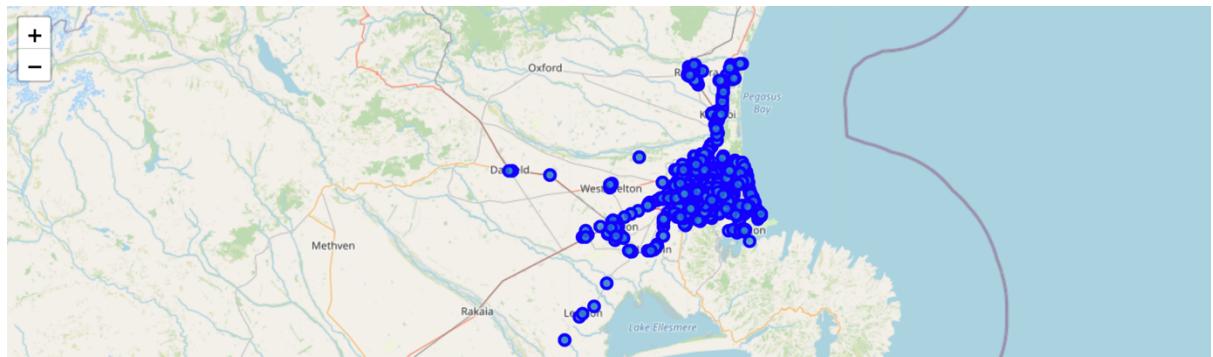


Figure 1. Visualisation of Bus Stops in Christchurch

The data on bus stops in Christchurch are clustered into five groups based on the locations of bus stops, which are as follows. The reason for doing so is that it is beneficial to the analysis and pattern observation of the bus stops if they are appropriately clustered. In respect of cluster labels, cluster 0 is those red points, cluster 1 is purple ones, cluster 2 is blue ones, cluster 3 is green ones, and cluster 4 is orange ones. The analysis of these clusters will be discussed in the next section of this report.

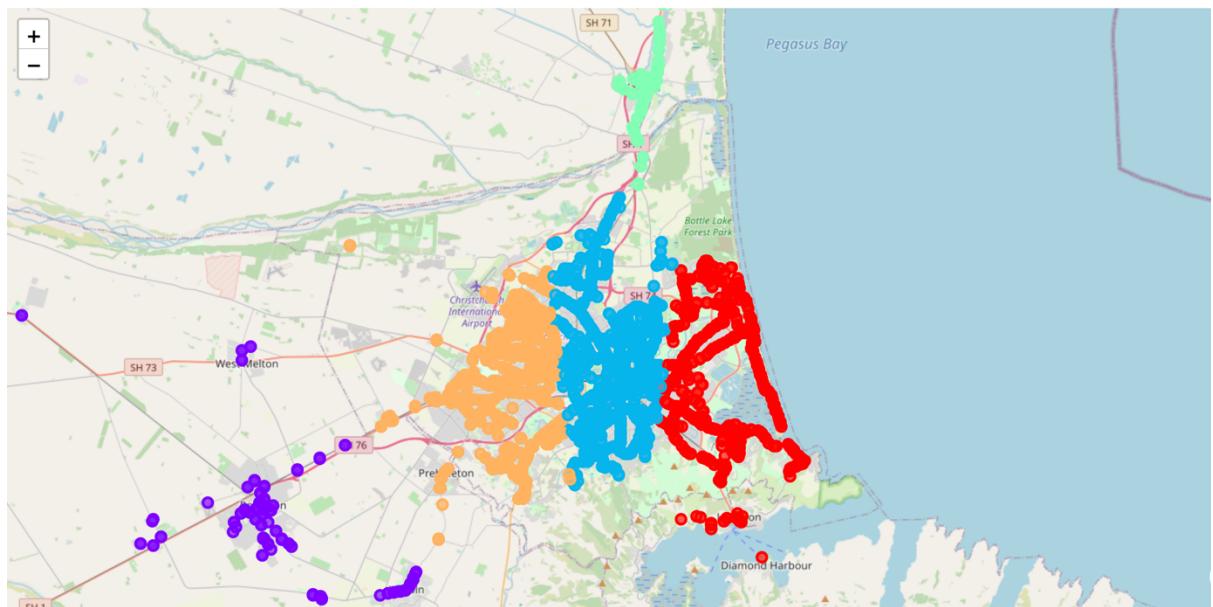


Figure 2. Visualisation of Clustered Bus Stops in Christchurch

## Discussion

As mentioned, bus stops are densely located in Christchurch city, which are cluster 0, 2 and 4 shown in the figure below. Generally, the locations of these stops are well arranged because they have covered most areas in Christchurch city.

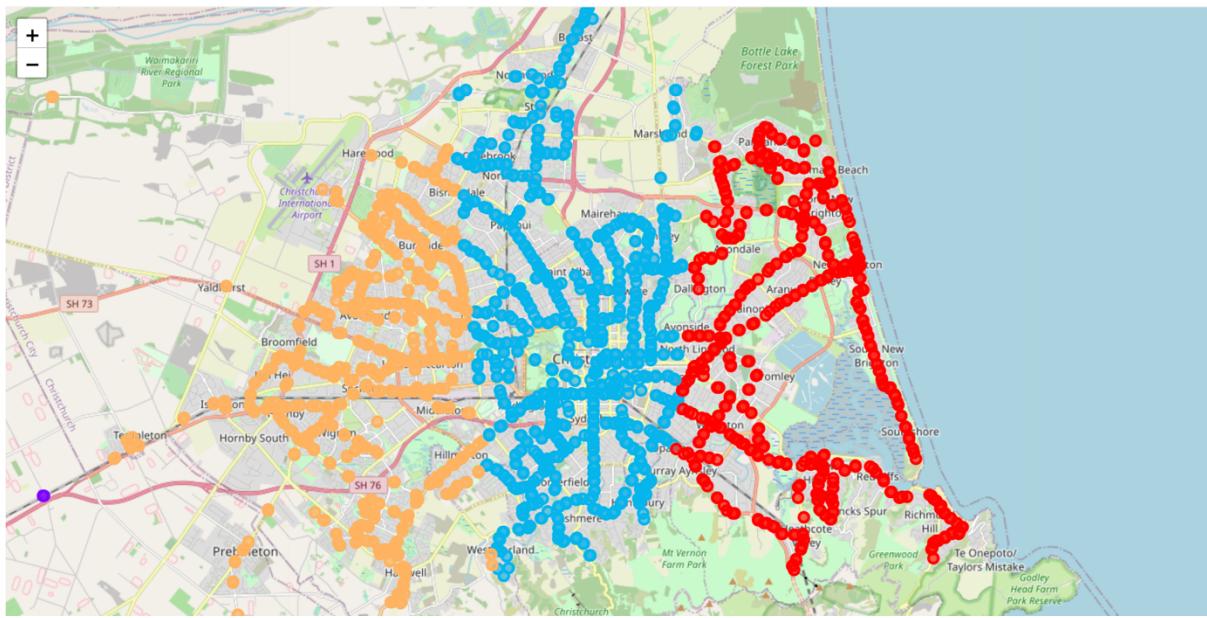


Figure 3. Visualisation of Cluster 0, 2 and 4

However, after zooming in the map where contain data on cluster 0, it will be noted that there is no bus stop on Breezes Road. This may be inconvenient for those who go to Bexley Park. In New Zealand, the public goes to parks frequently. If there is a bus stop, it can be helpful for a large number of people. Also, if a person wants to go to Wainoni or Aranui from South New Brighton, he/she must go to New Brighton first and then go to his/her destination, which is time-consuming. Therefore, a bus stop may be built on Breezes Road or a near position if possible.

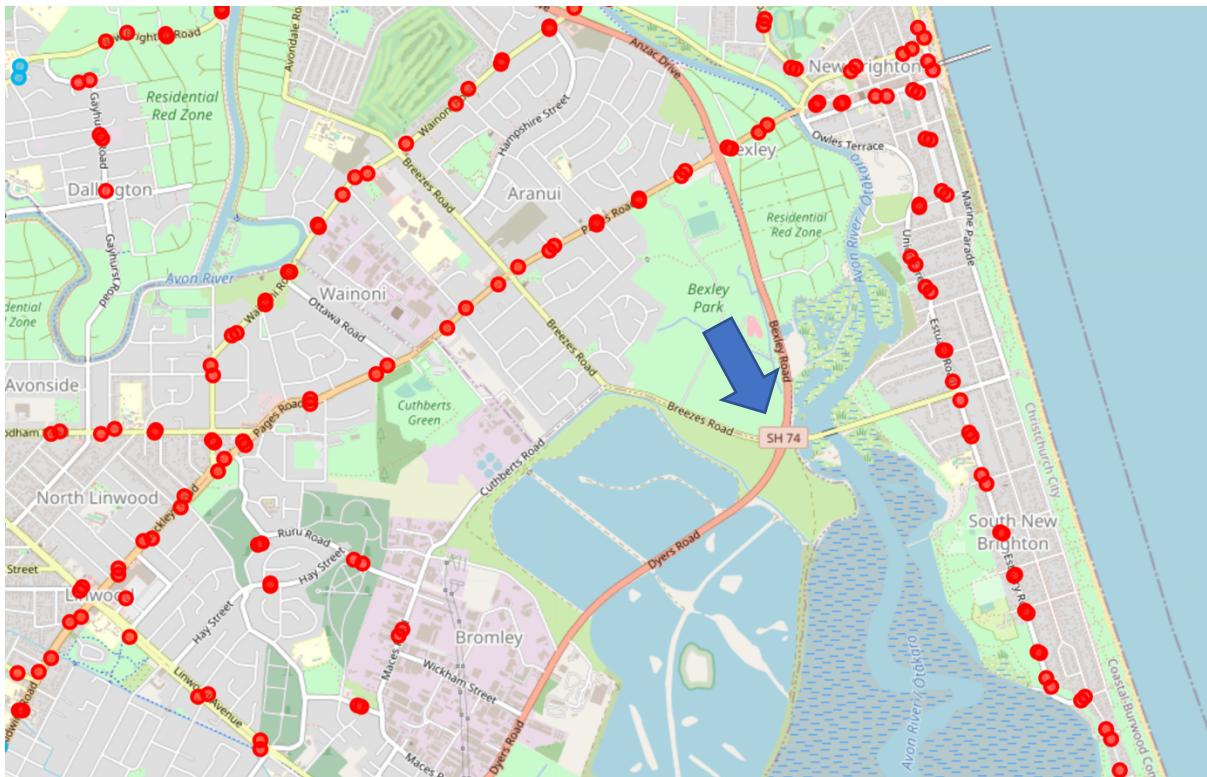


Figure 4. Visualisation of Cluster 0

Regarding cluster 1, it is reasonable that there are not many bus stops because that is a less populated area. Nevertheless, it will be better and more convenient if there is a bus stop on SH73. This is because this can help those who go to Doyleston or want to drop off at SH73 or a near position. In addition, there should be one more bus stop on Leeston Road, which can greatly benefit those who go to Springfield or Lincoln frequently.

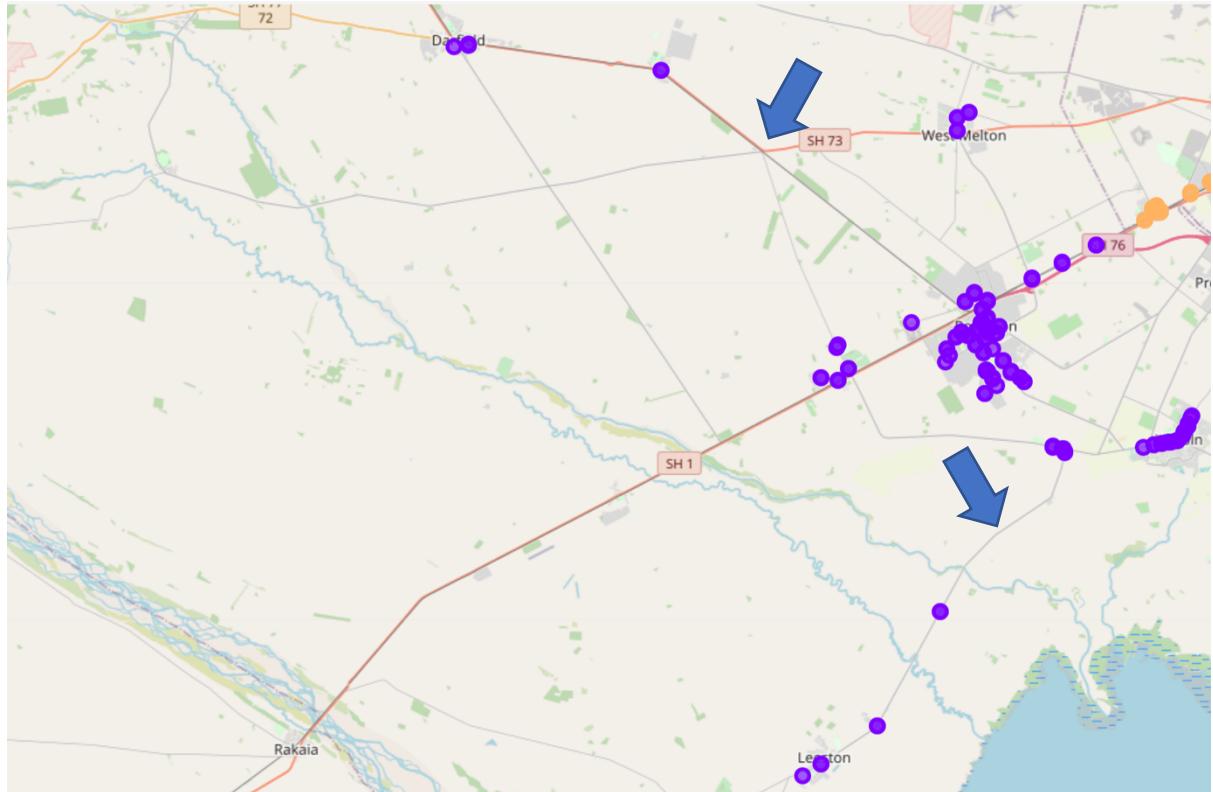


Figure 5. Visualisation of Cluster 1

Concerning cluster 2, bus stops belonging to this cluster basically covers the middle area of Christchurch city, but there are fewer bus stops in the south of Cashmere. If possible, the Christchurch City Council may build a bus stop near Victoria Park and Christchurch Adventure Park, which will be useful for those who go to these places. Also, there is now no bus stop on Centaurus Road or Port Hills Road. If there is one, it can provide convenience for those living there and additionally connect cluster 0 and 2. However, it should be noticed that the south of Cashmere is a motorway, and both Centaurus Road and Port Hills Road are on a hill. Bus stops should only be built if they do not cause any safety or cost concerns.

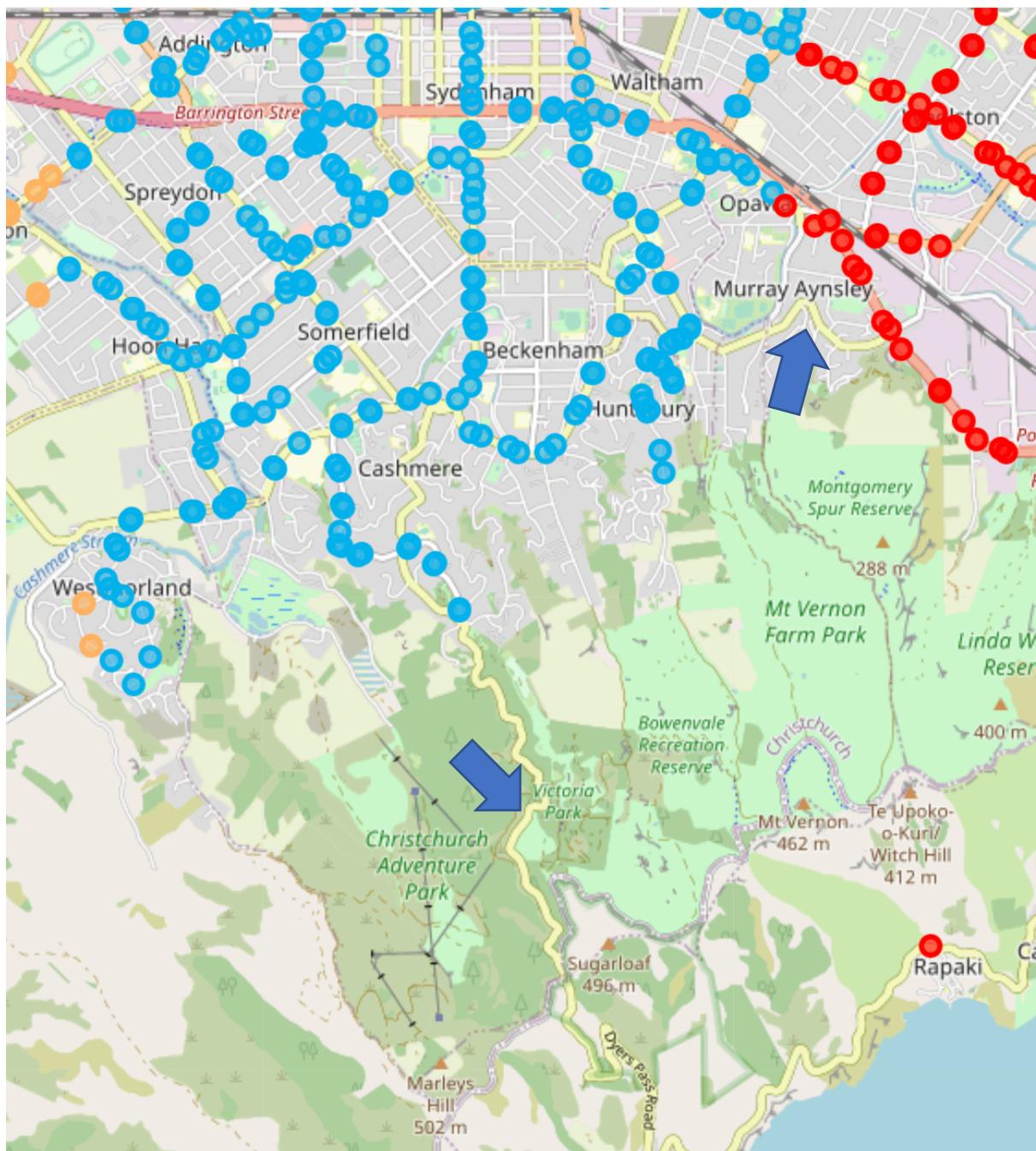


Figure 6. Visualisation of Cluster 2

Bus stops of cluster 3 are mainly located in Rangiora and Woodend. This is reasonable because most people live in these two areas. However, there is no bus stop on Rangiora Woodend Road, which can be inconvenient for people from one area to go to another area. So, there may be a need to build a bus stop on that road.

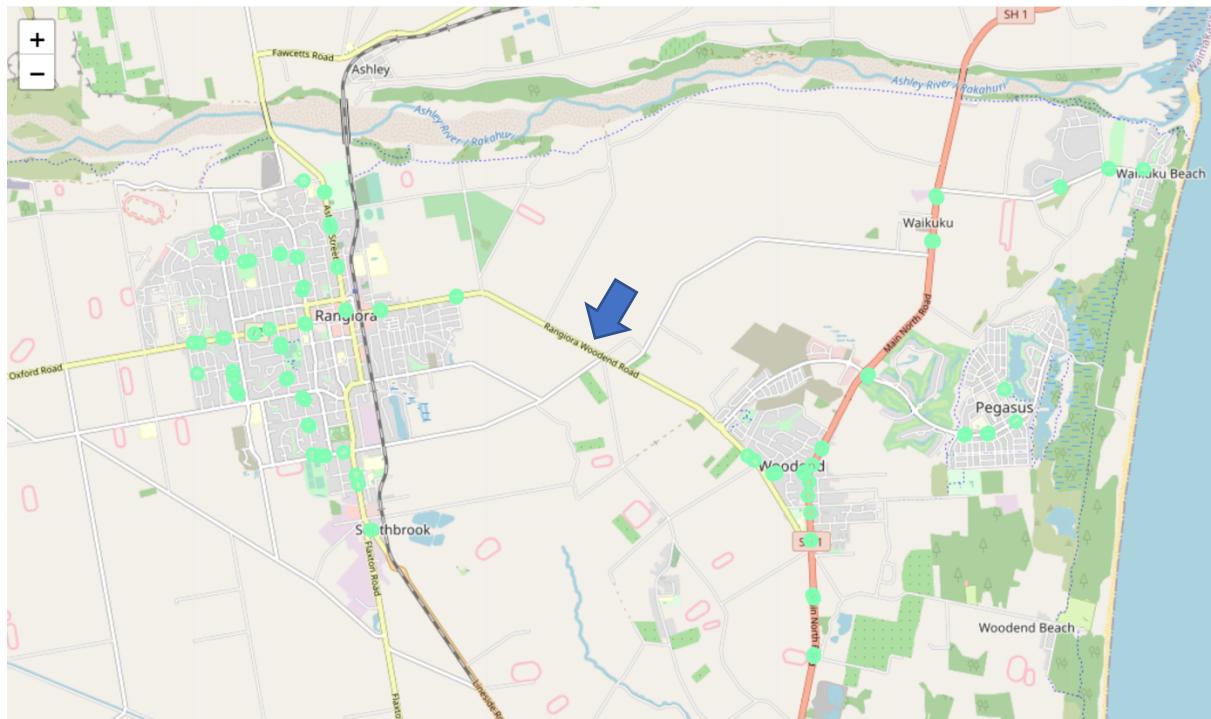


Figure 7. Visualisation of Cluster 3

Lastly, in regard to bus stops of cluster 4, their location arrangement can be considered appropriate because they properly cover a number of areas and help people living in western Christchurch travel freely.

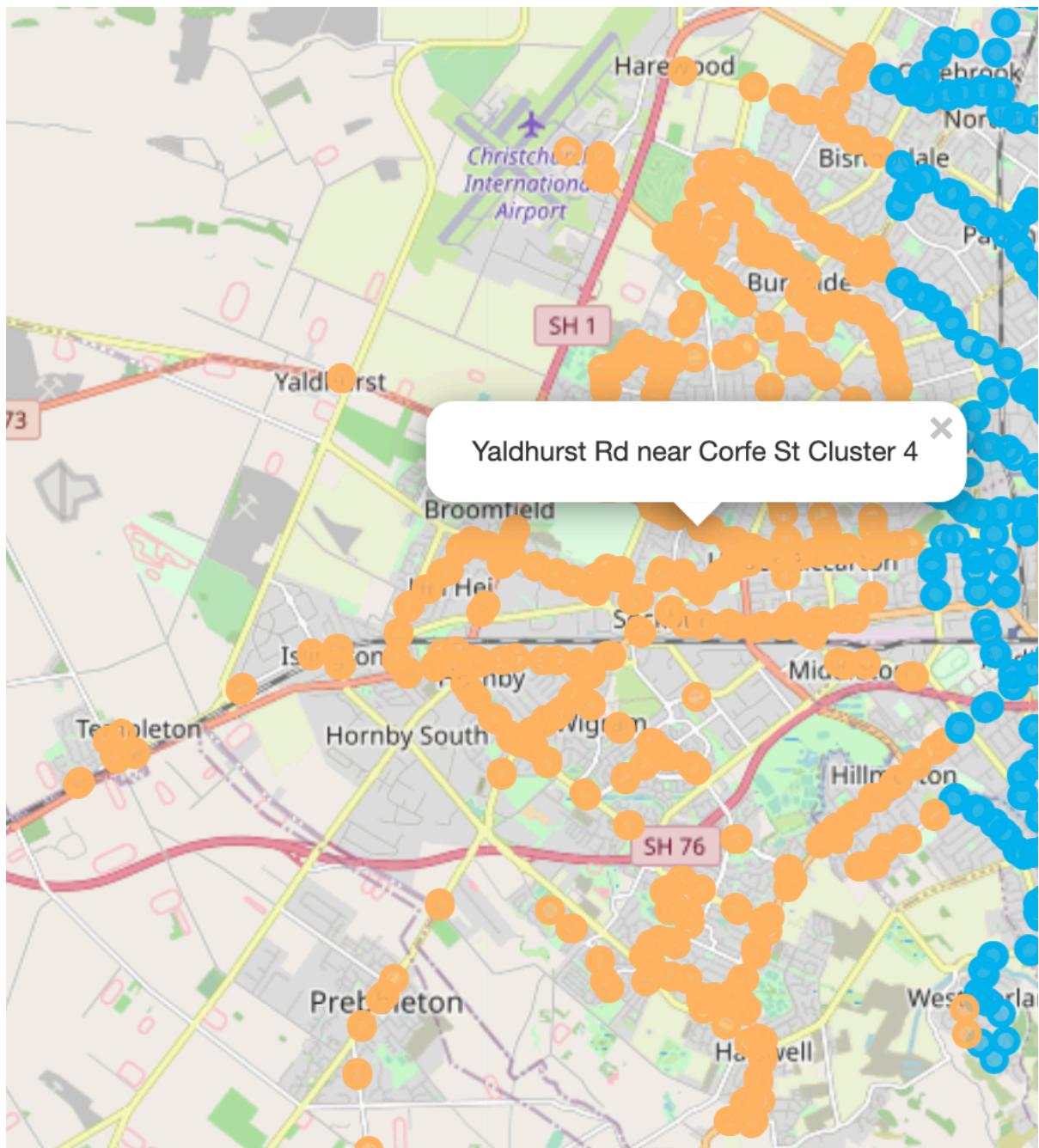


Figure 8. Visualisation of Cluster 4

## Conclusion

To summarise, the purpose of this report is to examine the location arrangement of bus stops in Christchurch, New Zealand and make recommendations for improving the location arrangement. By processing and analysing data on bus stops in Christchurch extracted from Canterbury open data, the data is clustered into five groups. The analysis of each group of clustered bus stops is performed. Based on the analysis, it is recommended that the Christchurch City Council should build new bus stops on Breezes Road, SH73, Leeston Road, Centaurus Road, Port Hills Road and Rangiora Woodend Road.

## **Reference**

Canterbury Regional Council. (2021, March 5). *Bus Stops*. Canterbury Maps.  
<https://opendata.canterburymaps.govt.nz/datasets/bus-stops>