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Future Public Transport Options for Toowoomba for the Next Twenty Years.

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Abstract

Expanding cities around the world are facing the harsh reality of insufficient public transport systems. As Toowoomba, Australia is a high growth city with a lower than average percent (0.7%) of the population utilising public transport, particularly in the north-eastern suburb of Mt Lofty, it was selected for analysis (Census Data: Toowoomba, 2011). The literature review included the types of public transportation, the need and importance of public transport in cities and the characteristics of an effective public transport system.

Major factors controlling the current development and use of public transport in Toowoomba are identified. Current public transport networks within Australia and around the world that are deemed effective in their operation are identified. The common technologies and strategies that contribute to an effective public transport network are determined. Within the study area, Mt Lofty, the resident's opinions are collected to determine a clear picture of what needs to be improved or changed for public transport usage to increase.

The cities that were selected for a public transport analysis are Wellington, Geelong, Hobart, Hamilton, Barnsley and Saskatoon. Discussion points were collaborated and then recommendations are made. The long and short term recommendations include 'dial and go service', longer hours of operations, Sunday services, electronic tickets, routes revision, higher frequency's services, night services, CDB shuttle and free public transport for students and/or seniors. This study provides recommendations to the Queensland Government that will improve the usage of the public transport service provided by Qconnect in Toowoomba within the next twenty years as the city continues to grow.

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Table of Content

List of Figures

List of Tables

List of Appendix's

1.0 Introduction

Public transport is essential in the 20th century as the world's population increases at the rapid rate of 1.13% per year. 54% of the world's population is living in urban areas; a statistic that is expected to increase to 66% by 2050. Urbanisation is increasing in today's society and nearly half of the residents live in urban areas with a population of less than 500,000. Urban living is increasingly popular due to higher education levels, health, transportation, social services, employment, cultural and political participation in these areas. Accurate data on world trends of urbanisation and city growth are essential to assess the future needs of residents (United Nations, 2014). Worldwide, by 2024 there is expected to be 7.4 billion people, therefore, making the need for mobility within cities even more essential (Worldometers, 2016). In the larger cities, this is particularly vital where there is already limited carparks in the city centre, increased driving times and limited roadways, hence creating congestion within city centres. This, in turn, plays a role in the decrease of a positive impression of the transport system by the road users. There is a strain on the current public transport networks to meet the needs of the ever growing population. The advancement of the public transport network needs to parallel this trend in order to support the need for the decrease of public cars in the city centre.

All around the world, growing cities are experiencing the harsh reality of insufficient public transport facilities. This problem needs to be addressed to ensure that measures can be taken and solutions swiftly implemented before the problem escalates. Current public transport networks need to be critiqued and addressed so that future public transport options can be determined.

Out of Australia's 24 million residents, 10.4% go to work by public transport (Census Data: Toowoomba, 2011). This figure takes into account the high amount of users in the capital cities and the people in the regional towns that do not have access to public transport. In table 1, the capital cities of Australia are displayed with their corresponding population and the percent of residents using public transport.

Table 1: Australian Capital Cities (Census Data, 2011)

Area	Population	Residents using public transport everyday
Greater Adelaide	1,230,000	8.5%
Greater Brisbane	2,070,000	12.8%
Greater Darwin	120,000	4.0%
Greater Hobart	211,000	5.4%
Greater Melbourne	4,000,000	13.9%
Greater Perth	1,730,000	10.6%

Note****Canberra and Sydney were not included due to inadequate data.

The two smallest capital cities have substantially less percent of their population using public transport compared to the larger capital cities in Australia. This reinforces that the smaller cities that are continuing to grow need to be the focus of the research project. This research project is about the current public transport system situation in Toowoomba, Australia. Toowoomba was selected as it is a high growth area with a lower than average percent of the population that utilises public transport. This is an important topic as public transport is going to become critical in moving people around the city centre as Toowoomba continues to grow and expand. This study will achieve a potential recommendation for the Queensland Government that will improve the usage of the public transport service provided in Toowoomba. Toowoomba is located in South East Queensland, an hour and a half west by car from the capital city, Brisbane, as shown in Figure 2. Toowoomba has been identified by regional Queenslanders as an important link between their home locations and the city. Toowoomba is the commercial and economic hub of the region, serving a population in excess of 250,000 residents (Southern Queensland Country, 2015).

Figure 1: Location of Toowoomba (Redlands Campus of Concordia Lutheran College, 2015)

The demographics for the Toowoomba city will be anaylised and predicted growth will be estabished. Figure 2 shows the boundry of the census area, that the data has been collected from.

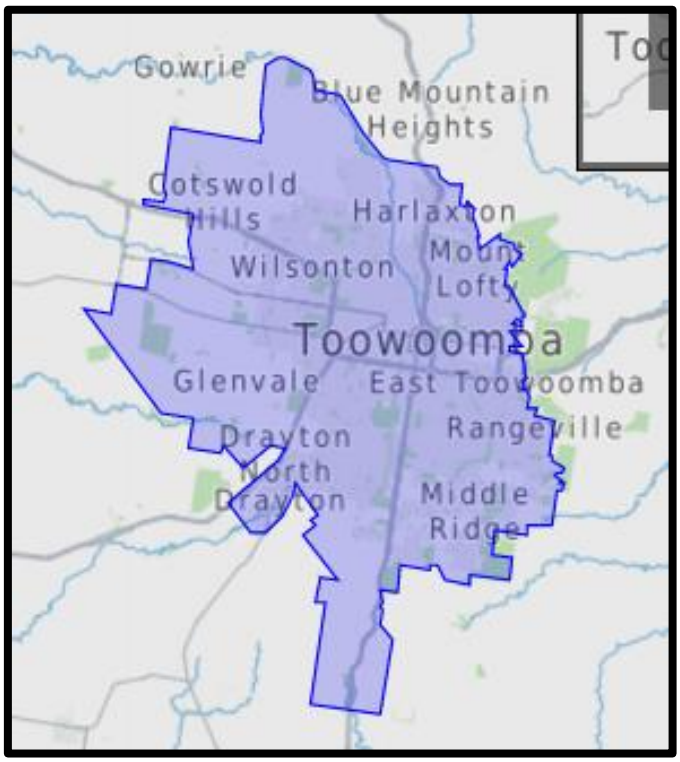

Figure 2: Toowoomba Area (Census data- Toowoomba, 2011)

From the 2011 Toowoomba city Census Data, the following information can be provided:

Table 2: Toowoomba Regional Council Demographic Statistics (Census Data, 2011)

Toowoomba Regional Council Statistics	
Population	96567
People per dwelling	2.4
Motor Vehicles per dwelling	1.6
Median weekly income – Personal	$555
Median weekly income – Family	$1295
Median weekly income - Household	$1021

Table 3: Current Performance of Toowoomba Regional Council (Census Data, 2011)

Travel Method to work in the Toowoomba Regional Council	
Car, as driver	67.8%
Car, as passenger	8%
Walked only	3.9%
Truck	1.0%
Bicycle	1.0%
Public Transport	0.8%
Other Methods	17.5%

In twenty years' time, the expected population of Toowoomba will be 200,000 (Queensland Treasury and Trade, 2012). In 2011 only 0.7% of Toowoomba's residents travel to work by public transport. Comparing that to the 7.6% of Queenslanders traveling to work by public transport, and 10.4% of Australians travelling to work by public transport, Toowoomba public transport network is not adequate (Census Data: Toowoomba, 2011). The public transport system in toowoomba is run by, Qconnect (Translink). Qconnect is a Queensland Government incentive that aims to provide connectivity and accessibility of services throughout regional,

rural and remote Queensland (Translink, 2016). Toowoomba's current public transport system consists of bus routes only. With 8 routes, limited hours of operations and services not available on Sundays and public holidays, the bus system does not meet the needs of the residents. Figure 3 potrays the bus routes that service the Toowoomba region. It can be seen that there are a number of routes that go to different areas of the city and terminate in the city centre. The public transport network within Toowoomba needs to be changed so public transport usage within Toowoomba can improve.

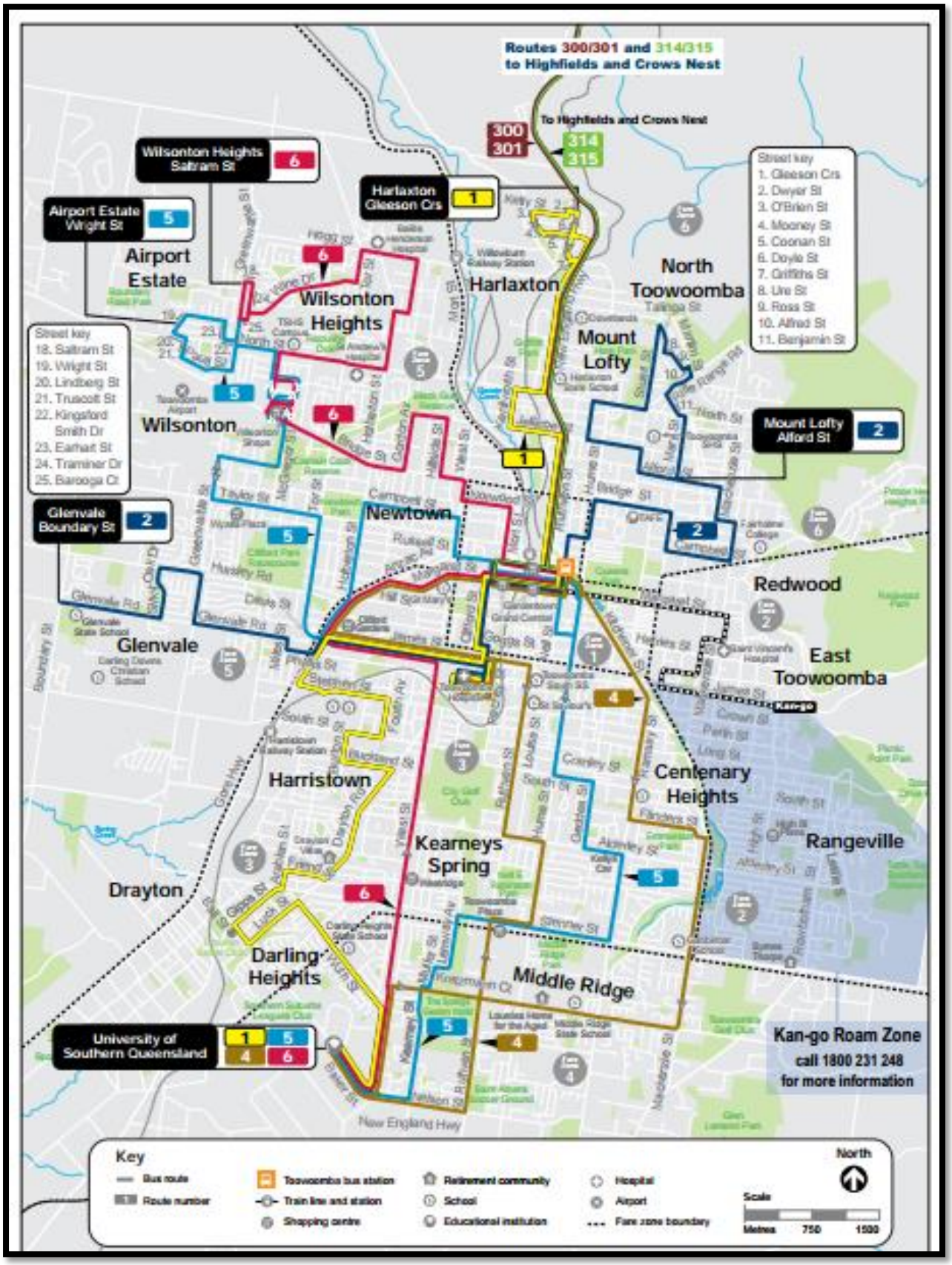

Figure 3: Toowoomba Bus Routes (Transport and Motoring, Queensland Government, 2015)

Aim

The aim of this project is to identify the major factors controlling the current development and use of public transport within the Toowoomba area and to identify strategies and technologies which would be appropriate for development within the next 20 years.

Objectives

The following objectives were further defined:

- Identify the major factors controlling the current development and use of public transport within the Toowoomba area.
- Identify strategies and technologies which would be appropriate for development within Toowoomba for the next 20 years.

The project scope will be restricted to the expected demographics of Toowoomba in twenty years' time to ensure there is a subsequent network to accommodate the growing population. This project will look at cities worldwide to gather a large range of networks to ensure that all techniques and concepts that are analysed are all-encompassing. Cities may not be analysed if they incorporate unattainable networks that are outside of the scope of this research report. Similar sized cities may be found; however, if they are identified as having an inadequate public transport system they will not be analysed in this project. Cities will only be analysed if higher than 2% of the population use public transport. This percentage has been determined as there are limited towns with a higher public transport usage among residents with this expected population.

2.0 Literature review

2.1Transport, Private and Public

2.1.1 Private

Private transport is a service that a driver provides for themselves, their families, friends and is not available to the general public. The most common examples of private transportation are the car and the motorbike. The benefits of using private transport for passengers revolve around the convenience of having their own car and therefore travelling without any constraints. The advantages of private transportation include;

- The route that is taken to get to the location.
- The flexibility of leaving at the desired time of the drivers and arriving at the required time.
- No weekends, late night or public holiday restrictions.
- Travel companions, whether to be alone or with companions.
- The environment (air-conditioning and music).
- Stops along the way.
- Comfort.
- Safety from strangers.
- Privacy.
- Storage space for belongings.

Even though private transportation has many benefits, there are also a lot of restrictions. Driving a car is not a viable option for some social groups, such as young, elderly or disabled people, and therefore, they still have to rely on other people to support their travel needs. (Blurtit, 2016).

2.1.2 Public

Public transport is a multiple passenger transport service available to the public for a cost and runs on a fixed, predetermined route. There are multiple types of public transport available, including buses, light rails and trams. Passenger boats are another option in some locations.

The benefits of using public transport include;

- Financial costs – Some passengers may find it cheaper to pay for tickets than to pay for the initial outlay of their vehicle plus the additional costs of fuel, maintenance, and registration.
- Community sense- interacting with other community members.
- Car parking.
- Availability to people of all ages.

Appropriate for the needs of both elderly and disabled passengers.

The benefits of using public transport to the community are significance as;

- Reduces congestion.
- Reduces the parking facilities that need to be supplied.
- Reduces greenhouse emissions that would be dispelled into the atmosphere.

In conclusion, public transport is a great benefit to the community when the services that are provided offer flexibility and diversity to parallel the ease of travelling by private transportation.

2.1.3 Active Transportation

The other less common form of transportation is defined as active transportation and refers to any form of human powered transportation. The forms most commonly utilised are walking and cycling, but can also be expanded to include skateboards, wheel chairs and rollerblades. This form of transport can either be by itself or implemented with other forms of public transport. This could be achieved by walking to a station, before catching the bus (Public Health Agency of Canada, 2014). Riding a bike to work is a cost effective and motivating way to get to a destination.

Benefits of riding a bicycle include;

- Riding a bike is cheaper than driving, with increasing fuel costs, it's becoming a more realistic way to get to work. Bike upkeep is rated as 30 times cheaper than a car.
- An increasing amount of bicycles racks located around the city and bike storage options at businesses are becoming more common.

- Partaking in exercise decreases your stress as well as promoting a healthy lifestyle. Reducing the need to go to the gym or some other form of exercise, hence saving time.
- Get an energy boost for the day, reduce the likelihood of developing diabetes, and heart disease.
- Avoiding congestion of traffic.
- Reduce greenhouse gas emissions produced (Business Insider, 2012).

Commuters riding to work have a better quality of life and health satisfaction than all other commuters, a study by University of Sydney states. This is achieved through increasing positive mental health, the sense of fun and saving money. (Bicycling Western Austraila, 2016).

Walking has all the same health benefits as cycling but is not always an option as many people do not live a reasonable walking distance from there place of employment.

2.2 The Need and Importance for Public Transport in Societies

2.2.1 Forms

2.2.1.1 Buses

Buses are the most widely used form of public transport and nearly all towns that offer public transport operate buses at a minimum, where there isn't a high enough population to support other services (University of Pretoria, 2013). Buses operate on the pre-existing roads, therefore, are inexpensive to introduce since new infrastructure on the roads is not needed to support the services. This service does require the cost of vehicles, garages, maintenance facilities and organisation of the services, however. Buses are easy to modify and a variety of routes can be run. Buses are more flexible in their routes, which is an advantage if there needs to be any necessary changes to the path. Some cities introduce exclusive bus lanes and provision of bus preferred signals to make more efficient runs. Buses do lack efficiency in carrying heavy passenger volumes. Buses can range depending on the passenger volume from minibuses, regular buses, articulated buses, and double decker buses (Vuchic, 2000).

Figure 4: Public Transport Option – Bus (Buses Worldwide, N/A)

2.2.1.2 Light rails

Light rails are the most common mode of semi rapid transit. Light rails are an electric powered rail system that operates on separate tracks that provide a permanent service at a lower investment cost than a train. This form of public transport can operate on public streets with the general traffic or on their own separated lines. Light rails are becoming more prominent in cities to make public transport services more efficient by being independent of the surrounding traffic congestion (Vuchic, 2000).

Figure 5: Public Transport Option - Light Rail (Light Rails Link, 2016)

2.2.1.2 Trains

Trains have the highest performance in regards to capacity, speed and reliability of all public transport options, but are only suited to cities with a high population. Having trains as a form of public transport around town require a large investment but are seem as an essential element in ensuring that the quality of life within a major city is maintained. Large rail transit have a large ability to effect the urban form and contribute to a city's mobility. Once tracks are made, they are permanent therefore there is no flexibility in the routes once designed without major financial consequence (Vuchic, 2000).

Figure 6: Public Transport Option – Train (Williams, 2016)

2.2.1.3 Taxi's

Taxis are the most convenient and comfortable form of public transport but are also the most expensive. Taxis are available at all hours, they come to your location and drop you outside your destination. They are the most convenient as there are no fixed routes, get to your designation at a greater speed as there are not multiple stops and can be enjoyed in private and comfort (Prezi, 2016).

Figure 7: Public Transport option – Taxi (Brisbane event planner, 2016)

2.2.1.4 Uber / Club cars

Travelling by the rideshare app, Uber, is an increasingly popular action. With only one tap on a smartphone, a car comes directly to the passenger's location and takes them to their destination. The Uber service is being utilised all over the world and is slowly gaining popularity in Australia. After first becoming legal in Australian Capital Territory, New South Wales and Western Australia, Uber is now legalised in Queensland (September 2016).

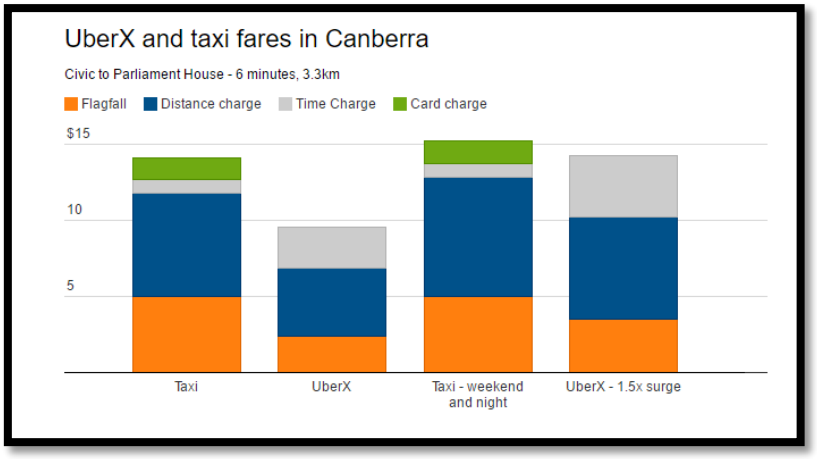

Figure 8: Uber Vs Taxi (Jericho, 2016)

As seen in Figure 8, riding in an Uber vehicle is cheaper than being in a taxi. Frequent passengers of both services have stated that Uber is a much more enjoyable experience. As there is a compulsory feedback questionnaire after getting out the driver and the passenger both give each other a rate out of 5. All Uber drivers have to maintain a feedback score higher than 4.2/5 stars to operate. This ensures that only the best drivers are kept.

Additionally, another benefit to the customers, is Uber is a cashless transaction as it charges their pre-selected credit card through the app on their smart phone. This reduces the need for passengers to bring cash or use an eftpos machine, and drivers worry about passengers leaving without paying the fare.

Although Uber is competing more with taxis, the trends must be accounted for as they will still affect the public transport rate. With Uber drivers providing a cheaper and generally quicker and safer mean of transport from one destination to another, it can be seen as to why this form of private transport is becoming so popular (Jericho, 2016).

2.3 Characteristics

2.3.1 Cost

The cost of traveling on public transport is a dominant factor when deciding whether to utilise these services, especially for lower-income passengers. When a fare increases, the lower income residents usage decreases. The reactions to a fare increase or decrease by the passengers is a major interest for transport services since the revenue made depends on the passenger numbers. All local, state and national governments believe the cost of traveling on public transport is the key variable that effects patronage on public transport (Mitric & Carruthers, 2005). If travel costs increase, the middle and higher classes can decide if they want to continue using public transport or change to an alternative travel method. The lower-income travellers who rely on public transport as they may not be able to afford a car or other transport methods do not get that luxury. Therefore, to insure the usage of all income travellers, fares need to be affordable to all users (Mitric & Carruthers, 2005).

2.3.2 Convenience

Convenience is a key component when designing a public transport system. Users are unlikely to use public transport services if public transport does not meet their needs and are inconvenient.

Electronic tickets

There are multiple different varieties of electronic tickets around the world. Electronic tickets are a card which has money loaded onto it and the user can use it to pays as they go on public transport. An example is in Brisbane where transit passengers use Go Cards, as they are fast,

easy and convenient to use when travelling. Translink is the company that runs Go Cards and are available in Brisbane, QLD.

There are many benefits of using electronic cards while travelling around cities on public transport. They are a lower cost than manually paying for a paper ticket every trip; the card records the start location and end location by the passenger scanning on and off, and charges for that route. Using electronic tickets are also convenient as they can be used on all forms of public transport, such as buses, trains, trams and ferries within a city. As there is no cash involved in the transaction, it is more convenient for travellers as they do not need to carry around correct change. If they need to top up their card, they can either opt for it to be topped up automatically via a direct debit type service or transfer money to their electronic ticket at specific shops. There are different electronic tickets that are available for adults, children, seniors and students, with the appropriate discounts automatically applied for the different patronage groups. Apps make managing your account easy, as the balance, and trip history can be accessed anytime on a computer or smartphone. Through the use of all these features, Translink has provided the Brisbane residents with an easy to use system that helps make the public transport system in Brisbane convenient for its users (Translink, 2015)

2.3.3 Routes

Public transport routes affect the amount of passengers using the service enormously. If there are no public transport routes near a resident's house or near their destination, the user would not likely choose to use it. Those residents would choose a more convenient option such as driving in a car or catching a lift, therefore, losing potential customers to the service. Willing customers may not be able to take advantage of using public transportation if suitable routes are not available. Routes need to be designed to allow travel to all suitable major destinations as well as having suburban options. Due to this, public transport routes need to be planned and designed carefully to try and accommodate as many people as possible. Ensuring this will then guarantee the appeal to the maximum number of passengers for use of the public transport service (Chowdhury, et al., 2015).

2.3.4 Days and Hours of Operation

Travel times are a big influence when deciding whether to use public transport regularly when going to work. Workers that start at 8:00am would not have the option to use public transport if no buses would get them to their workplace until after 8:30am, therefore, public transport is

not a viable option. This concept applies in the same way in the evening. During the week, the workers are the majority of the users of the public transport system, therefore, it is essential that their needs are catered for. Furthermore, if public transport services are not run on Sundays and public holidays, then there is a loss of potential clients due to the vast numbers of people out and about on these days. Travel times need to start early enough to allow for residents to get to work and operate late enough that residents can get home after finishing work for the day (Wardman, 2001).

2.3.5 Transfer waiting time

Waiting times are a critical factor when deciding if to travel somewhere by public transport or by a car but can become a deterrent if they are known to be preposterously long. As an example, if a passenger was to drive to a destination that would take 15 minutes by car, the passenger would unlikely choose to use public transport if they had to get on a bus, travel for 10 minutes, get off and wait 10 minutes for the next bus, before traveling the remaining 5 minutes of the journey. Waiting time depends on the frequency of the public transport. Waiting times can vary depending on whether its peak time, the area and the location of the final destination. When travelling around the city centre where the service frequency is high, random intervals tend to dominate and schedule delay will be nearly non-existent. As service demand rises, the scheduled delay is guaranteed to increase, as well as arrival waiting times. There needs to be a higher frequency of public transport to cope with the passenger increase during peak times to keep up with demand so travel time is not delayed and, therefore, less waiting time for passengers. Little waiting time between buses, especially during peak travel times, would make using public transport services more desirable and, therefore, would increase passenger's usage (Wardman, 2001).

2.3.6 Comfort

Comfort is a key element in the success of public transport. A study that has taken place in Auckland, New Zealand that states that public transport users desire a 33% reduction in their current travel time and 16% reduction in travel costs. A further study showed that if all interchanges were more comfortable, the users would only desire 25% reduction in travel time and 10% reduction in cost. This shows that if bus stops and interchanges were more comfortable, users would be more inclined to use them, even if they cost a little more and took a little longer time to reach their destination. Therefore, comfort needs to be considered when

designing stations, interchanges and vehicles. This shows that passengers don't mind the longer waits as long as they are comfortable (Chowdhury, et al., 2015).

2.3.7 Safety

Safety is an important aspect that needs to be met when deciding on public transport networks. The Public Transport Users Association believe that if personal safety was ensured, patronage would increase. Personal safety can be achieved is by ensuring that there are adequate surveillance and staff on all the systems (Public Transport Users Association , 2015). Safety is essential as the safety problem is not a perception, it is a reality. Women and children travelling alone frequently opt to not use public transport in certain instances. For example after dark or in certain unguarded stations for safety reasons. Isolated stations are the third biggest worry to passengers regarding public transport, as found in surveys. The absence of staff on the public transport system can also drive potential passengers away because of safety concerns. Therefore, it is shown that staff members need to be present to ensure that all passengers feel safe and protected (Public Transport Users Association , 2015).

In conclusion, all the main factors including cost, convenience, routes, travel time, transfer waiting times, comfort and safety have to be designed carefully so that the passengers are happy to be traveling on public transport. This will, in turn increase the passenger numbers and generate an effective public transport system for Toowoomba.

2.4 Planning and Design of Bus Systems

2.4.1 Route planning

Unfortunately, it is impossible to provide acceptable public transport routes that meet everyone's requirement. Providing an efficient network of routes, can be achieved by making complex journeys achievable by using a combination of routes. Routes are generally planned in isolation rather than in part of a coordinated network. This is an unsatisfactory approach as it only caters for the passengers that need to get into the centre of town rather than neighbouring suburbs and, therefore, multiple traveller's needs are not met. Poor route planning also results in poor route coverage, which increases the requirement for interchanges between routes and irregular frequencies. Good planning ensures that routes are available to provide convenient links between all high demand locations. As towns and neighbourhoods are constantly changing and expanding, this means that routes need to be constantly reviewed and changed to suit the current demands of the residents. This can only be done by trial and error procedures

and can take a considerable amount of time and may never be perfect. Lack of undergoing route revisions can be negative for the city as they can become outdated and inefficient (Urban Bus Toolkit, 2006).

2.4.2 Alternative Approaches to Network Design

There are a variety of different ways to construct a route network to meet passenger demands. This includes; walking distances, route frequency, converging routes on a single focal point, terminating in the city centre, non-radical route, hub and spoke route systems, official boundaries and type of routes (Urban Bus Toolkit, 2006).

2.4.2.1 Walking distances and route frequency.

A city's public transport service typically radiates outwards from the city centre. The number of branches to a public transport route is determined by the nature of the road system, and the policy and market forces of the city. The passenger's perception are another factor to consider. For example, if passengers don't want to walk far to get to the bus, then routes will need to go deeper into residential areas. Having the routes along the main roads reduces the waiting times and provide shorter walking distances between stops (Urban Bus Toolkit, 2006).

2.4.2.2 Converging routes on a single focal point.

Where there are large city centres, it is inadequate to only have one single focal stop as other key locations of that area would exceed acceptable walking distances from that point. Several stops within a city centre are, therefore, required. This can also be incorporated by implementing numerous routes and sub network routes connecting them and the outer neighbourhoods (Urban Bus Toolkit, 2006).

2.4.2.3 Hub and spoke route systems.

This system is more effective in smaller towns but the concept is still valuable and with an adaption, it can be suited to cities. All routes go into the city centre directly to one central station. As all routes within the city would follow this, the passengers are than able to easily transfer to another route and head in another direction. This is most effective in little to medium towns as the routes lengths are smaller, therefore, there are smaller waiting times for the buses.

This concept can be adapted to a city size by having more than one bus on each route (Urban Bus Toolkit, 2006).

2.4.2.4 Terminating in a city centre.

A primary decision to be made when determining whether a transport system is going to terminate in the city centre. Two options for this are (one) having a direct route to neighbourhoods and back and (two) having routes continue on through the city centre and continuing to the neighbourhoods on the other side of town and looping backwards and forth. Some disadvantages of having routes terminate in the city centres include an increase in congestion, having inner city valuable land used as bus terminals, and passengers wanting to continue to the other side of towns having to change buses. Some advantages of routes terminating in the city centre include schedules being more likely to remain on time, convenient interchange location, and fare structures being less complex (Urban Bus Toolkit, 2006).

2.4.2.5 Non-radial routes.

An example of a non-radial route is a circular route than runs around the outskirt suburbs of the city linking the various suburbs together. These routes do not reach the city centre and are run with smaller passenger vehicles as they are not as commonly used. These non-radial routes also help create movability around the suburbs as its providing an alternative route to take. This type of route can only be achieved when there is a large enough demand for it, otherwise, passengers have to go through the feeder routes into the city and then out to another suburb on a different route (Urban Bus Toolkit, 2006).

2.4.2.6 Routes

One of the disadvantages of having inner city and outer city routes is when the two routes meet. The time it takes for passengers to disembark, and load onto a new bus, as well as any additional waiting time at the station increases the journey times for the passengers. This makes travelling on public transport less appealing and the buses lose vehicle utilization by turning around (Urban Bus Toolkit, 2006).

2.4.2.7 Types of Bus Routes

- End to end route: Operates on a major street and goes up and back. This type of route is most common on main streets.
- Outer suburbs circular routes: Returning to the original point without going over the same road twice. This route is most effective in residential suburbs.
- Inner city circular routes, but links the key areas to the town: (Shopping centres, sports fields, key areas). This route reduces the need for a city centre terminal and turning facilities. This is most effective in the business district as passengers can get on and off where needed throughout the route.
- Loops: Combination of an end to end routes and circular routes. Straight road and then does a loop at the end and gets back onto the original line. Down a higher hierarchy road and then doing a loop around the residential area at either end is a common example of this type of route (Urban Bus Toolkit, 2006).

3.0 Methodology

The purpose of this research topic is to review the current public transport network within the Toowoomba region and identify any technologies and strategies that, if implemented, could increase patronage of the services offered. This will be undertaken by examining the current public transport networks within Australia and around the world that are deemed effective in their operation and implementation. Identifying the common technologies and strategies that might contribute to an effective public transport network. Within the study area, the resident's opinions will be recorded to see if there are common opinions with respect to the current public transport system and thus obtain a clear picture of what needs to be improved or changed to ensure the increase of the public transport system in the Toowoomba city.

3.1 Analysis of cities public transport

Identify 4 – 7 cities that have a population higher than the current Toowoomba population so the potential for regional growth can be incorporated into the study. Elimination of a system will occur if the results of the study determine that the town's public transport usage is below 2%. The cities that will be selected for analysis must have similar demographics to Australia to ensure that suitable recommendations can be achieved be applied in an accurate manner. The countries that the cities will be selected from, will be limited to include; Australia, Canada, New Zealand, United Kingdom and the United States of America.

For each city selected for the study, an analysis of their current public transport systems will be undertaken. The information obtained during that analysis will be the same information that collected for the study of Toowoomba's current transportation circumstances. Through this process of analysis, the effective (and perhaps ineffective) strategies and technology's will then be identifiable and an analysis of all cities participating in the study will occur in order to identify common strategies in those locations that might improve public transport usage in Toowoomba. These strategies and technologies will be listed and a thorough vetting process will occur in order to determine whether those will be suitable for implementation in Toowoomba.

The initial stage involves an analysis of Toowoomba's current public transport systems which will involve the collection of the following data and information:-

- City name and location (country).
- Population.
- Percent of residents using public transportation.
- Climatic data.
- Type of transportation currently available.
- A number of routes currently available.
- The frequency of routes.
- Ticket options.
- Average adult cost of a ticket.
- Parking price for a spot in the CBD
- Day and hours that services are available.
- Additional strategies and technologies used within the Public Transport Network.

*all prices are displayed in AUD

3.2 Other Cities Considered

Cities around the world will be examined in order to determine whether they meet adequate criteria and if so, they will be analysed further. The initial step will be to select cities with a population similar to Toowoomba's expected population of 200,000 in twenty years' time (Queensland Treasury and Trade, 2012). If it is found that they are lacking a public transport usage over a value of 2%, they will not be analysed in the study. Instead, these cities will be recorded to show how many towns have been identified and have problems similar to Toowoomba in the public transport department.

The list of cities will be displayed in the following table:

Table 3: Cities that did not meet adequate criteria

Cities that did not meet the criteria			
City, Country	Population	% of population using public transport	Reason not considered

3.3 Analysing Toowoomba's public transport network

Identifying the major factors controlling the development and the use of public transport in Toowoomba will be assessed. An analysis of the Toowoomba bus network will take place.

Sources used to collect information, and additional information can be collected from:

(Census Data: Toowoomba, 2011)

(Weatherzone, 2016)

(Transport and Motoring, Queensland Government, 2015)

(Toowoomba Region, 2016)

Toowoomba is located in Queensland, Australia. Toowoomba's temperature ranges from, Summer (December to February): 14.4°C -31.4°C, Autumn (March- May): 8.5°C -29.9°C, Winter (June-August): 4.5°C -22.5°C and Spring (September –November): 9.1°C -30.3°C. Toowoomba is known as the garden city and every year host the carnival of flowers which attracts individuals from around Queensland.

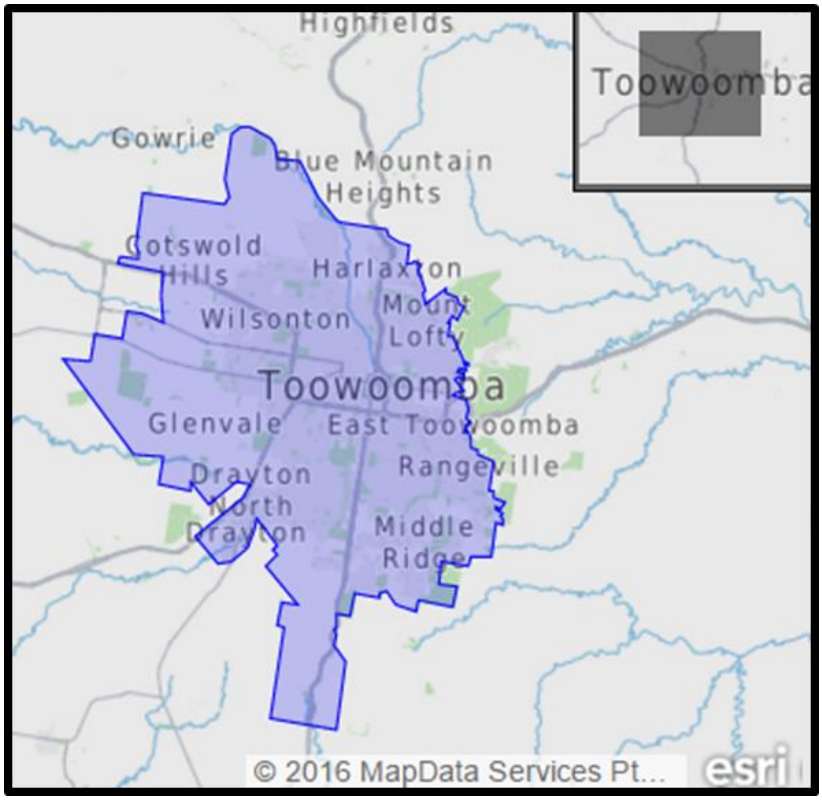

Figure 9: Toowoomba Census Area (Census Data, 2011)

As of 2011 Toowoomba's population was 96,567 residents within the Toowoomba city census boundary seen in Figure 9. 0.9% of the residents in Toowoomba use public transport. In 2016, Toowoomba's expected population is expected to be 110,000 residents.

Table 4: Toowoomba Analysis

Toowoomba Public Transport Analysis		
Public Transport Form	Number of routes	8 bus.
	Frequency of route	1hour – 2 hours.
	Type of route	End to end. Straight and loops.
	Cost	$2.20-$8.50.
	Parking price	Hour: $1.70 Day: $7
	Ticket options	Cash 1 Day Pass 7 Day Pass
	Days and hours in service	Weekdays: 6:30am – 6:00pm Saturday: 8:00am - 5:00pm Sunday – Not in service (All Toowoomba)

The public transport routes for Toowoomba are shown below again (Figure 3) in Figure 10, they represent the web route system that branch out and all link in the CBD.

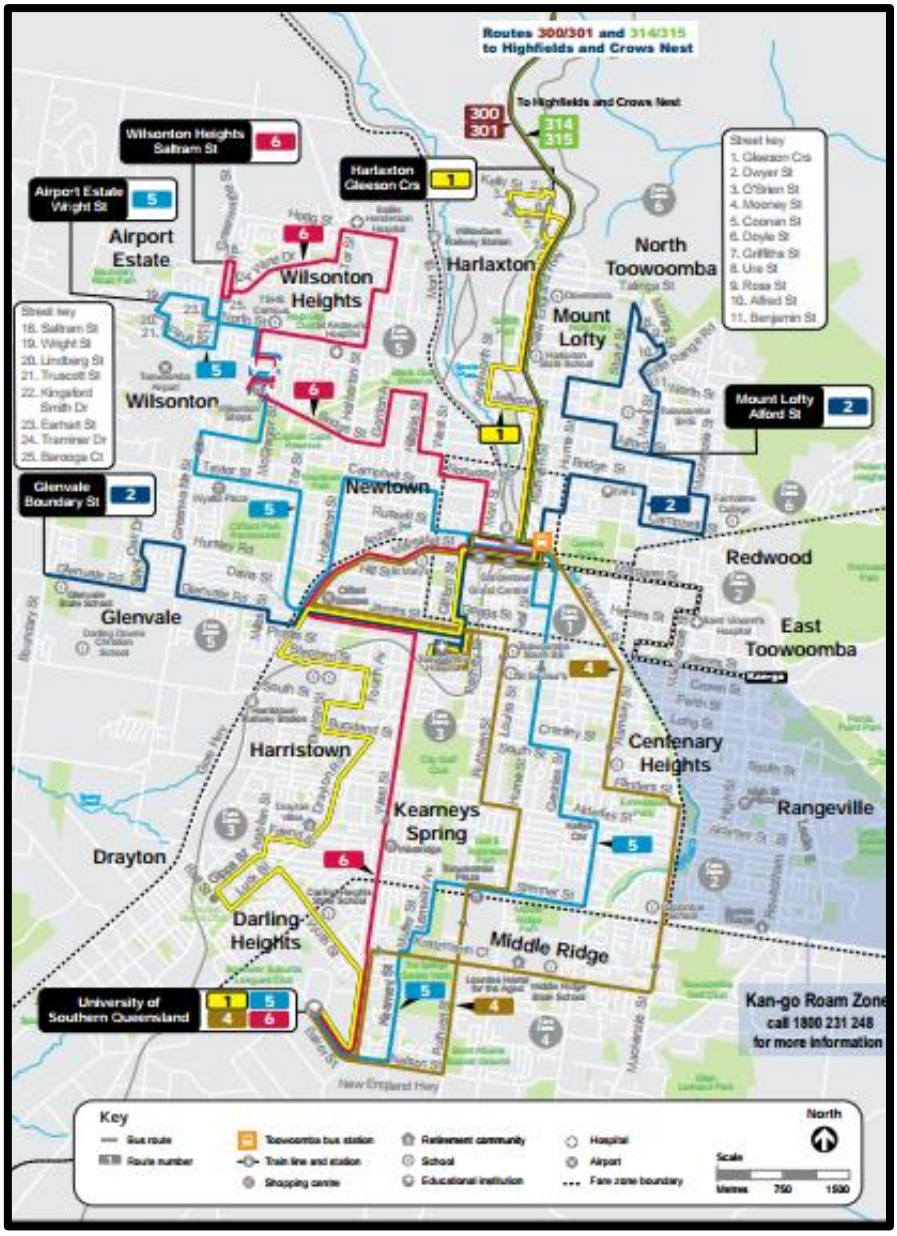

Figure 10: Toowoomba public transport routes

From January 2015, the Toowoomba Regional Council provided a free CBD shuttle service that was available to the elderly and access challenged/disabled persons who were seeking to utilise the library service and other CBD services. The shuttle bus started with 6 designated stop locations and operated Monday to Saturday from 9:30am-2:30pm. After 2 extensions and some route revisions, along with the allowance of the general public with priority to the elderly and access challenged/disabled persons the CBD shuttle stopped operating on the 19th of August 2016 due to the steady decline in patronage. Therefore it is evident that a CBD route at this present time is not viable for the current population and the resident's needs, but in the future it maybe an option worth re-considering (Toowoomba Regional Council, 2016).

Figure 11: First route of CBD Shuttle (Toowoomba Regional Council, 2016)

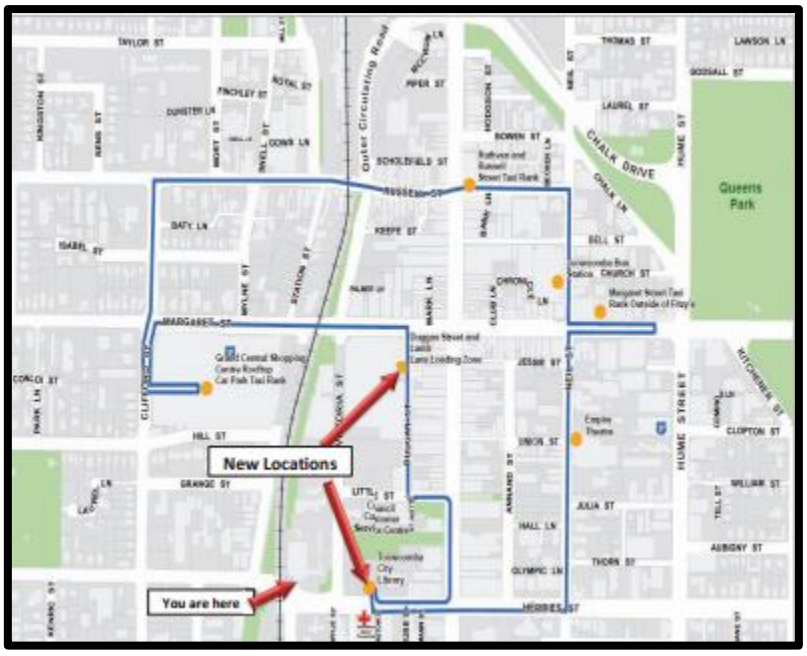

Figure 12: Changed route of CBD Shuttle (Toowoomba Regional Council, 2016)

The Toowoomba city has a Kan-go service for its Rangeville residents in order to connect them to the city. This service is a 'dial on demand' service provided by Qconnect. The service travels a fixed route between the city centre and the Range Shopping Centre via St Vincent's hospital, and then picks up and drops off pre-booked passengers in the Roma A Zone. This service is accessible by placing a call the day prior to your reservation date and booking an appropriate time. This booking service enables a door to door service to be achieved effectively. Residents in the Roam B Zone can call and book and will be directed to the closest pick up location (Transport and Motoring, Queensland Government, 2015). This service is beneficial for the residents in this area as patronage of other public transport services (such as a regular bus) is not high enough to have consistence routes but it still allows the residents to travel into the city. This service costs the same as all other bus services within Toowoomba.

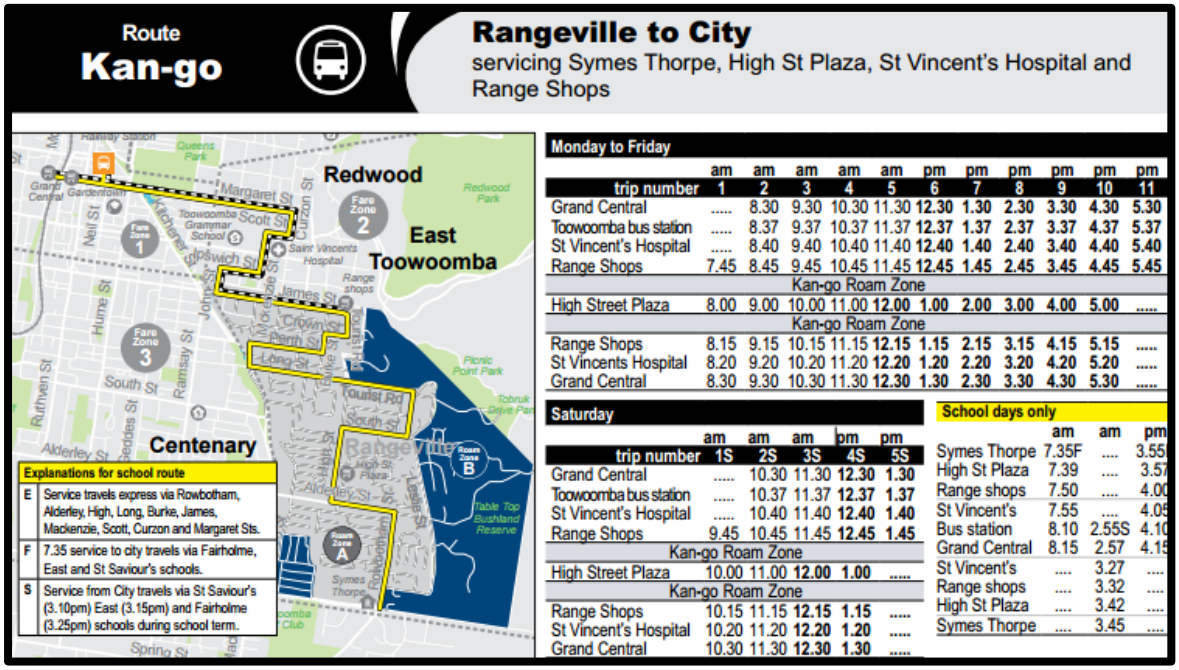

Figure 13: Kan-go service (Transport and Motoring, Queensland Government, 2015)

3.4 Mt Lofty/ East Toowoomba

Mt Lofty is a suburb in North East Toowoomba and will be the focal point of the research. The public transport route in this area will be analysed so it can be compared to other cities and suburbs of a higher patronage.

Due to the limited census data on Mt Lofty individually, the study area census data collection will be extended to East Toowoomba/Mt Lofty suburbs. This region was the chosen study area as it was identified as one of the poor preforming suburbs (in terms of Public Transport patronage) within Toowoomba. Within Mt Lofty, there is only 0.7% of residents that use public transport (Census Data: Toowoomba, 2011).

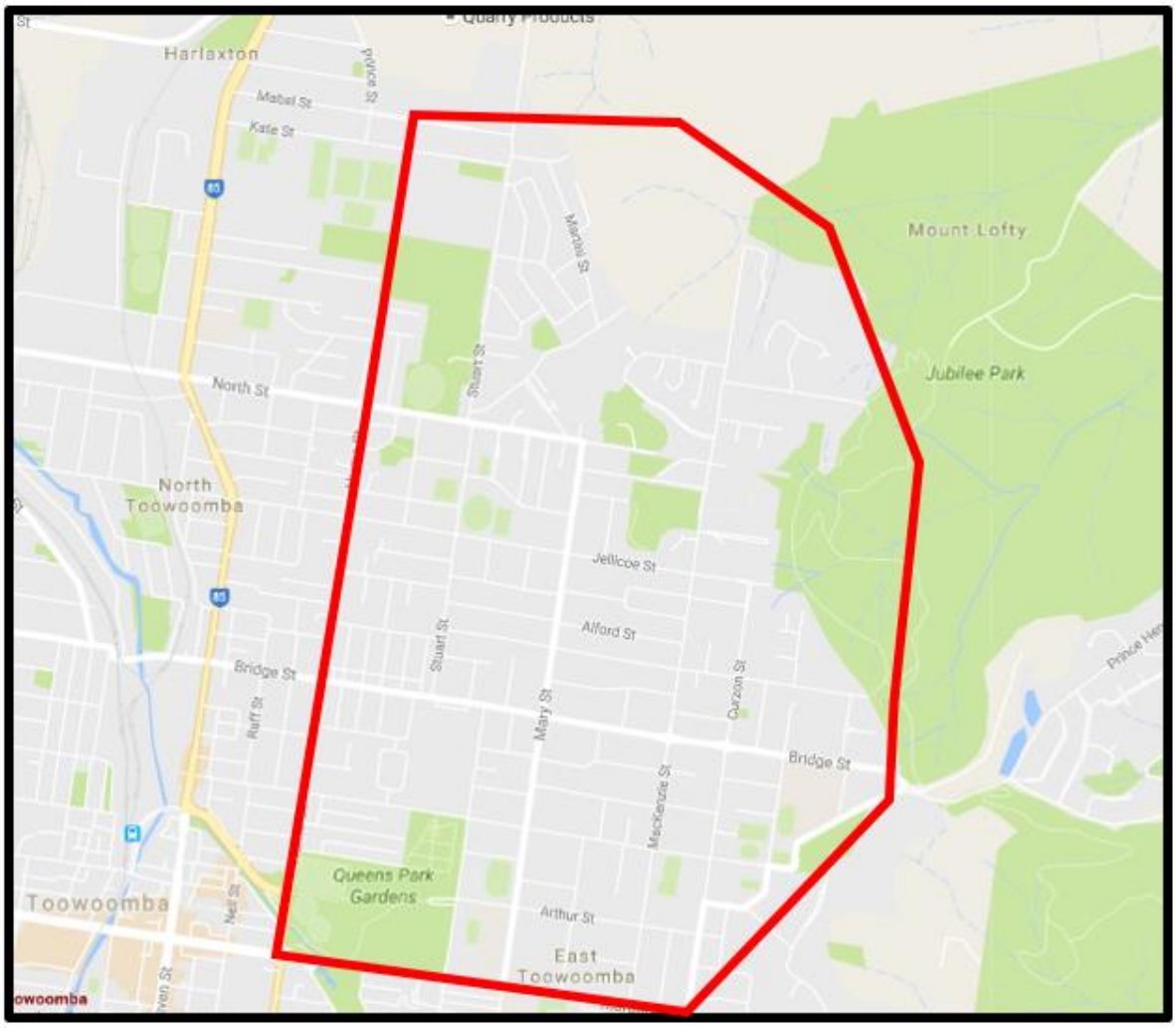

Figure 14: Study area (Google Maps, 2016)

The Mt Lofty suburb is on the edge of the Toowoomba Range and therefore, the further north the suburb stretches, the more the topography continuously steepens which make walking difficult and strenuous. Therefore the physical characteristics of this area limit the ability of residents (particularly the elderly) to easily walk and ride to bus stops. The southern side of the study area is flatter, therefore there are fewer limits for the residents in regards to walking or riding to work.

In the East Toowoomba/ Mt Lofty area, there are 10,000 residents (Census Data: Toowoomba, 2011). Due to East Toowoomba/Mt Lofty's proximity to the CDB, 6.6% of people walk to work and, 1.3% of people ride to work (Census Data: Toowoomba, 2011). This is higher than the average percentage of Toowoomba's City residents either riding or walking to work. Therefore, when discussing future options for the city as a whole, this data will be taken into account.

Figure 15, below shows the public transport network within the Mt Lofty suburb and identifies the streets that are on the current bus route. This is a straight and loop route which leaves from the CBD area, does a loop in the residential area to reach a higher quantity of houses before heading back to the CBD by the same path. By analysing this route it can be seen that a few of the key stop locations are the local shopping centres, which include Mackenzie Row, Northlands and Mary Street Village before a final link to the CDB. The route also bypasses the Technical and Further Education. The Mt Lofty bus route operates on weekdays from 7:30am -5:00pm, and 8:30am -4:30pm on Saturdays. The frequency of the bus route is hourly.

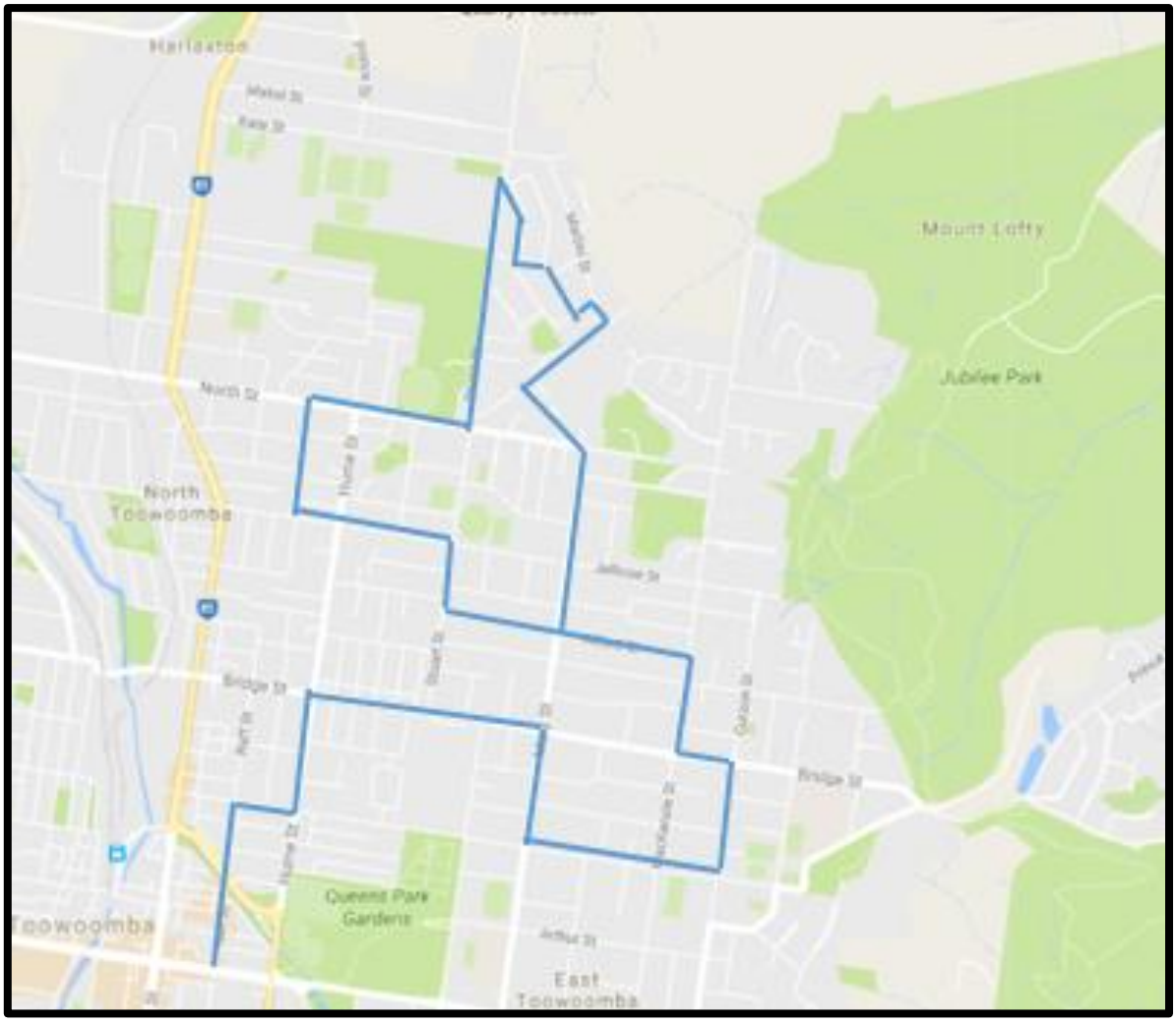

Figure 15: Mt Lofty Bus Route (Google Maps, 2016)

3.5 Survey for Mt Lofty residents

A survey will be undertaken by residents in the selected study area to identify reasons why Mt Lofty residents don't use public transport and determine if there are common trends for why this is the case. If there are common suggestions as a result of the data collected, it would be understood that this would be a result of the majority of residents in that area are feeling the same way about the public transport system. This will allow for accurate solutions to be implemented and improvements to be made from the identified conclusions.

Figure 16 is the survey that was undertaken by the residents of Mt Lofty.

Survey

My name is Belinda, and I'm a final year Civil Engineering student at USQ. For my final year research project I've undertaken a study on Future Public Transport Options for Toowoomba. I'm currently looking at why Toowoomba, and particularly Mt Lofty/ East Toowoomba residents, do not use Public Transport. All information collected will remain anonymous.

Questions

1. Please circle your age group?

   (Under 17) (17 - 25) (26 - 39) (40 - 64) (65+)

2. Please circle your gender?

   (Male) (Female)

3. How many trips out of the house do you take on an average weekday?

   (0) (1) (2) (3) (4+)

4. Have you ever used public transport in Toowoomba?

   (Yes) (No – go to Q7)

5. How frequently do you use public transport?

   (Less than 1/month) (Less than 1/week) (Less than 1/day) (1/day) (2+/ day)

6. Where do you travel to? (Circle as many as appropriate)

   (Work) (Sporting facility's) (Social activities) (Shopping) (Other)

   (Continue on to Q9)

7. Why do you not use public transport?

8. If there was adequate services would you use public transport?

   (Yes) (No – why not)

9. Would you 'Park and Ride' (i.e. Drive/bike to a location and then catch public transport) if it was available?

   (Yes) (No – why not)

10. Do you think the current transport routes in Toowoomba are sufficient?

    (Yes) (No)

11. Do you feel safe using the public transport network?

    (Yes) (No)

12. Please rate the Toowoomba Public transport network.

    (Unsatisfactory) (Average) (Good) (Excellent)

13. Suggestions on how public transport could improve in Toowoomba.

Thank you for your time.
Belinda

Figure 16: Sample Survey

3.6 Analysis of Survey Results

An analysis of the survey results will be undertaken and key information gathered will be further explained.

Comments from the surveys will be summarised and the key reoccurring points will be discussed further and displayed as exemplified below:

The summary's that will be included are:

- Why residents don't use public transport,
- Why residents wouldn't use public transport if there were adequate services,
- Why residents wouldn't partake in a park and ride system, and
- Suggestions on the public transport network.

4.0 Results

4.1 Detailed Analysis of Cities

4.1.1 Wellington

Sources used to collect information, and additional information can be collected from:

(New Zealand Tourism Guide, 2016)

(Statistics New Zealand , 2013)

(Metlink, 2016)

(Wellington City Council, 2016)

Wellington is located on New Zealand's North Island. Wellington's climate are summer (December - February): 19°C - 21°C, autumn (March - May): 14°C - 19°C, winter (June – August): 6°C - 12°C and spring (September - November): 14°C - 17°C. Wellington is known as the windiest city in New Zealand. Due to Wellington's position on the edge of the Cook Strait, the winds are funnelled through the passage, particularly on the northern side.

Figure 17: Wellingtons Location (Google Maps, 2016)

Wellington's population has inclined to 204,000 people in 2016 (Forecast Id, 2016). 16.8% of residents in Wellington use public transport. This city was selected for analysis because of its unusually high public transport usage. The analysis will highlight some key strategies that have helped the residents embrace using public transport as a regular transport method.

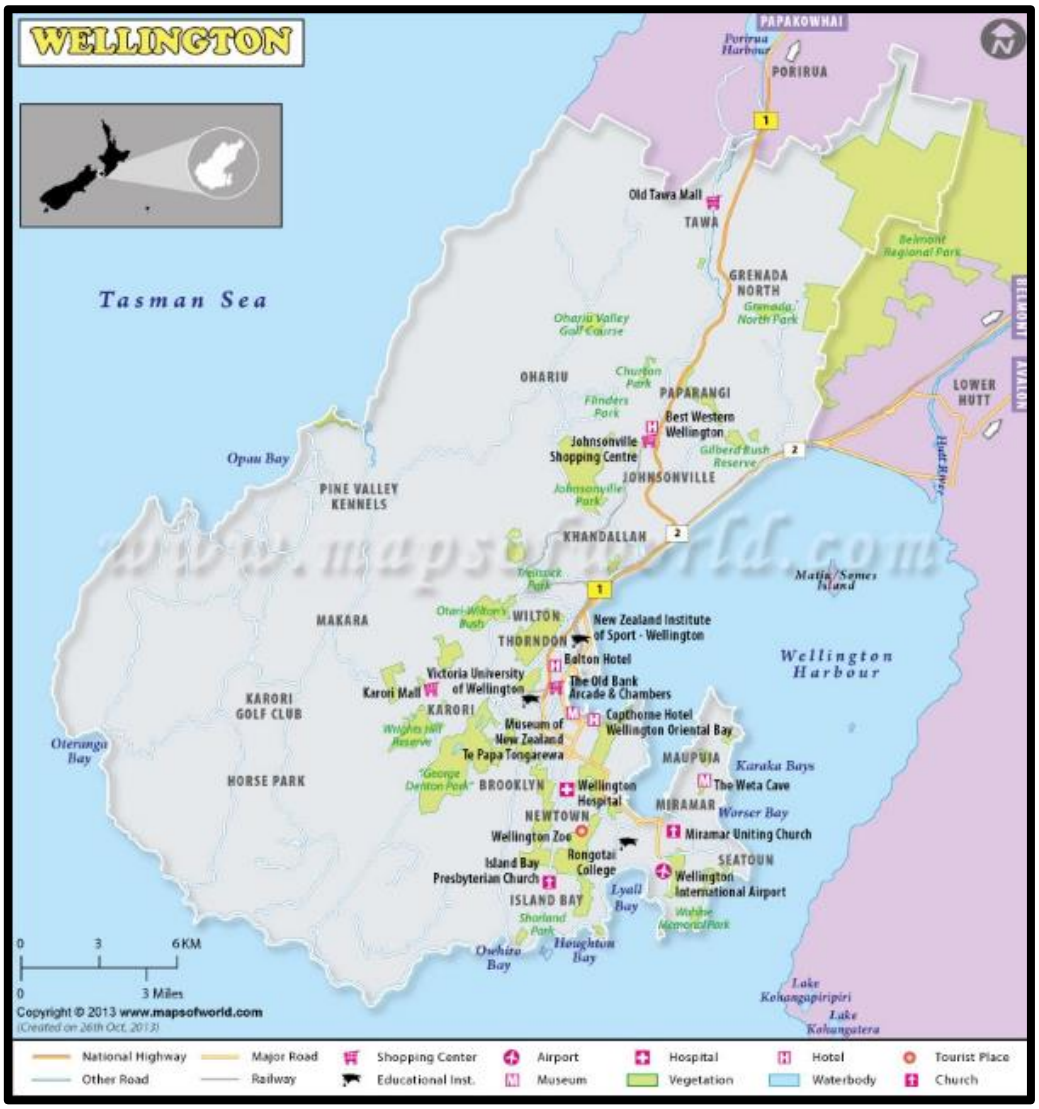

Figure 18: Wellington City (Map of World, 2013)

Table 5: Wellington Analysis

Wellingtons Public Transport Analysis		
Public Transport Form	Number of routes	40 city bus routes 44 additional bus routes in the outer Wellington area 5 end to end train lines 1 end to end ferry line 1 end to end cable car line
	Frequency of route	Bus: 15 minutes – 1 hour Train: 30 minutes - 3hours Cable car: 10 minutes Ferry: 30 minutes - 2 hours
	Type of routes	End to End Loops
	Cost	$2.5 -$6.5
	Parking price	Hour: $4 Daily: $32
	Ticket Options	Single/cash Electronic card Weekly pass Monthly pass.
	Days and hours in service	Weekdays 5:45am -12:00am Saturday: 6:30am – 12:30am Sunday: 7:00am- 11:50pm

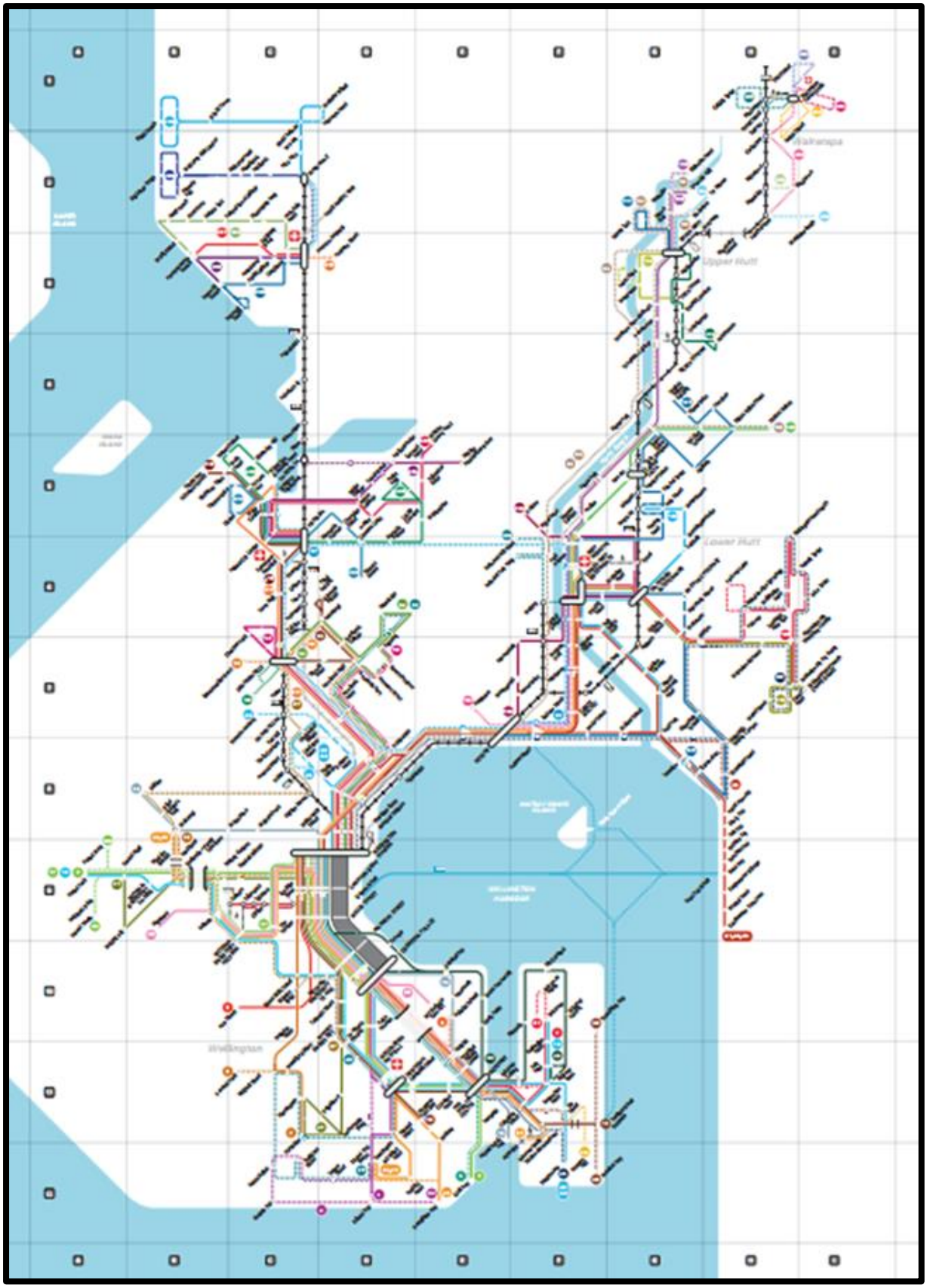

Figure 19: Wellington routes (Metlink, 2016)

Additional information points:

- Public transport operates during the weekends with reduced frequency, routes and hours of operation.
- Highest frequencies are during the week at peak hours.
- Public transport operates Friday and Saturday nights.
- Hours of operation suit normal working hours.
- The majority of residents use electronic tickets.
- A lot of people do not own a car and rely solitary on public transport.
- Multiple interchanges are established to link different routes and transport methods.
- Trains operate from the inner city out to the surrounding areas in the Wellington region.
- Buses services to connect from the train stations to the resident's homes.
- City sprawl favours public transport.
- Park and ride facilities are available.
- Security for bikes by providing lockers, racks and sheds.
- Carpool priority carparks available at key locations.
- Real time tracking of services on a smartphone app

4.1.2 Geelong

Sources used to collect information, and additional information can be collected from:

(Travel Victoria , 2016)

(CDC Victoria, 2016)

(Census Data: Geelong , 2011)

(Public Transport Victoria, 2016)

(Id, 2016)

(City of Great Geelong, 2016)

(Market Square Geelong, 2016)

Geelong is located in Victoria, Australia. Geelong's climate ranges from summer (December – February): 10.9°C - 24.9°C, autumn (March- May): 7.6°C - 22.9°C, winter (June – August): 5.4°C - 15°C and spring (September - November): 6.6°C - 20.3°C. Geelong has a large commercial central business district which extends to shoreline offering the residents easy access to the popular beach front attractions.

Figure 20: Geelong Location (Google Maps, 2016)

In 2015, Geelong had 187,000 residents living in the city. 5.4% of the population in Geelong use public transport according to the 2011 census data. Geelong is neighbouring Melbourne, the capital city of Victoria, much like Toowoomba, as it is situated close to Brisbane and easy access to transport to the capital city is important.

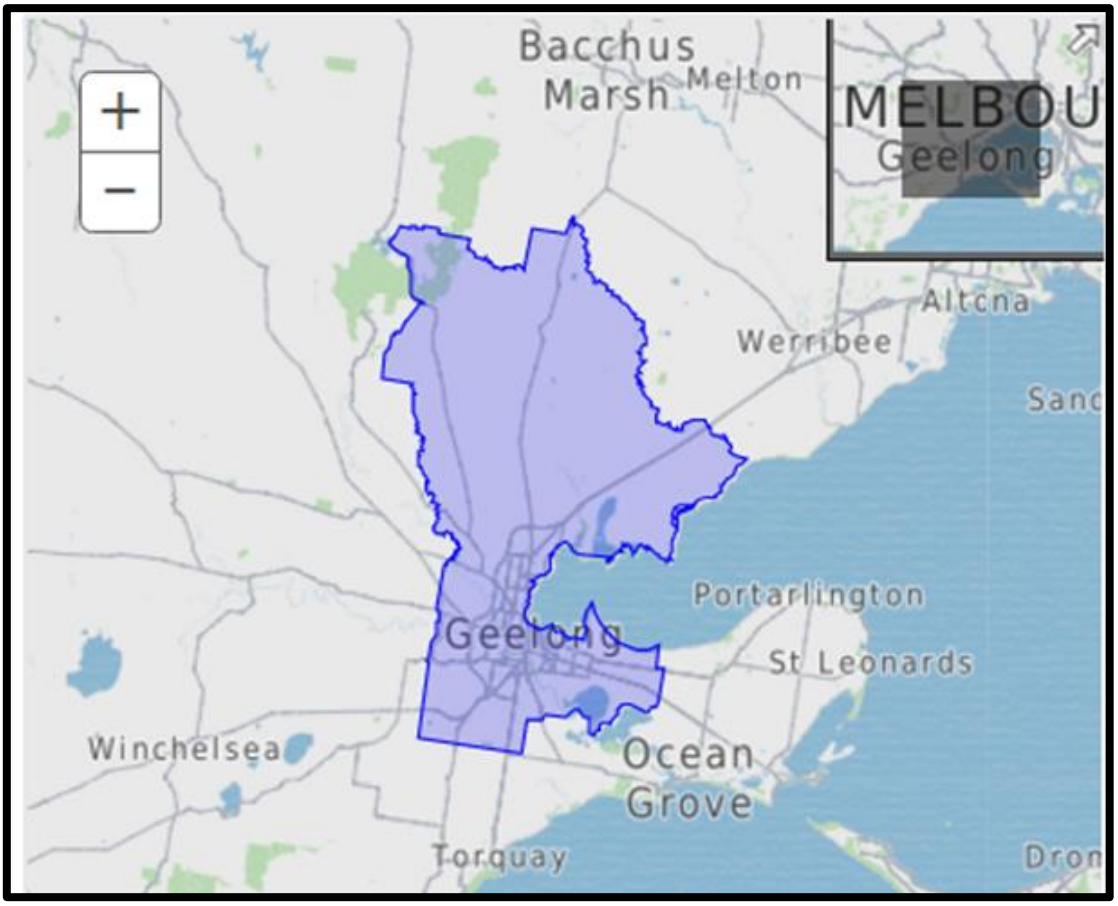

Figure 21: Geelong's Location (Census Data: Geelong, 2011)

Table 6: Geelong Analysis

Geelong's Public Transport Analysis		
Public Transport Form	Number of routes	18 Bus routes 1 Train route to and from Melbourne 1 Park and ride shuttle bus
	Frequency of route	Train: one leaves Geelong every 20 minutes to Melbourne Bus: 20-60 minutes
	Type of route	Bus: Loops Bus: Straight and loops Bus: Straight Train: Straight
	Cost	Bus: $3.90 Train: $6.00
	Parking price	Hour: $1 Daily: $24
	Ticket options	Paper tickets Myki (electronic card) 7 day pass 28 day pass 365 day pass
	Days and hours in service	Weekdays – 5:00am – 9:00pm Saturday – 6:00am – 8:00pm Sunday – 8:00am – 8:00pm

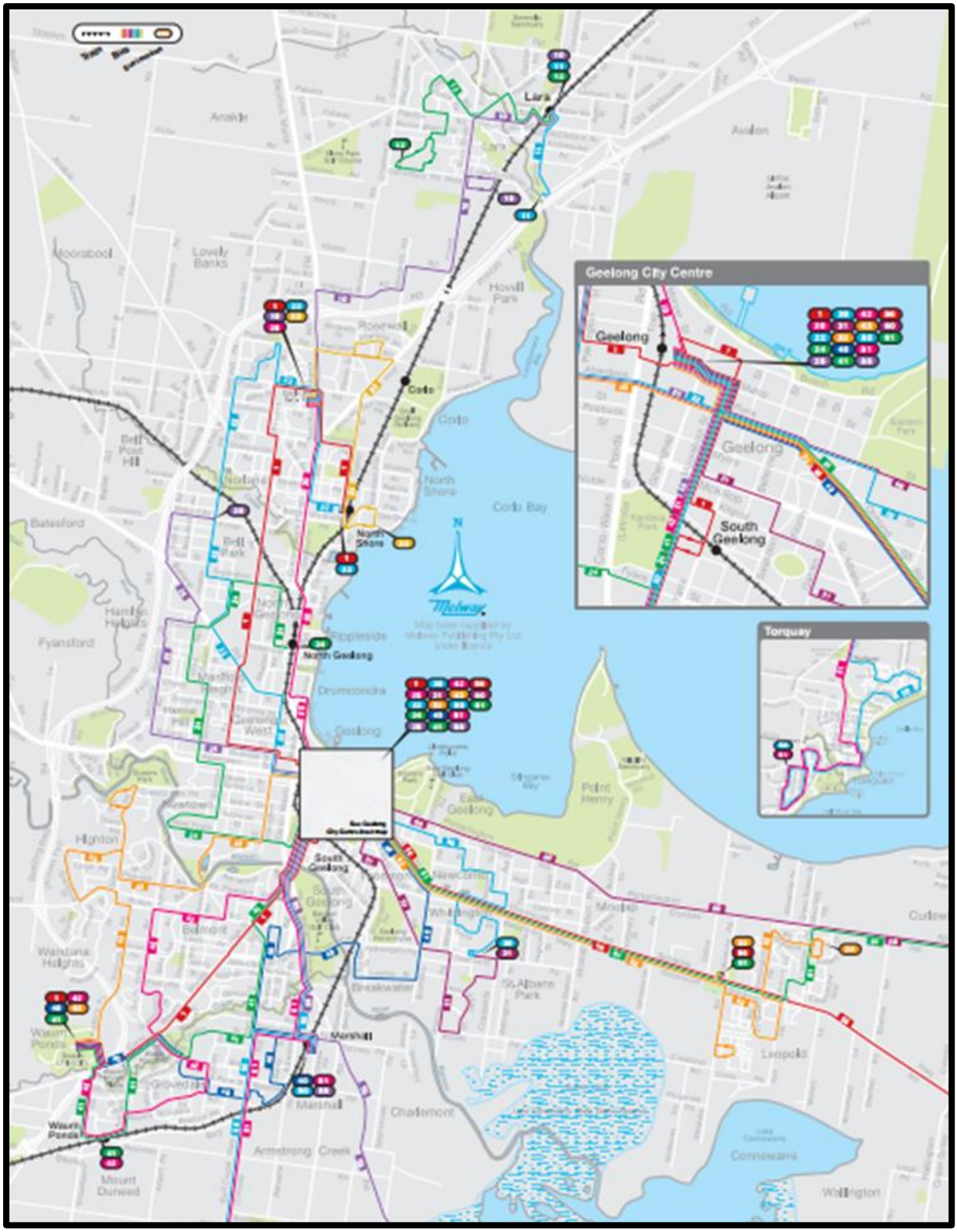

Figure 22: Geelong's Public Transport System (CDC Victoria, 2016)

Figure 23: Geelong's Shuttle Bus (City of Great Geelong, 2016)

Note: Car park lots: 2, 10, 11, 12 and 15 are paid carparks.

Additional information points:

- Inner city routes operate frequently during the weekends and at night (20-40 minutes).
- Public transport operates during the weekends with reduced frequency, routes and hours of operation in the outer suburbs. 60-70 minutes during the day time, compared to 20-60 minutes during the week.
- Public transport operates around the University and CBD until 9:00pm.
- Highest frequencies are during the week at peak hours.
- Hours of operation suit normal working hours.
- The majority of residents use electronic tickets.
- Residents are able to live in Geelong and commute to Melbourne by train.
- Park and ride facilities are available.
- $3 return shuttle is available from a free car park to CBD.
- Real time tracking of services on a smartphone app

4.1.3 Hobart

Sources used to collect information, and additional information can be collected from:

(Weatherzone:Hobart, 2016).

(Census Data:Hobart, 2011).

(Metro Tasmania , 2016)

(Id, 2016)

(North South Travel, 2015)

(City of Hobart, 2016)

Hobart is located in Tasmania, Australia. Hobarts climate presents as summer (December - February): 8.7°C - 25.2°C, autumn (March- May): 4.7°C -22.9°C, winter (June-August): 2.2°C -15.7°C and spring (September - November): 4.1°C – 21.5°C. Hobart is the capital city of Tasmania and is the second oldest city in Australia, after Sydney.

Figure 24: Hobarts Location

In 2015, Hobart had a population of 209,000 residents and 5.4% of the residents use public transport. This city was chosen for further analysis as along with an adequate population, there is an achievable public transport rate that Toowoomba would be trying to achieve in the next twenty years. Hobart is the first Australian city to introduce parking meters within the CBD to try and decrease congestion within the CBD.

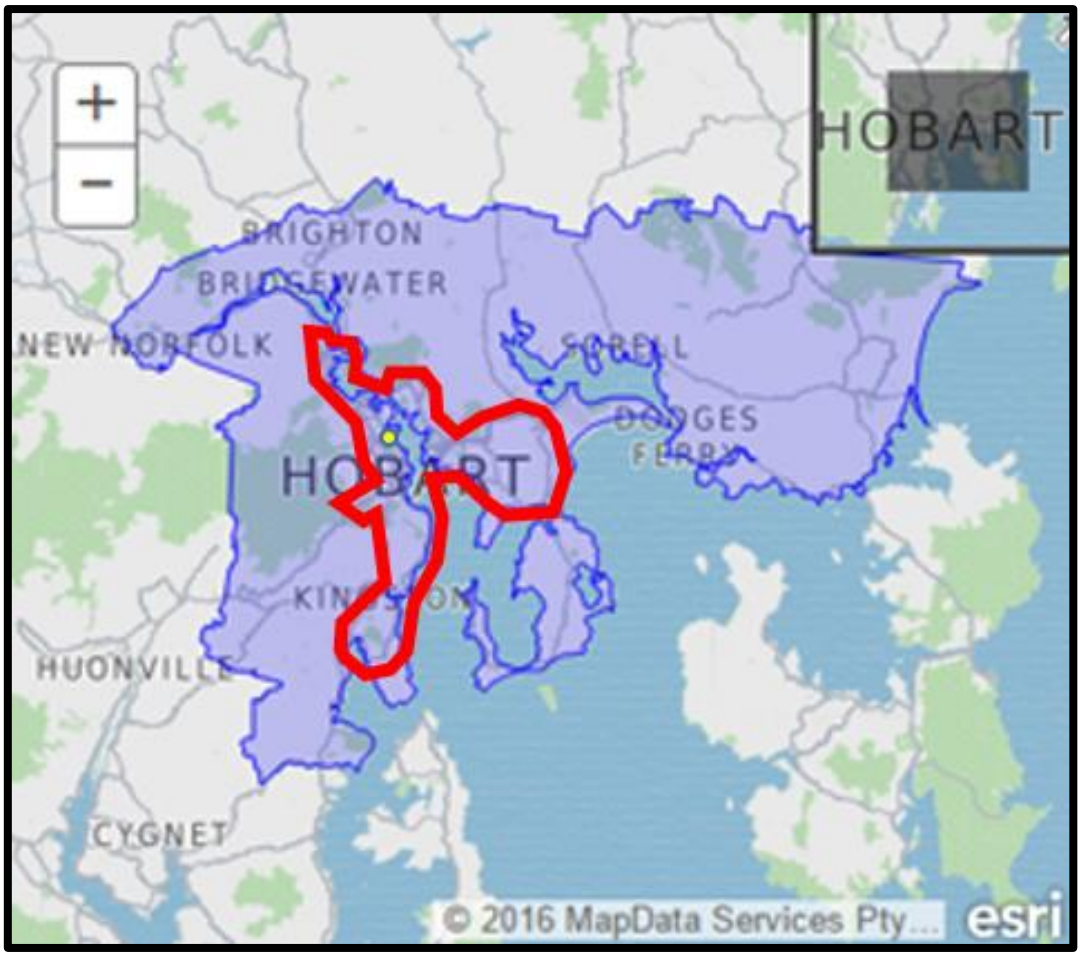

Figure 25: Hobart census data range (Census Data: Hobart, 2016)

The public transport systems only reaches the red boundary displayed in Figure 25, comparing to the blue line which represents the census data boundary. All the data collected is taken from the boundary area hence there must be a higher amount of passengers using it in the city area.

Table 7: Hobart Analysis

Hobarts Public Transport Analysis		
Public Transport Form	Number of routes	83 bus routes 1 loop shuttle bus
	Frequency of route	Bus: 20 minutes -1 hour Shuttle Bus :10 minutes
	Type of route	End to end. Loops.
	Cost	$3.20 - $6.80
	Parking Prices	Hour: $1 Daily: $19
	Ticket options	Student Fares – free (7:00am-7:00pm weekdays) or reduced Green card (electronic ticket) Single paper tickets
	Days and hours in service	Weekdays 5:30am – 11:30pm Saturday 8:50am - 11:30pm Sunday 8:30am – 7:30pm

Figure 26: Hobarts Free Shuttle (City of Hobart, 2016)

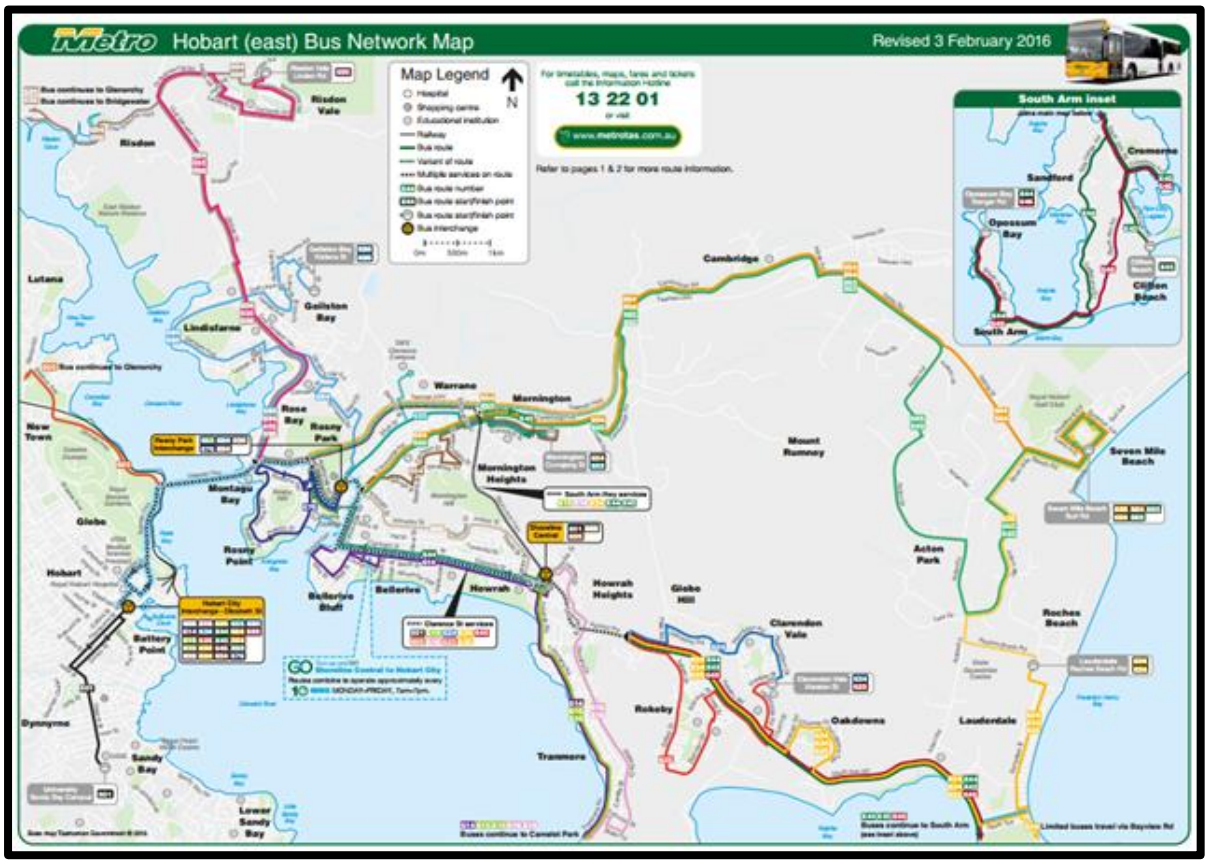

Figure 27: Hobarts East bus network map (Metro Tas, 2016)

Figure 28: Hobarts South bus network map (Metro Tas, 2016)

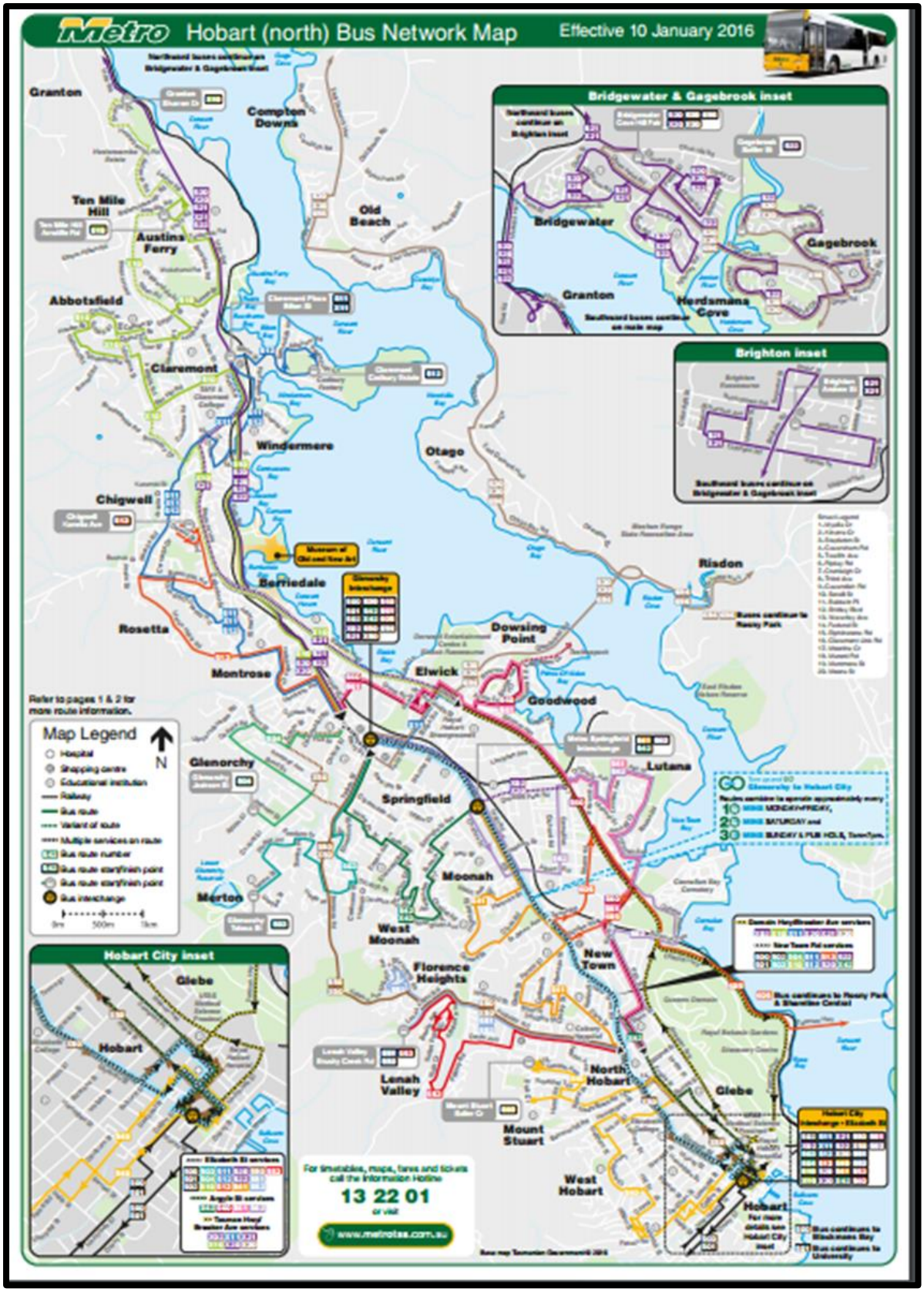

Figure 29: Hobarts North bus network map (Metro Tas, 2016)

Additional information points:

- Park and ride facilities have been supported.
- High school students receive free public transport through the week.
- Free shuttle operating on Saturday in the CBD
- 10 minute ‘Turn up and go’ service
- Two ‘Park and Ride’ stations.
- Security for bikes by providing lockers, racks and sheds.
- Public transport operates around the University and CBD until 11:00pm.
- Inner city routes operate frequently during the weekends and at night (20-40 minutes).
- Public transport operates during the weekends with reduced frequency, routes and hours of operation in the outer suburbs.
- Highest frequencies are during the week at peak hours.
- Hours of operation suit normal working hours.
- The majority of residents use electronic tickets.
- Public transport operates Friday and Saturday nights until 11:30pm.
- Real time tracking of services on a smartphone app

4.1.4 Saskatoon

Sources used to collect information, and additional information can be collected from:

(World Population Review, 2016)

(Current Results, 2016)

(National Household Survey, 2011)

(Saskatoon Transit, 2016)

(City of Saskatoon, 2016)

(University of Saskatchewan, 2016)

Saskatoon is located in Saskatchewan, Canada. The climate ranges from, summer (June – August): 11°C – 25°C, autumn (September – November): -8°C– 18°C, winter (December – February): -18°C – -6°C and spring (Mar – May): -9°C – 18°C. Saskatoon is the largest city in Saskatchewan, but Regina is the capital city.

Figure 30: Location of Saskatoon (Google Maps, 2016)

Currently, the population of Saskatoon is 199,000 (2016) and 4.4% of the population use public transport. 2% ride bikes and 5.1% walk on a daily rate. Saskatoon has a high residential density and therefore bus services can operate efficiently and meet the demand of the residents, who cannot walk or ride to their destination.

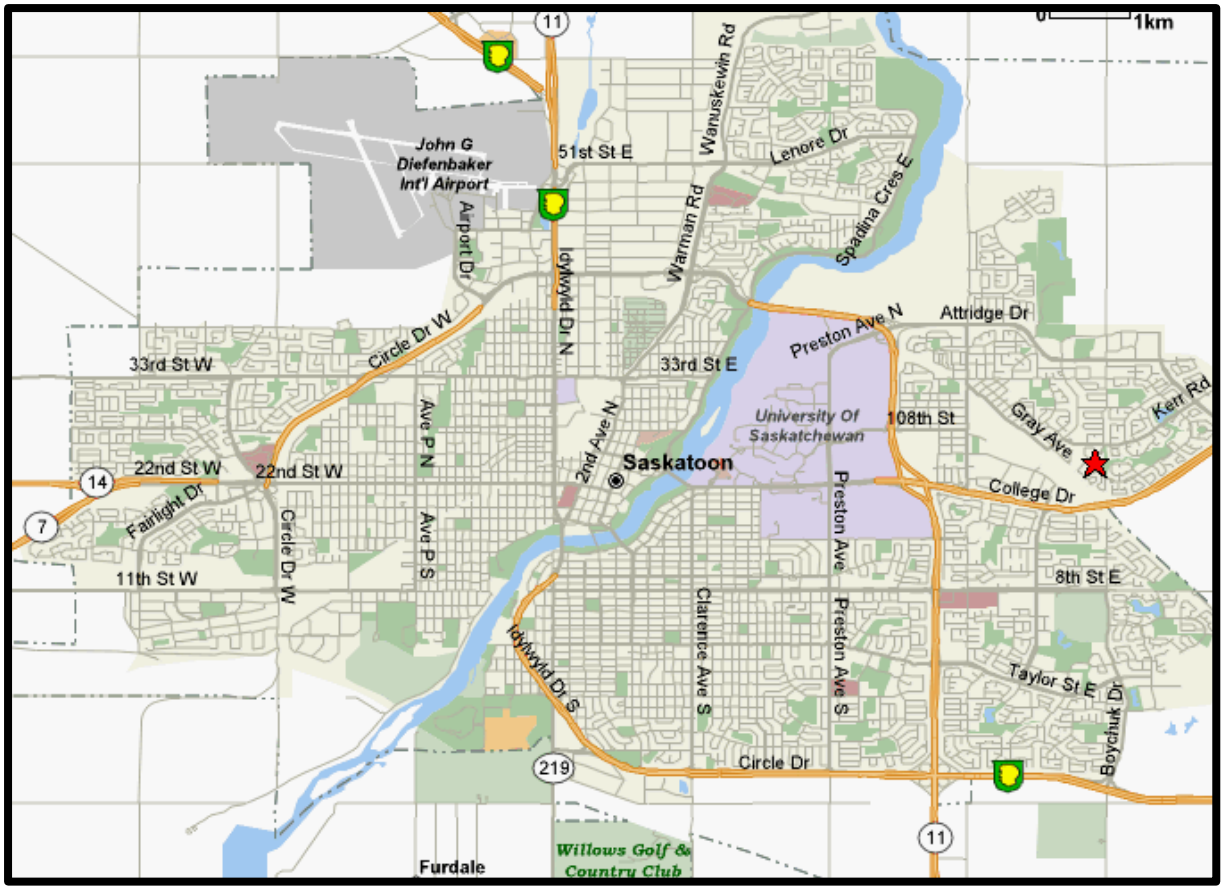

Figure 31: Saskatoon city map (World Map, 2016)

Table 8: Saskatoon analysis

Saskatoon Public Transport Analysis		
Public Transport Form	Number of routes	42 routes
	Frequency of route	Weekdays and Saturdays: 30 minutes 6:30pm onwards and Sunday: 60 minutes
	Type of route	End to end Loop End to loop
	Cost	$3
	Parking Price	Hour: $2 Daily: $16
	Ticket Options	Cash Go-Pass Smart Card U – Pass Monthly pass Annual pass Day pass Senior citizen pass Low income passes
	Days and hours in service	Weekdays - 5:30am- 1:00am Saturday – reduced routes - 6:30am – 1:00am Sunday – reduced routes - 8:45am -9:15pm

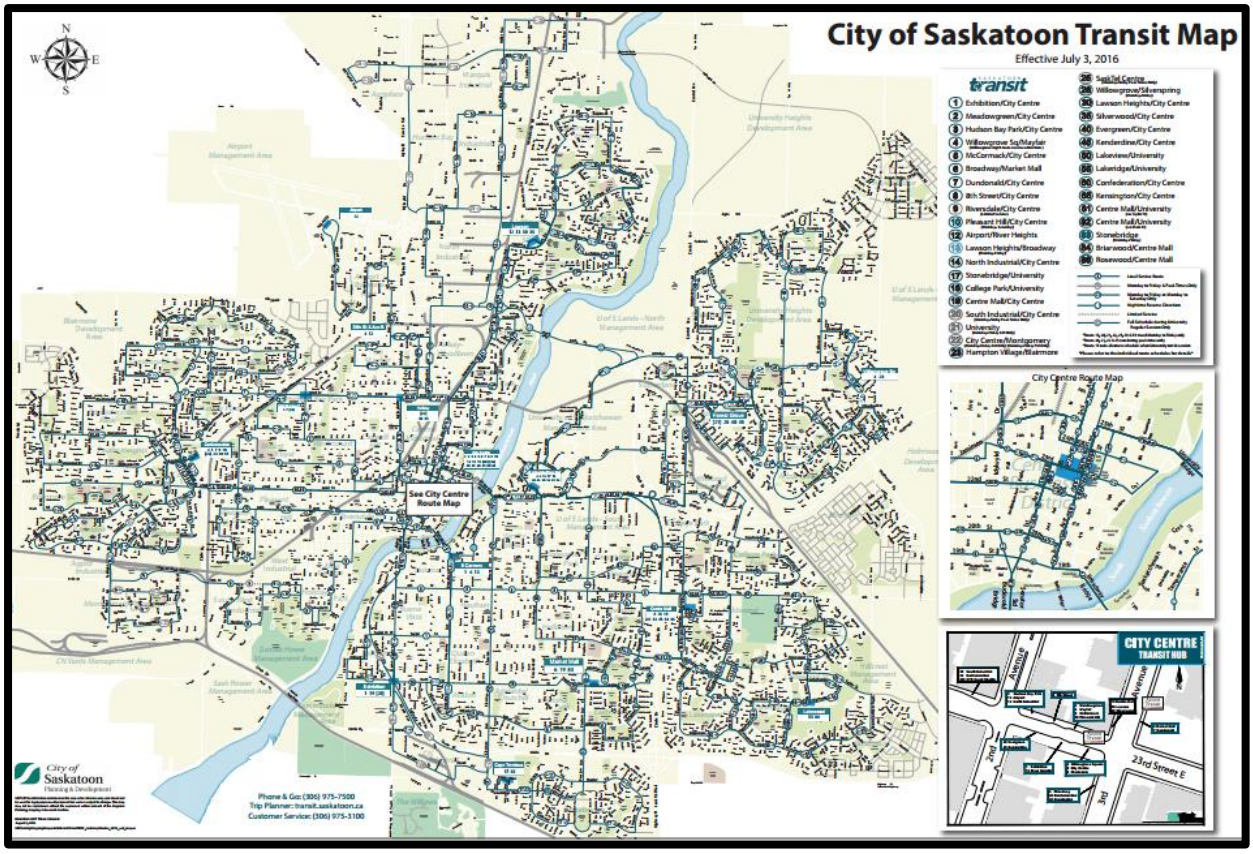

Figure 32: Saskatoon Transit Map (Saskatoon Transit, 2016)

Additional Information Points

- Real time live tracking of buses available on a smartphone app.
- Public transport operates on public holidays.
- Bike racks available on most buses.
- Night services available until 1:00am except for Sunday night.
- Easy phone and go option to locate the closest bus.
- Hours of operation suit normal working hours.
- The majority of residents use electronic tickets.
- Same stop times from Monday through to Saturday.
- Public transport operates on Sunday with reduced frequency, routes and hours of operation (60 minutes compared to 30 minutes).
- U-pass (Term Bus ticket) for university students is mandatory.
- Public transport operates around the University and CBD until 12:45pm on weekdays.

4.1.5 Barnsley

Sources used to collect information, and additional information can be collected from:

(World Weather Online, 2016)

(Travel South Yorkshire, 2016)

(Barnsley Metropolitian Borough Council , 2015)

(The National Archives, 2012)

Barnsley is located in the United Kingdom. The climate ranges from, summer (June – August): 7°C – 21°C, autumn (September – November): 2°C– 18°C, winter (December – February): 0°C – 8°C and spring (March – May): 1°C – 16°C. Barnsley is bordered by antique villages and historic parklands that make for ideal weekend trips out of the city.

Figure 33: Barnsley's location (Google Maps, 2016)

In 2011 the population of the city Barnsley was at 231,000. Of the residents, 5.2% of the individuals use public transport to get around town and to neighbouring towns on a daily basis. Even though this city's population is at the limit of being too big to analyse, it was

deemed important to look at cities in different areas around the world, to determine if the same strategies and technologies are being used.

Table 9: Barnsley Analysis

Barnsley Public Transport Analysis		
Public Transport Form	Number of routes	58 bus routes 1 train routes 3 tram routes
	Frequency of route	30 minutes -1hour
	Type of route	End to end Loop End to loop
	Cost	$2:95
	Parking Prices	Hour:$2.4 Daily: $19.2
	Ticket Options	Cash Mi Card (Electronic Card) 1 day pass 7 day pass 28 day passes Annual pass
	Days and hours in service	Weekdays: 5:15am-11:30pm Saturday: 5:30am - 11:30pm Sunday: 10:00am- 11:30pm

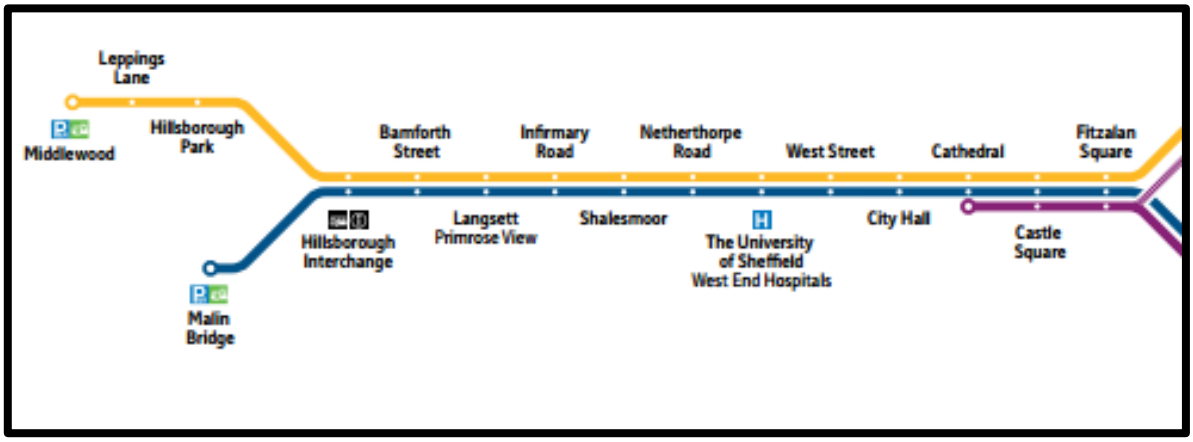

Figure 34: Barnsley Tram Route (Part 1 of 2) (Travel South Yorkshire, 2015)

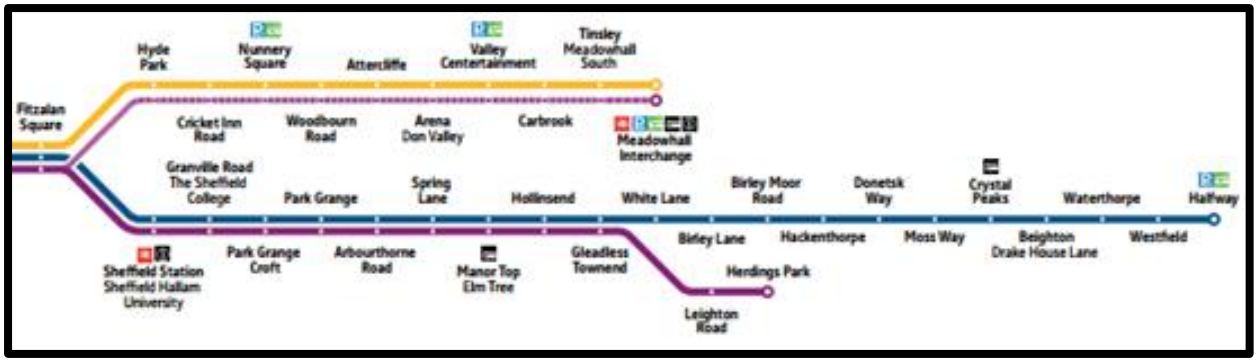

Figure 35: Barnsley Tram Route (Part 2 of 2)

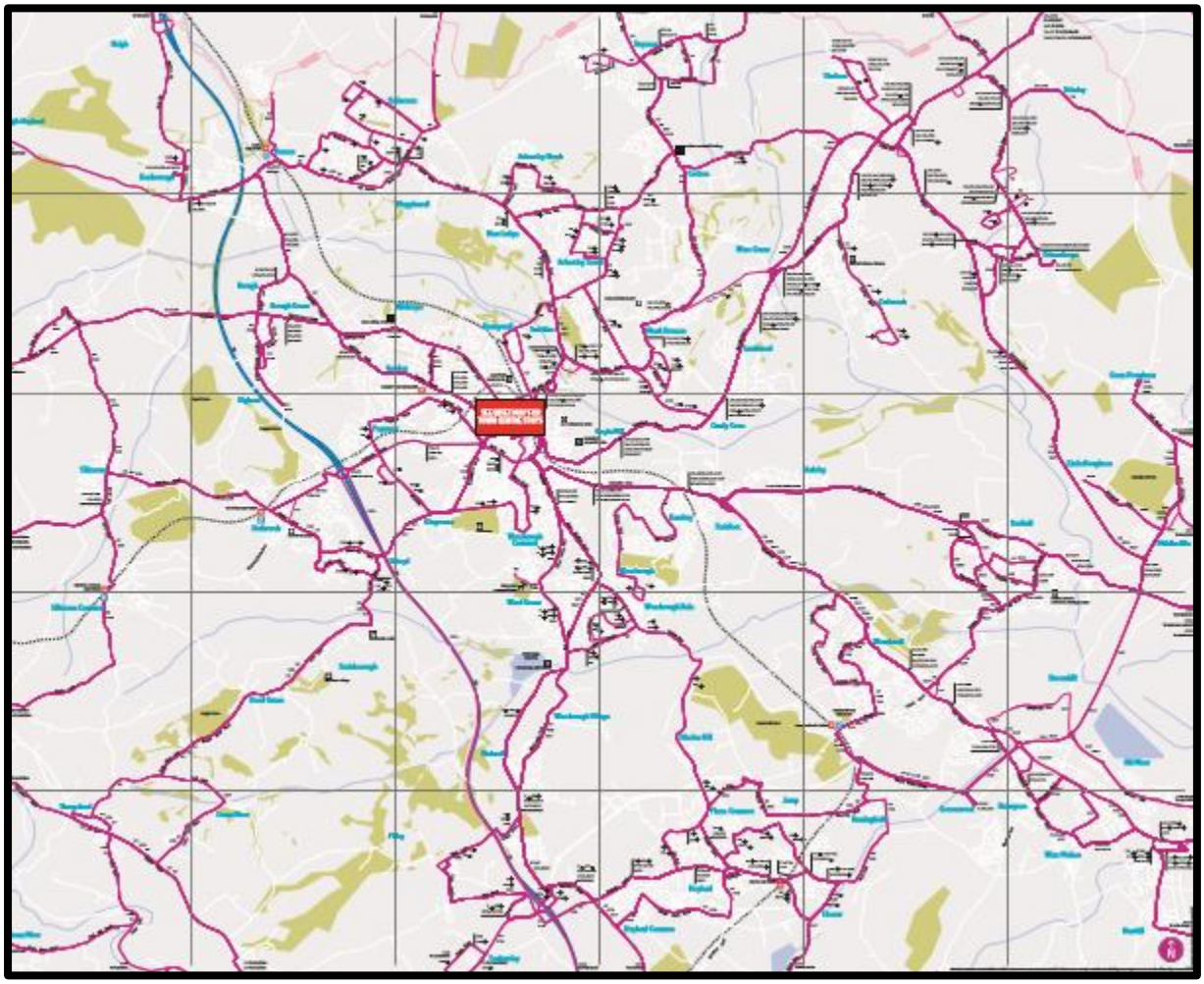

Figure 36: Barnsley Bus Route (Travel South Yorkshire, 2015)

Additional information points:

- Barnsley Transport Strategy to make it easier for people to move between home, work, health and leisure facilities by walking, cycling or using public transport.
- Park and ride facilities have been supported.
- Pedestrian and cycling road safety education are available.
- Students receive free travel on public transport if they live more than 5 kilometres from their education institution.
- Free travel for seniors on off-peak times.
- Disabled residents can travel for free anytime.
- Trains operate from the inner city out to the surrounding areas in the Barnsley region hourly.
- Buses services to connect from the tram stations to the resident's homes.
- Multiple interchanges are established to link different routes and transport methods.
- Night services available until 11:30pm every day.
- The majority of residents use electronic tickets.
- Public transport operates during the weekends with reduced frequency, routes and hours of operation in the outer suburbs
- Highest frequencies are during the week at peak hours.
- Hours of operation suit normal working hours.

4.1.6 Hamilton

Sources used to collect information, and additional information can be collected from:

(Weather and Climate, 2016)

(Bus It, 2016)

(Media New Zealand, 2015)

(Hamiliton City Council, 2016)

Hamilton is located in the North Island of New Zealand. The climate ranges from in summer (December - February): 14°C - 24°C, autumn (March - May): 7°C - 22°C, winter (June - August): 4°C - 16°C and spring (September - November): 9°C - 21°C. Hamilton is New Zealand's largest inland city, much like Toowoomba in Queensland. Hamilton is the fourth largest city and second fastest growing city in New Zealand.

Figure 37: Hamilton Location (Google Maps, 2016)

Hamilton's population in 2015 was 160,000 and between 2-5% of residents use public transport. The reason this city was selected to analysis was due to the common outwards sprawl effect of the residents housing along with being identified as a high growth city. Only an

approximate number of residents that use public transport could be determined, but it is still more than the minimum of 2% so it is suitable to be studied.

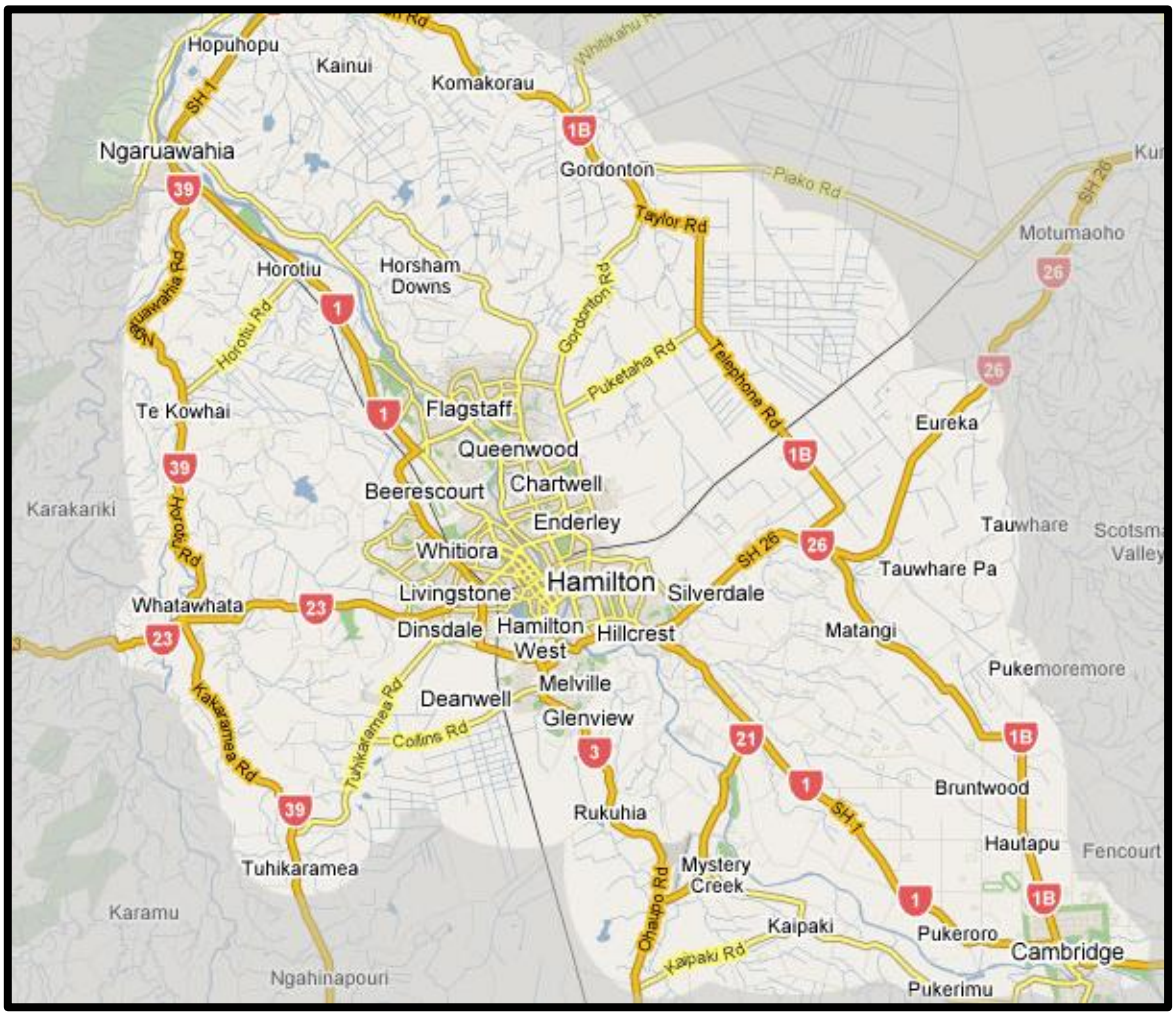

Figure 38: Hamilton City (Fire Star Appliances , 2016)

Table 10: Hamilton Analysis

Hamilton's Public Transport Analysis		
Public Transport Form	Number of routes	28 bus routes
	Frequency of route	30 minutes for the key routes 1+ hour for non-key routes.
	Type of route	End to end End and Loop
	Cost	$3.30
	Parking Prices	Hour: $2 Daily: $27.50
	Ticket options	BUS IT Cards (Electronic card) Super gold Card Student fares City explorer – 1 day pass within city limits
	Days and hours in service	Weekdays: 6:15am – 9:30pm 14 key routes service on weekends and public holidays. Saturday: 7:10am – 7:00pm Sunday: 8:30am- 7:00pm

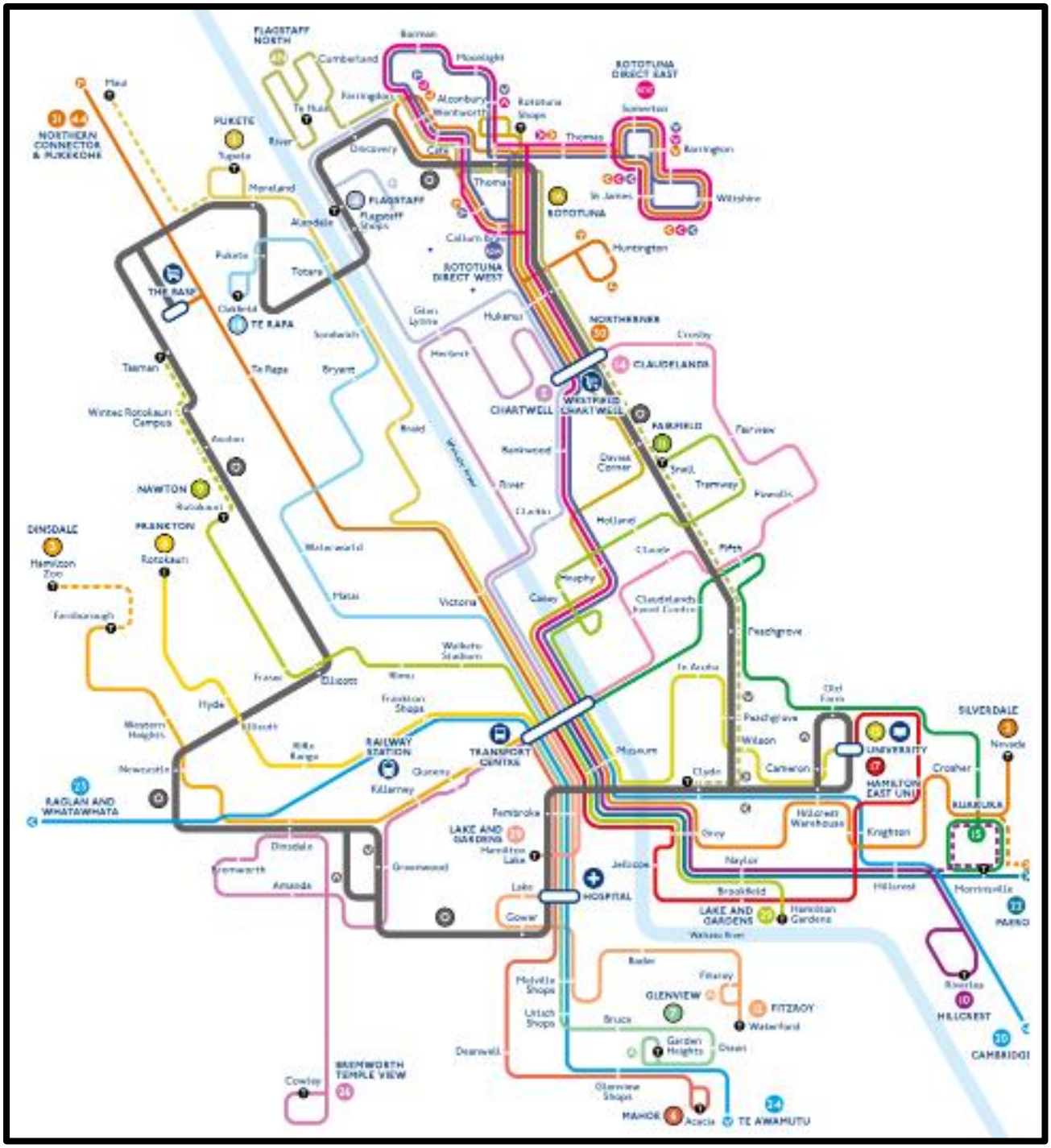

Figure 39: Hamilton public transport routes ((Bus It, 2016)

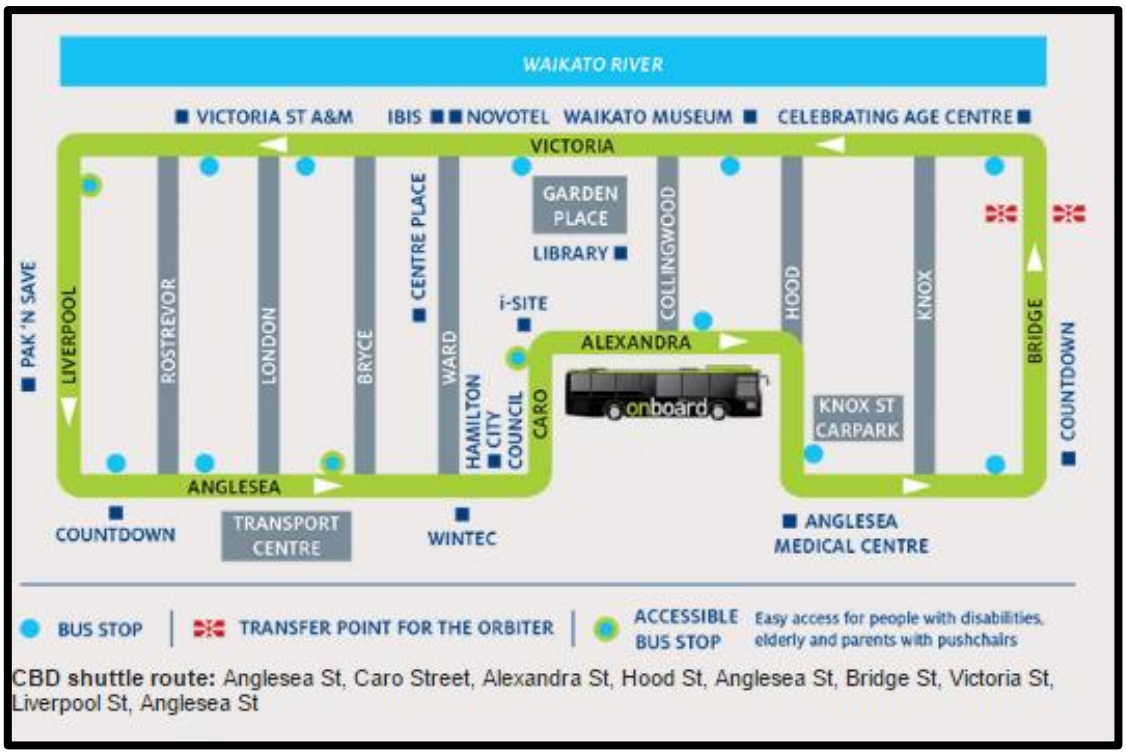

Figure 40: Hamilton's free CBD shuttle route (Bus It , 2016)

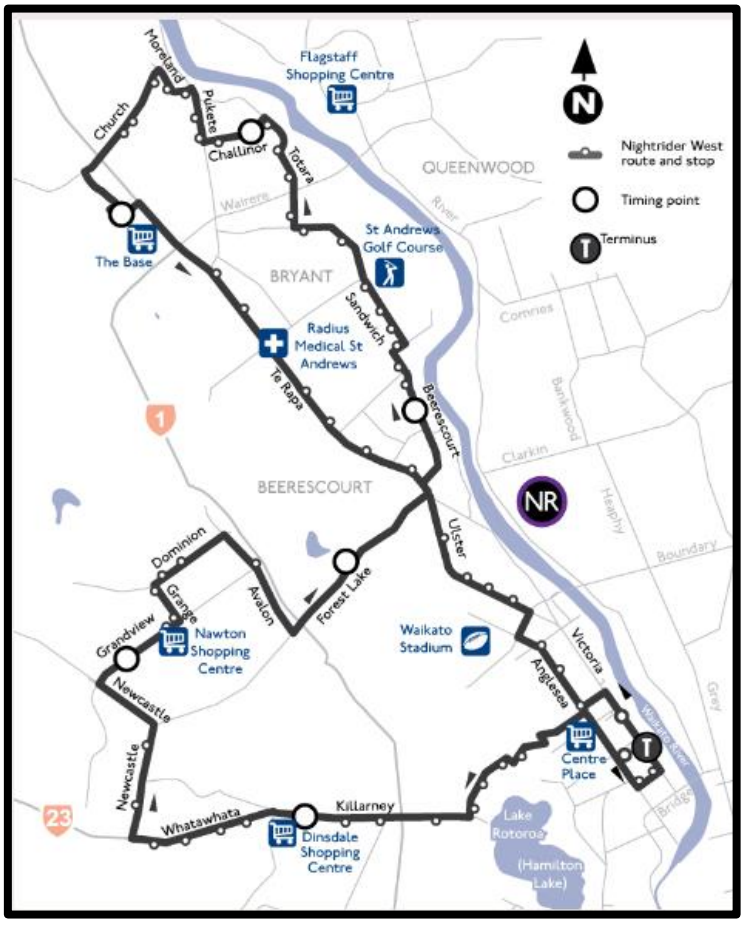

Figure 41: Hamilton night rider (East Route) (Bus It, 2016)

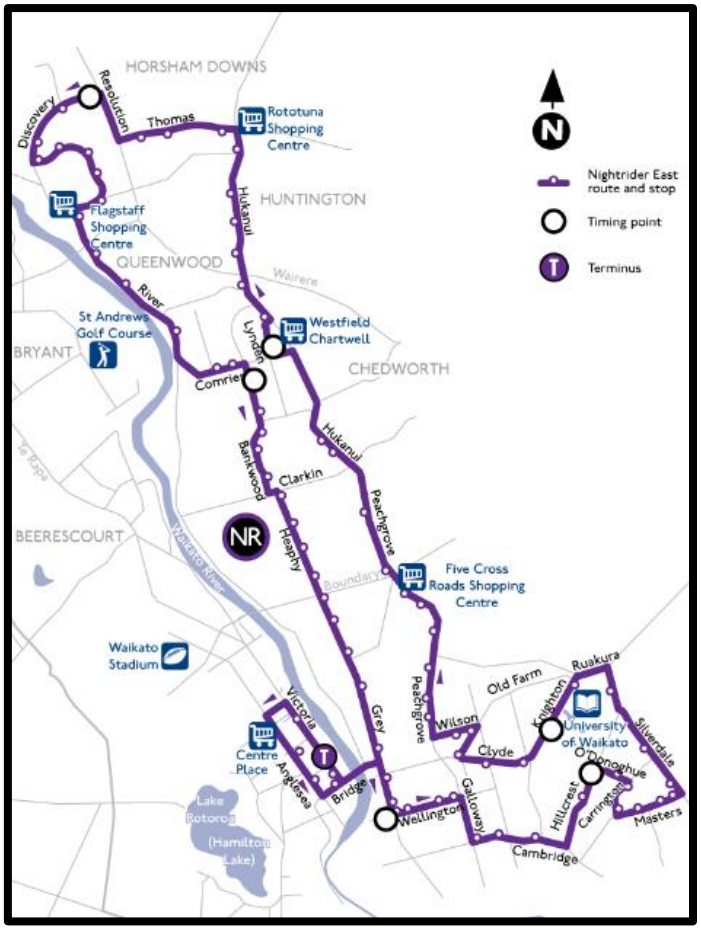

Figure 42: Hamilton night rider (West Route) (Bus It, 2016)

Additional information points

- Night services available (12:00am-4:10am) on Saturday and Sunday mornings.
- Non key routes operate only at peak times
- A free CBD shuttle operates 7:00am – 6:00pm on weekdays, and 9:00am-1:00pm on Saturday at 10 minute frequencies.
- Public transport operates on public holidays.
- Hours of operation suit normal working hours.
- The majority of residents use electronic tickets.
- Public transport operates during the weekends with reduced frequency, routes and hours of operation in the outer suburbs.
- Public transport operates around the University and CBD until 9:00pm on weekdays.
- Free travel for seniors on off-peak times.
- Highest frequencies are during the week at peak hours.
- Real time tracking of services on a smartphone app.

4.2 Other Cities Considered

Sources used to collect information, and additional information can be collected from:

(Census Data: Townsville, 2016)

(Census Data:Cairns, 2011)

(Suburban Statistics , 2016)

(World Population Review, 2016)

(Governing, 2011)

(City Mayors Statistics, 2012)

Other cities around the world that have similar demographics to Toowoomba were analysed and information on their population and public transport usage were determined. These cities didn't require further analysis as the cities were not suitable to ensure that accurate recommendations can be achieved. Australia, Canada, New Zealand, United Kingdom and the United States of America were the countries that the analysed cities were limited too.

Summary of reasons why cities were not selected for further analysis included:

- Insufficient public transport system usage.
- Inadequate data available to report accurate findings.
- Population size

Unlike Australia, the public transport usage percent is available through the census data that is collected every five years. There was not a similar system in various country's that specified what the public transport usage percent was in the selected city.

Table 11: Cities that don't make the requirements

Cities that did not meet the requirements			
City, Country	Population	Public transport Usage	Reason not finally considered
Richmond, Virginia, USA	210,000 (2012)	1.6%	Percent of residents using public transport is not high enough.
San Bernardino, California, USA	213,000 (2012)	1.6%	Percent of residents using public transport is not high enough.
Townsville, Queensland, Australia	157,000 (2011)	1.9%	Population not adequate.
Cairns, Queensland, Australia	147,000 (2015)	2.4%	Population not adequate.
Oxnard, California, USA	202,000 (2012)	Not Available	Adequate data is not available
Barrie, Ontario, Canada	182,000 (2016)	Not Available	Adequate data is not available

4.3 Survey Results

4.3.1 All Questions

Summary of survey results from Mt Lofty/ East Toowoomba Residents. There was 58 individuals that partook in the survey.

Table 12: Question 1 of survey results

1. Please circle your age group.	%	No.
Under 17	6.9	4
17-25	39.6	23
26-39	6.9	4
40-64	32.8	19
65+	13.8	8

Table 13: Question 2 of survey results

2. Please circle your gender.	%	No.
Male	41.4	24
Female	58.6	34

Table 14: Question 3 of survey results

3. How many trips out of the house do you take per average weekday?	%	No.
0	0	0
1	12.1	7
2	31.0	18
3	17.2	10
4+	39.7	23

Table 15: Question 4 of survey results

4. Have you ever used public transport in Toowoomba?	%	No.
Yes	51.724	30
No	48.276	28

Table 16: Question 5 of survey results

5. How frequently do you use public transport?	%	No.
less than 1/month	80	24
less than 1/week	3.3	1
Less than 1/day	10	3
1/day	0	0
2+/day	6.7	2

***Public Transport Users Only

Table 17: Question 6 of survey results

6. Where do you travel to? (Circle as many as appropriate)	%	No.
Work	16.7	7
Sport	4.8	2
Social	21.4	9
Shopping	33.3	14
Other	23.8	10

***Public Transport Users Only

Summary of why residents do not use public transport

- Hours of operation are unsuitable to suit working hours.
- Own a car.
- The car is convenient and quicker.
- Infrequent services.
- Parking within the CBD is not too expensive.
- Lack of information about fare prices, routes and frequency.
- Prefer to walk or drive over public transport.
- Pick up / drop off locations aren't easily locatable
- Non existent

Table 18: Question 8 of survey results

8. If there were adequate services would you use public transport?	%	No.
Yes	46.4	13
No	53.6	15

***Non users only

Summary of why residents wouldn't use public transport if there were adequate services

- Not cost effective
- Longer commute
- Prefer independence of own car

Table 19: Question 9 of survey results

9. Would you park and ride if the option was available?	%	No.
Yes	43.1	25
No	56.9	33

***Park and ride were defined as driving or biking to a location and then catching public transport to your final destination.

Summary of why residents would not partake in 'Park and Ride'

- Weather conditions.
- The uncertainty of security of the vehicle.
- Fitness levels.
- Need car during the day.
- The car is more convenient.
- Takes too long.
- Distance too small.
- Free parking available at work.
- The terrain is unsuitable for riding.
- The bus stop is close enough.

Table 20: Question 10 of survey results

10. Do you think the current transport routes in Toowoomba are sufficient?	%	No.
Yes	27.6	16
No	72.4	42

Table 21: Question 11 of survey results

11. Do you feel safe when using the public transport network?	**%**	**No.**
Yes	75.9	44
No	24.1	14

Table 22: Question 12 of survey results

12. Please rate the Toowoomba public transport network.	**%**	**No.**
Unsatisfactory	43.1	25
Average	44.8	26
Good	10.3	6
Excellent	1.7	1

Suggestions from residents on how public transport could improve in Toowoomba

- Linking with large residential developments (Highfields, Glenvale/Wellcamp, and Wyreema/Cambooya)
- Faster transportation to Brisbane (Train)
- More direct route to CDB.
- Electronic tickets available for usage.
- Smartphone app of services.
- Frequenter services.
- Linking of services.
- Safety improvements.
- Secure waiting areas.
- Buses that go later at night.
- Decrease cost.
- North to South routes and East to West routes.
- Sunday services.
- Extend hours to suit normal office hours.
- Public transport to run on time.
- Safer and more cautious drivers.

- Routes to un-serviced locations.
- Provide bike paths not on the road.
- Advertising.
- Incentives for use.
- Light rail options.
- Legalise ride share apps.
- Shift people's perceptions of public transport.
- Underground shuttle route in the CBD.
- Frequenter stops.
- Route changes.

4.3.2 'Users' verse 'non users' of public transport in Toowoomba

Analysing the difference in results when comparing the answers of residents that have used public transport before in Toowoomba (users) compared to residents that haven't used public transport (non users).

Table 23: Users Vs non users, Question 9 of survey results

9. Would you park and ride (%)	Users	No.	Non Users	No.
Yes	53.3	16	32.1	9
No	46.7	14	67.9	19

Table 24: Users Vs non users, Question 10 of survey results

10. Do you think the current transport routes in Toowoomba are sufficient? (%)	Users	No.	Non Users	No.
Yes	30	9	25	7
No	70	21	75	21

Table 25: Users Vs non users, Question 11 of survey results

11. Do you feel safe (%)	**Users**	**No.**	**Non Users**	**No.**
Yes	66.6	20	85.7	24
No	33.3	10	14.3	4

Table 26: Users Vs non users, Question 12 of survey results

12. Please rate the Toowoomba public transport Network	**Users (%)**	**Users No.**	**Non Users (%)**	**Non Users No.**
Unsatisfactory	36.7	11	50	14
Average	50	15	39.3	11
Good	10	3	10.7	3
Excellent	3.3	1	0	0

4.3.3 Gender linked results of public transport in Toowoomba

Table 27: Genders feeling safe, Question 11 of survey results

11. Do you feel safe	**Male (%)**	**Male No.**	**Female (%)**	**Female No.**
Yes	91.7	22	64.8	22
No	8.3	2	35.3	12

5.0 Discussion of Results

A discussion of the results collected about the multiple cities public transport systems and the information obtained from the data. The identified strategies and technologies that were identified will be further analysed and discussed to how they improve patronage in those cities. A discussion will occur about the trends and suggestions that the survey data provide. These discussion points will be collaborated and then recommendations will be made to improve the public transport service to increase patronage numbers within Toowoomba and more specifically, Mt Lofty.

5.1 Identify the Strategies and Technology's used in Analysed Cities

5.1.1 Network

Wellington city has sprawled so the majority of the residents live in the same area, therefore allowing a higher residential density and making it easier to service a higher amount of residents with fewer trips. Public transport in those areas is more efficient as there are many trips to these locations to service the large population. By providing train services from the CBD to the outer suburbs, it allows a larger amount of residents to be able to use the public transport and therefore meeting more resident's needs. Multiple interchanges are established to compliment and link different routes and transport methods (Metlink, 2016). The outer buses than service the residents by picking them up from the train station and then disperse them around the suburbs to their home. This ensures that larger quantities of passengers can get out to the suburbs and then can travel the last leg of their journey on a smaller bus where is isn't as highly populated and congested. This has allowed some wellington residents to not need to own their own car and rely solely on public transport (Statistics New Zealand , 2013).

One of the advantages of having a major city in close proximity to other smaller cities is that the work/life balance can be achieved. Some residents need to work in the major cities but prefer to live in a smaller city (The Age, 2013). This work/life balance can be achieved by ensuring that the residents have access to frequent fast routes between the two cities. There is a one hour train ride from Geelong to Melbourne's CBD which is the capital of Victoria (Public Transport Victoria, 2016). This allows residents to be able to live in Geelong and commute to Melbourne by train. Barnsley has trains operating from the inner city into the surrounding area hourly allowing the residents to enjoy that work/life balance (Barnsley Metropolitian Borough Council , 2015).

5.1.2 Convenience

User convenience is essential when designing public transport routes, as it is one of the major factors that determine whether a resident will use public transport. The different cities all incorporated different strategies that helped improve the user's convenience.

Convenience strategies that have been used in the cities analysed include:

- 'phone and go option' – Allows passengers to call the bus service operator, key in a bus stop number and find out the time that the next bus will be running past the bus stop. This allows the passengers to quickly access information regarding the bus timetabling (Saskatoon Transit, 2016).
- Geelong, Wellington, Hamilton, Hobart and Saskatoon all provide there users with a real time live tracking of services available on a smartphone app. This ensures that tracking of buses can be done easily and is convenient to address multiple queries which can include, but doesn't limit to:
    - How far away the next bus is.
    - Timetables of available services.
    - 8Journey planners
    - Cost

  This system allows the passengers to easily access a large range of information from there smartphone (Bus It, 2016)

- Having consistent stop times throughout the week and weekends, helps avoid user frustration. Users can become familiar with the service and can have a daily routine getting to work (CDC Victoria, 2016).
- All six cities that were analysed provided the residents with the opportunity to use different forms of the electronic card. With increasing technology, electronic cards are becoming more widely used as the system is convenient. It allows the users to not have to carry correct change, and the same card system can be used across all forms of public transport within the city (buses, trains and ferry's) (Translink, 2015). Apps that run in conjunction with the service can further enhance the user friendly environment created for simple tasks such as topping up your account. A large percent of users that use public transport all use electronic tickets when using public transport (Travel South Yorkshire, 2016).

5.1.3 Days and Hours of Operation

The days and hours of operation that public transport services operate are important. The days and hours of operation need to meet residents' needs otherwise, they cannot be frequently used and the residents cannot become dependent on. Strategies that were identified include:

- All six cities that were analysed ensured that the public transports hours of operation were suitable to allow for the residents to be able to use public transport to get to and from work between the common working hours between 7:00am-6:00pm. This ensures that the worker's needs are met, and provides the users with a reliable travel method to work.
- During those common or peak travel times, the services provided need to ensure that enough services are operating to meet the traveller's demands. All cities have the highest frequencies at peak hours during the week. The hours that the services are running more frequently vary between 7:00am and 9:00am for the before work rush and then 4:00pm-6:00pm for the residents to return home (Bus It, 2016).
- Some of the less commonly used routes within Wellington city only operate during the peak morning and afternoon times. This occurs as there is not a high enough amount of passenger usage at this time. Minimising the services helps to reduce the empty buses operating during the middle of the day. The buses still service the residents in the area that need to get to work at those times without wasting resources (Metlink, 2016).
- Public transport in all six cities operate on Saturdays, Sundays and public holidays, as the majority of businesses around the world have incorporated a 7 day trading cycle. By allowing residents to access public transport on the weekend, reduces the congestion within the city. Services are more consistent to users and ensure those residents that work on the weekends have a reliable travel method. Those services operate at a reduced frequency, fewer routes and shorter hours of operation. Due to fewer residents working on the weekend, the high frequency of routes that are provided during the week aren't needed (Barnsley Metropolian Borough Council, 2016).
- Night services are available in Barnsley, Saskatoon, Hobart and Wellington. This allows residents to partake in any after-hours activities and still be able to rely on public transport getting them home. Students are able to study later at the University and library's and use public transport to get home safety. Any passengers that go to bars and clubs have multiple travel options and an alternative travel option to Taxis and Ubers when traveling home. Therefore the residents after hour's hobbies and

commitments are able to be attended while still being able to travel home by public transport.

5.1.4 Park and Ride

Wellington, Geelong, Barnsley and Hobart have implemented park and ride facilities for the residents to utilise. This gives the option for users to ride a bicycle or drive to a location, park and then catch public transport further into the city. The cities have provided carparks and security for bikes in these locations. Security varies between cities, but include facilities such as bike racks, secure lockers and sheds. To compliment the park and ride facilities offered in Wellington, carpool priority carparks have been implemented to encourage and create incentives for residents to carpool to the park and ride destination (Metlink, 2016). This service encourages residents to use multiple forms of transportation to get to their location.

5.1.5 Reduced travel costs / free travel

The various cities that were analysed have undertaken different strategies to reduce travel costs and providing free travel to some of the residents of their city.

- Saskatoon Transit has made it mandatory for any full and part time undergraduate university students that study at University of Saskatchewan to hold a U-Pass (term bus ticket). A U- Pass tickets provides a one off fee for the students, and then the students are able to use any form of public transport in Saskatchewan for the university semester. There is no limit of trips, times or services. The cost of the U-Pass is lower than a general adult ticket (Saskatoon Transit, 2016). The U-Pass provides students with transportation savings and helps reduce the congestion at the university and surrounding suburbs. By enforcing this mandatory U-Pass, the surrounding suburbs and university area are pedestrian and cycle friendly. Students, therefore, do not need to own cars as public transport is offered all around the city. Students don't need to pay for parking at the university either. U-Passes are beneficial to students as they overall reduce the cost of mobility, and allows them to be fully dependant on the public transport service as it provides adequate services to meet the needs of the students (Saskatoon Transit, 2016).
- Barnsley provides free transport for residents that live further than 5kilometres from the university. This free service allows students to travel from there place of residence,

as per displayed on a card to the University (Barnsley Metropolitian Borough Council , 2015). This provides the residents that live further away from university with an adequate travel service to get to university.

- Barnsley and Hamilton provide free travel on public transport services for seniors and disabled residents during the off-peak times. By allowing seniors and disabled residents to travel for free on public transport in off peak time allows those residents that may struggle to drive or not have a drivers licence to increase their mobility throughout the day (Barnsley Metropolitian Borough Council , 2015). This in turns allows those residents to be less dependent on family members, friends and any other people or services that might help them move around during the day. In turn, those residents feel like they have increased freedom. The residents can plan there days around the public transport services and increase the patronage rates during non-peak hours, especially in the suburbs. If those residents want to use public transport during peak hours, than reduced rates apply (Bus It, 2016).
- Hobart has allowed high school students to receive free public transport through the week between 7:00am and 7:00pm to get to school. This allows students to rely purely on public transport. The students carry an ID card and therefore can participate in after hour's activities at school before going home (Metro Tasmania , 2016). By allowing the younger generations with free transport allows them to learn how to use it and encourage usage. The students are more likely to continue using the public transport network, rather than opting for alternative ways of travel as they grow up, therefore increasing public transport usage in the future.

5.1.6 CBD shuttle

Providing shuttles in the CBD is an effective way to ensure that congestion can be reduced within the city centre. CBD shuttle usage reduces the stress of finding carparks in the city centre (Atlantic, 2016). Routes that focused primary within the CBD are common amongst all the cities that were analysed. City Shuttle buses were provided in Hamilton, Hobart and Geelong.

- Hamilton offers a free CBD shuttle that operates between 7:00am – 6:00pm on weekdays, and between 9:00am-1:00pm on Saturday. The route operates at 10 minute frequencies (Bus It , 2016).

- Hobart runs a free shuttle bus around the CBD all day on Saturday (Metro Tasmania , 2016).
- Geelong operates a $3 return shuttle from a large free car park out of the CBD to the city centre. As parking costing more expensive than $3 in the CBD, it is cost effective for the residents to park further away and catch the shuttle in (CDC Victoria, 2016).

These cities have incorporated these strategies to ensure that getting around the CBD on the weekends when there is increased amounts of people is easier and therefore reducing the congestion within the city (Atlantic, 2016).

5.1.7 Frequency

There needs to be a high enough frequency of public transport services to cope with the increased passengers during peak times. This ensures that travel time is not delayed and reduces waiting time for passengers. Increased frequency of services in peak travel times make using public transport more desirable and therefore would increase the passenger's usage (Wardman, 2001).

The frequency of the services depends on the time of day, the area and the location of the final destination. The cities that were analysed followed a similar pattern. In peak hours, services operated every 10-30 minutes. During the day in the outer suburbs, services operated every 30-60 minutes. In the CBD, services operated between 10-30 minutes.

Hobart has a service operating called 'Turn up at go'. This service allows residents to be on one side of the CBD and get to the other side easily. There are multiple stops and buses that run along that route with the possibility of continuing through. It provides the residents with an easy way to travel around the CBD. There are services operating between 7:00am and 7:00pm at a minimum frequency of 10 minutes, Monday to Friday, 20 minutes on Saturdays and 30 minutes on Sundays (Metro Tas, 2016).

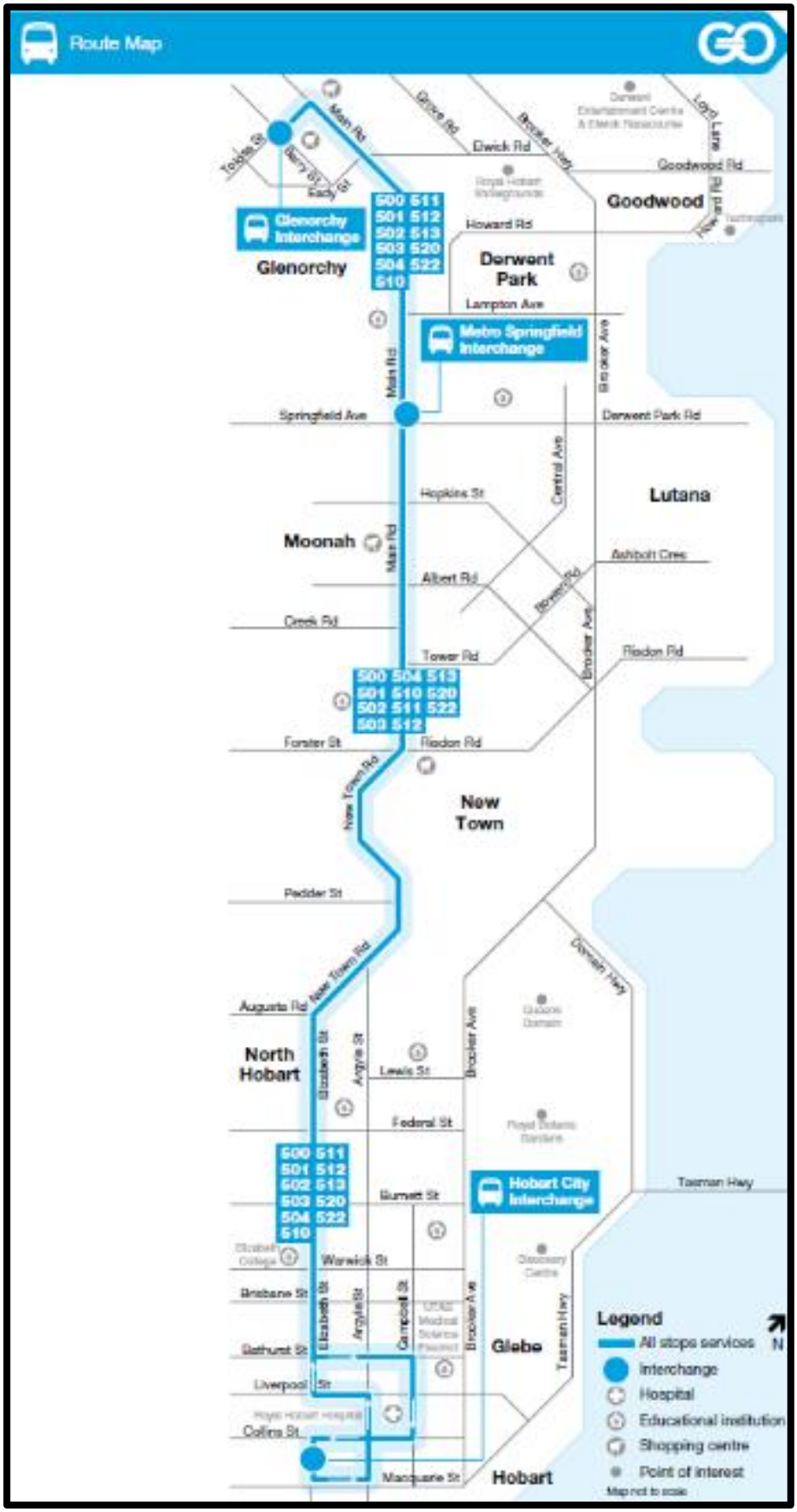

Figure 43: Turn up and go service in Hobart (Metro Tas, 2016)

5.1.8 Routes

In all six cities analysed the routes allowed travel to all major destinations, as well as providing a high coverage within the residential suburbs. Public transport routes have been planned and designed carefully to try and accommodate as many people as possible.

The most common locations where the services were offered were:

- Residential neighbourhoods.
- Education facilities (University, School and Tafe).
- Shopping Centres.
- City Centres.
- Hospitals.
- Sports fields/stadiums.
- Individual city attractions (Museums/Parks etc.).

It was determined that residential neighbourhoods were the best serviced area as if there are no public transport routes near a resident's house, the user can't use it. These locations are common designations that users frequently need to go to, therefore there is high demand to provide services to these locations.

5.1.9 Cost

Local, State and National governments believe the cost of traveling on public transport is the key variable that effects patronage on public transport. To ensure a higher usage of passengers using public transport, the fares need to be affordable to all income classes (Mitric & Carruthers, 2005).

5.1.9.1 Fare costs

The cost of using public transport in the various cities that were analysed are displayed in table 28. The fare displayed is the price of one single adult bus ticket travelling one zone. Geelong, Saskatoon, Barnsley and Hamilton have a flat fare cost.

Table 28: Fare Prices (AUS) in the various cities

City	Fare
Wellington	$2.50
Geelong	$3.90
Hobart	$3.20
Saskatoon	$3.00
Barnsley	$2.95
Hamilton	$3.3

All cities public transport fares are lower than $4. With the initial cost of purchasing a car, maintenance, fuel, servicing, interest and devaluation of the car, it makes owning a car expensive. For a week, the cost of using public transport could be $50, compared to RACQ saying what you spend on a small new car a week is $110 (RACQ, 2016). It becomes more cost efficient to use public transport in these cities. These cities all provide a cheaper alternative to owning a car.

5.1.9.2 CBD parking compared to Using public transport.

One of the major factors that affect the public transport usage is the cost of using public transport. For the residents that work within the CBD, a comparison between the costs of taking public transport to work to the cost of parking in the CBD needs to be considered. Public transport needs to be more cost effective than using a car and paying for parking within the CBD, to subsidise the extra time that the user may spend travelling to work.

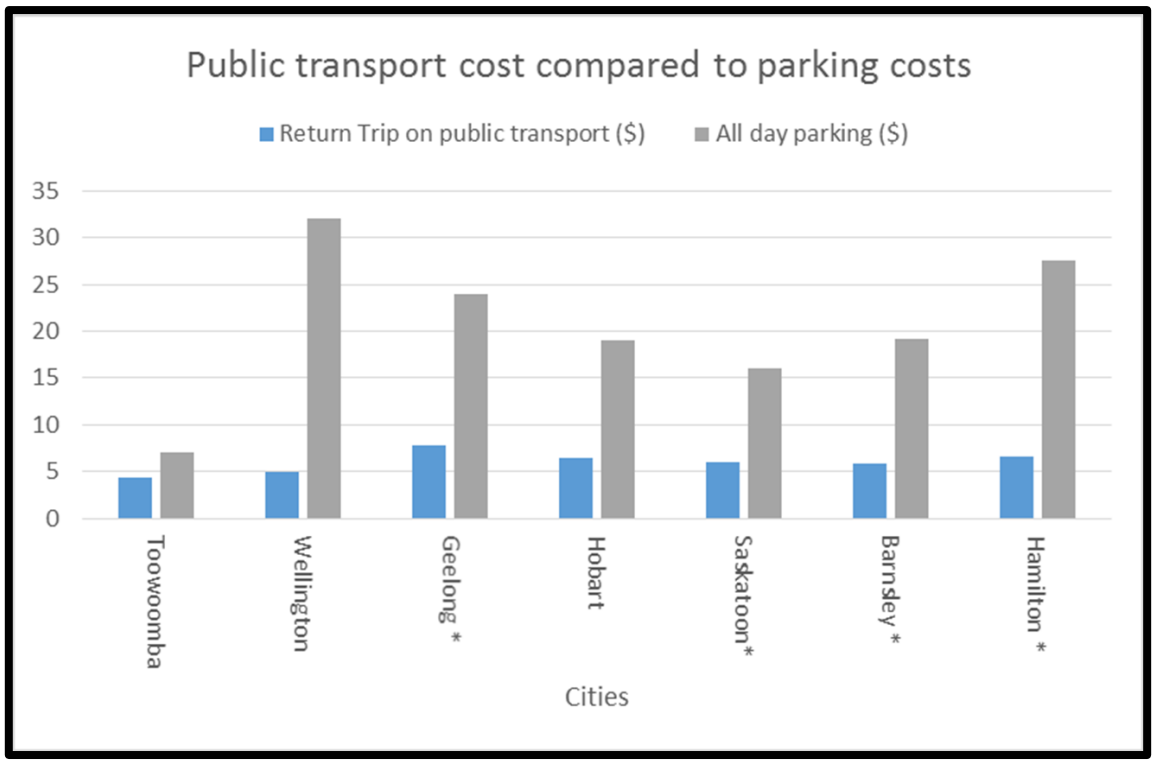

Figure 44: Cost of using public transport

Information regarding Figure 44;

- *Cities have only one price for a public transport ticket.
- All other cities, the prices are the minimum cost for a return ticket based on a single, one zone, adult price with no discount applied.
- This graph was formed based on parking prices in the CBD, and the prices were gathered in reference to the city council carpark prices to ensure consistently.

As Figure 44 above shows, the price of using public transport is between 15% and 38% of the cost to park in the CBD all day. Conclusions can be made that it is cost effective to use public transport in these cities, and would contribute to the high public transport usage rates in these cities.

5.1.10 Safety

Ensuring that users feel safe using public transport, is a top priority. Staff members being present, proper lighting and surveillance operating increases the users feeling of being safe. Due to the unavailability of detailed strategies in place in the individual cities analysed, and primarily how safe the users feel using public transport, this will not be further included.

5.2 Identify the Trends in the Survey Results

Key points from the survey will be discussed and analysed to determine why there is a low public transport usage rate in Toowoomba. There were 58 residents that participated in this survey.

The key findings to be discussed are as follows:

Question 3 asks, "How many trips out of the house do you take on an average weekday?" From this question, the term 'trip' was not specified. In this context, a trip is defined as 'going from one place to another' (The Free Dictionary, 2016). Some participants questioned the term 'trip', and therefore answered according to their own judgement as to what they believed the term alluded to. This then resulted in inconsistent data. As this data collected from the question is varying, it will not be used in the analysis.

A query posed in question 6: "Where do you travel to?" resulted in some participants selecting the option 'other', when in actual fact they meant 'school', as outlined in their survey. As several school students were surveyed and indicated they use public transport to get to and from school, 'school' should have been an option due to the recurrence of this answer. Of the 30 residents utilising public transport, the locations in which they listed they visit most are: shopping (14), other (10), social (9), work (7) and sport (2). Residents were allowed to select as many options as were appropriate. It can be seen that the shop was the most common reason for using public transport and therefore routes servicing the shopping centres in the area need to be a high priority. As the bus route leads into the CBD where residents can easily shop or work, the bus route supports the data that has been collected in regards to these locations.

51.7% of residents living in the suburb of Mt Lofty, claimed to have used public transport in Toowoomba. Of particular note, 80% of these users, access public transport less than once a month. Therefore, public transport in Toowoomba is not convenient for the residents to use on a regular basis. In some situations, driving may not be an available option, thus, making public transport their last resort/backup option. Two residents out of the 58 surveyed, aged between 17 and 25, use public transport twice a day going to and from school as indicated on the survey. From these results, it can be assumed these residents do not own a car.

Nearly half of the non-public transport users said they would use public transport if adequate services were available. This is an important number to note, as it shows that if the public transport services within Toowoomba improved and met the resident's needs, there is potential for a higher patronage usage. To ensure that the resident's needs are met, examining the reasons as to why residents choose not to use public transport will allow any recurring patterns to be recognised. The main reason why the individuals did not use public transport was because the hours of operation were unsuitable to fit in with normal working hours. The first Mt Lofty bus does not get into the CBD (Toowoomba bus exchange) until after 8:05am in the morning and the last service leaves the CBD at 4:45pm. Thus, these operating hours reinforce the unsuitability for residents that may work standard working hours (Transport and Motoring, Queensland Government, 2015) . With services only operating hourly and then no services operating in the suburb between 1:45pm and 4:20 pm, this disadvantages any residents that may want to use public transport between these times. Currently, the combination of free and paid parking and most residents own their own vehicle (Census Data: Toowoomba, 2011) making it more convenient for residents to drive into town and pay for parking, as it's not much more expensive than 2 tickets on the bus. Until using public transport is cheaper than parking within the city, the residents will be reluctant to look for alternative way to travel into the CBD, opting to continue driving their own vehicles.

43% of the residents surveyed said they would participate in park and ride system if it was available. The participations that said that they would not park and ride gave this answer due to the security of their vehicle or bike and that the bus stop location was close enough not to ride or drive before swapping to public transport. Other points that were brought up included Toowoomba's climate and having insufficient fitness levels to ride the steep hills within Mt Lofty. Adequate security for cars and bicycles need to be a priority if a successful park and ride service is going to be achieved. For this change to occur, bike racks or sheds and security cameras would need to be provided. By providing bicycle routes that are not on the road and allocating additional designated bike lanes more people will be encouraged to use their bike as a mode of transport.

30% of public transport users and 25% of non-users believed the public transport services to be sufficient. Consequently, 68% of all residents believe the public transport network is not adequate and therefore improvements need to be made to make it more suitable and useable. The majority of the suggestions from the residents were about the timetabling of the bus

service, and seeking longer hours of operation that suit normal working hours, more frequent services and to operate on Sundays. Since a growing number of businesses in Toowoomba now operate on 7 day trading cycle, residents that work on Sunday have no option but to drive to work. By providing a service to those residents would then consequently open up a service to provide transport to these residents who work Sundays. Offering services on Sunday would also allow residents to catch the bus into the shopping centres so residents can avoid the increasing congestion in the city centre. Residents have also suggested a service that runs later into the night.

Changing the routes to service more areas, would give the public transport network a wider range, hence providing services to more residents. A potential solution would be to incorporate a 'Dial and go' service to reach the less demanding areas, this would allow all the residents in the area to be able to access public transport.

Comparing the differences in the male and female statistics as to whether they feel safe on public transport is very important. Feeling safe plays an important role in public transport as patronage levels will decrease if they don't feel safe. 91.7% of males feel safe when using public transport compared to 64.8% of females feeling safe. This shows that 35% of females are worried about their safety on public transport, Females feeling safe on public transport needs to be a focus, with the aim of achieving 100%. As some of the suggestions were about increasing safety and have secure waiting areas, this highlights that safety could be the reason why some residents don't use public transport in Toowoomba.

Comparing the results of question 12 "please rate the Toowoomba public transport network", the users of public transport rated it higher than the non-users. Comparing 50% of non-users who suggest it to be unsatisfactory, to 36.7% of users, it can be seen that a lower percentage of users find it that bad. 50% of public transport users say that the network is average compared to 39.3% of non-users. This confirms that once using the public transport network, a higher rating would be achieved. 10% of users think that the public transport system is good and 3.3% of users thinks it is excellent showing there are residents that do think the public transport network within Toowoomba is a valuable service.

Other suggestions recorded by the residents in Toowoomba highlight alternative technologies and strategies that could improve the service. By introducing an electronic ticket system, it

would be much easier and convenient for passengers to use the service as they don't have to carry cash and the cards can be easily topped up online. Creating a majority cashless system would make it much more convenient for the users. Since technology is continuing to rise, creating an app that can be accessible on resident's smartphones is ideal so that passengers can plan their trip, be shown when the next bus will come to the designated stop and will allow users to find out information easier rather than going on to the website and manually looking at a timetable. By initially having some incentives to encourage passengers to use the bus service might help encourage new passengers to take advantage of using public transport.

Some long term solutions and out of scope suggestions have been made though are noteworthy. These suggestions were: a shuttle route system in the CBD, whereby a train runs from Toowoomba to Brisbane on a regular basis, allowing residents to commute between the two places for work. Another suggestion was the introduction of train lines to the smaller, surroundings towns and suburbs such as Highfields, Wyreema, Cambooya, Glenvale and Wellcamp. Legalising ride share apps, shifting residents views regarding public transport, decrease the cost and increase advertising about what public transport is available in Toowoomba are more suggestions that were made.

5.3 Comparing the Identified Main Strategies and Technologies and the Survey Results Trends to Toowoomba

An analysis of the subject cities identified key strategies and technologies and how they may be implemented within Toowoomba, and more specifically Mt Lofty. The survey results obtained from participants will be considered when deciding how to recommend and implement the strategies and technologies within Toowoomba (and Mt Lofty).

5.3.1 Network

To increase the ability for the small portion of Toowoomba residents that choose to travel to achieve the sought after work/life balance can occur by increasing or offering alternative options (The Age, 2013). By increasing the options for travel arrangements, a small portion of Toowoomba residents that choose to travel to obtain a better work/life balance will able to achieve their sought after lifestyle by making use of these alternative arrangements. In particular, Toowoomba residents that need to get to Brisbane on a daily basis are after a quicker and easier option. Currently, Toowoomba has 17 bus return trips daily to Brisbane. This commute takes 1 hour and 45 minutes through the use of transport companies such as Greyhound and Murrays (Greyhound, 2016) (Murrays, 2016). This commute time is longer than both Geelong and Barnsley routes. Until there is an alternatives transport service with a smaller commute time, residents will not be able to take advantage of working in Brisbane whilst taking advantage of the Toowoomba lifestyle. This work/life balance can be achieved by ensuring that the residents have access to more frequent and faster routes between the two cities.

By providing a ‘dial and go’ service operating in Mt Lofty, the Toowoomba Council would allow for the residents in the low usage area, to be provided with services and thereby increase such usage. This type of service is beneficial as there are currently not enough residents to justify consistent and frequent routes, but it still allows more residents of Mt Lofty to get into town. Figure 45 shows the location that the ‘dial and go’ service can operate. The current bus route servicing the area is able to collect the residents in that area by leaving the fixed route and returning to that location after collecting the resident, when the service is returning down Mary Street. This proposed service can pick up residents at those required times, and if there are no dial and go residents on that route, than the service can continue on as normal.

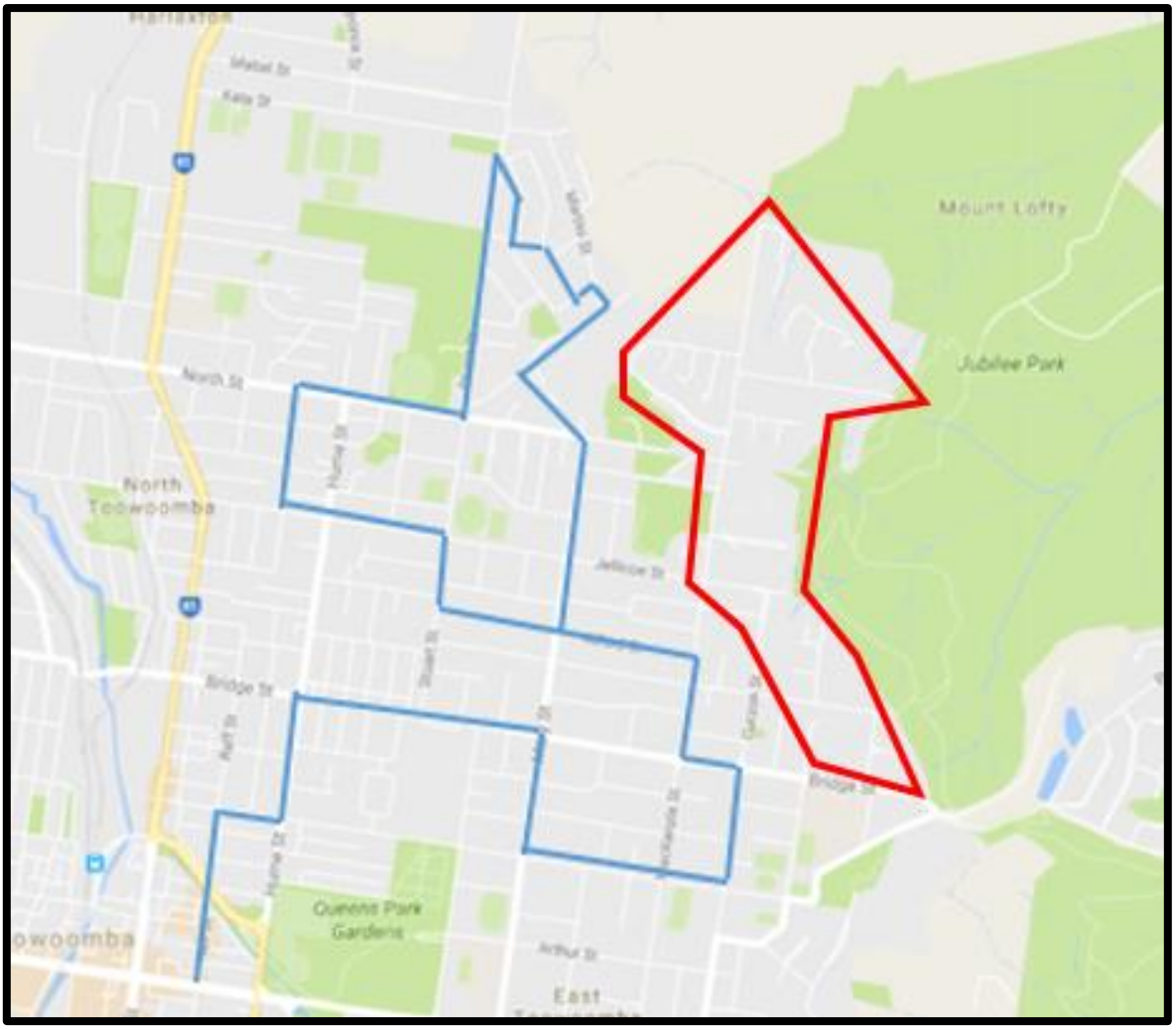

Figure 45: Kan-go service for the future (Mt Lofty) (Google Maps, 2016)

5.3.2 Convenience

Introducing the use of electronic tickets into Toowoomba would increase the traveller's convenience in making use of public transport as well as reduce the need for the exchange of cash. Users would not be constrained by having to be in possession of the correct change to utilise the service and the overall efficiency at each bus stop would increase. Translink runs public transport in other cities in Queensland (Brisbane, Gold Coast, Sunshine Coast and Cairns) that offer electronic tickets. Translink also maintain a service for their customers that allows for the usage of apps. Introducing these strategies to Toowoomba would be relatively easy to achieve and implement with the need to keep up with the increasing technology that is already be in place in those other cities. Providing the Toowoomba residents with this service would significantly increase patronage of the Toowoomba bus services due to the more user

friendly nature of the system in addition to the ease with which the customer is able to access key information.

Toowoomba's public transport system has allowed local residents to become familiar with the timing of the current services as these remain consistent throughout the week. This helps prevent user frustration and can allow the residents to have a set daily routine. Increasing the frequency of the same schedule and routes will allow for users in Toowoomba to have better access to the city and surrounding areas at differing times to what is currently offered. By ensuring that the new schedule remains consistent and predictable during both the weekdays and weekends, the service will remain user friendly and will ultimately encourage residents to utilise their public transport options.

5.3.3 Hours and days of operation

Unlike all the cities that were analysed, Toowoomba's buses, days and hours of operations are not accommodating the needs of the local population. From the survey data, it can been seen that the most common reason residents say they don't use public transport is due to the hours and frequency with which it operates. In Mt Lofty, the buses run from 7:30am-5:00pm on weekdays and 8:30am-4:30pm on Saturdays. Increasing the hours that the bus service is operating will allow more residents to be able to use the bus, especially allowing residents to travel to work. Currently the times don't meet the needs of the majority of the workforce. By expanding those hours the bus service would allow for more workers to utilise their public transport options. There is also the potential for increased patronage if the hours of operation were increased as 42% of residents that currently don't use public transport said that if adequate services were in place, they would make use of public transport. By increasing their hours of operation so as to service the normal business hours, the workers then have an alternative method to private transport.

By providing public transport on Sundays and public holidays, Qconnect will facilitate a more reliable and convenient system for the local Toowoomba population. Toowoomba, like most cities, operates on a 7 day trading cycle and will therefore be able to service those users working, as well as provide an alternative transport method to driving and dealing with weekend congestion within the city centre. These services don't need to be as frequent as weekdays as there will be fewer residents working.

By incorporating a night schedule, Qconnect is able to provide a beneficial alternative to the patrons of the Toowoomba CBD without the need for those patrons to organise parking, the expense of taxis or even have to walk home. By periodically extending the hours of operation, Qconnect will allow those users that partake in after-hours activity's the ability to rely on public transport to get home. Due to Toowoomba's current population, it would not be feasible to incorporate after hours services straight away, but as Toowoomba's population continues to grow, it will become more viable.

5.3.4 Park and ride

By providing park and ride facilities for Toowoomba residents Qconnect will encourage an alternative method of travel. This allows residents that may be located further away from bus stops to ride their bicycle or alternative mode of transport, to the bus stop and lock it up in a locker provided and continue their journey by utilising the public transport network. Determining where these locations should be stationed is critical in ensuring that they will be used effectively. Providing these park and ride areas in a flat location is also important as residents are more inclined to ride a bike on a flat road rather than on mountainous terrain. The survey data showed that Toowoomba residents were concerned about the security provision for bikes and cars, hence this need to be a priority to ensure that residents feel confident their personal property is secure. This security can be achieved by providing lockers, racks or sheds with security cameras, increasing bike paths and routes, introducing pedestrian and providing cycling road safety education awareness would also increase pedestrian usage within Toowoomba. 43% of residents within Toowoomba say that they would park and ride which shows that there is the potential to increase not only public transport usage but also bicycle riding as well. By providing bicycle routes that are not on the road and allocating additional designated bike lanes more people will be encouraged to use their bike as a mode of transport. In Mt Lofty, there is currently not as much potential for a park and ride facilities as at other locations due to the mountainous terrain. Providing a location on flat ground that's easier for residents to ride further distances on is a more viable option

5.3.5 Reduced travel costs / free travel

By incorporating reduced ticket costs, residents within Toowoomba would increase the usage of public transport as long as the services provided were accommodating to those residents. The cities that were analysed incorporated various strategies, these included; a mandatory

public transport pass for university students (Saskatoon Transit, 2016), free transport for students that lived over 5kilometers from their education facility (Barnsley Metropolitian Borough Council , 2015), seniors and disabled residents received free travel in non-peak times (Barnsley Metropolitian Borough Council , 2015) (Bus It, 2016) and high school students travel for free (Metlink, 2016).

Enforcing a concept such as mandatory public transport tickets in Toowoomba for the university students may not be suitable in this location as the University is not situated in the city centre.

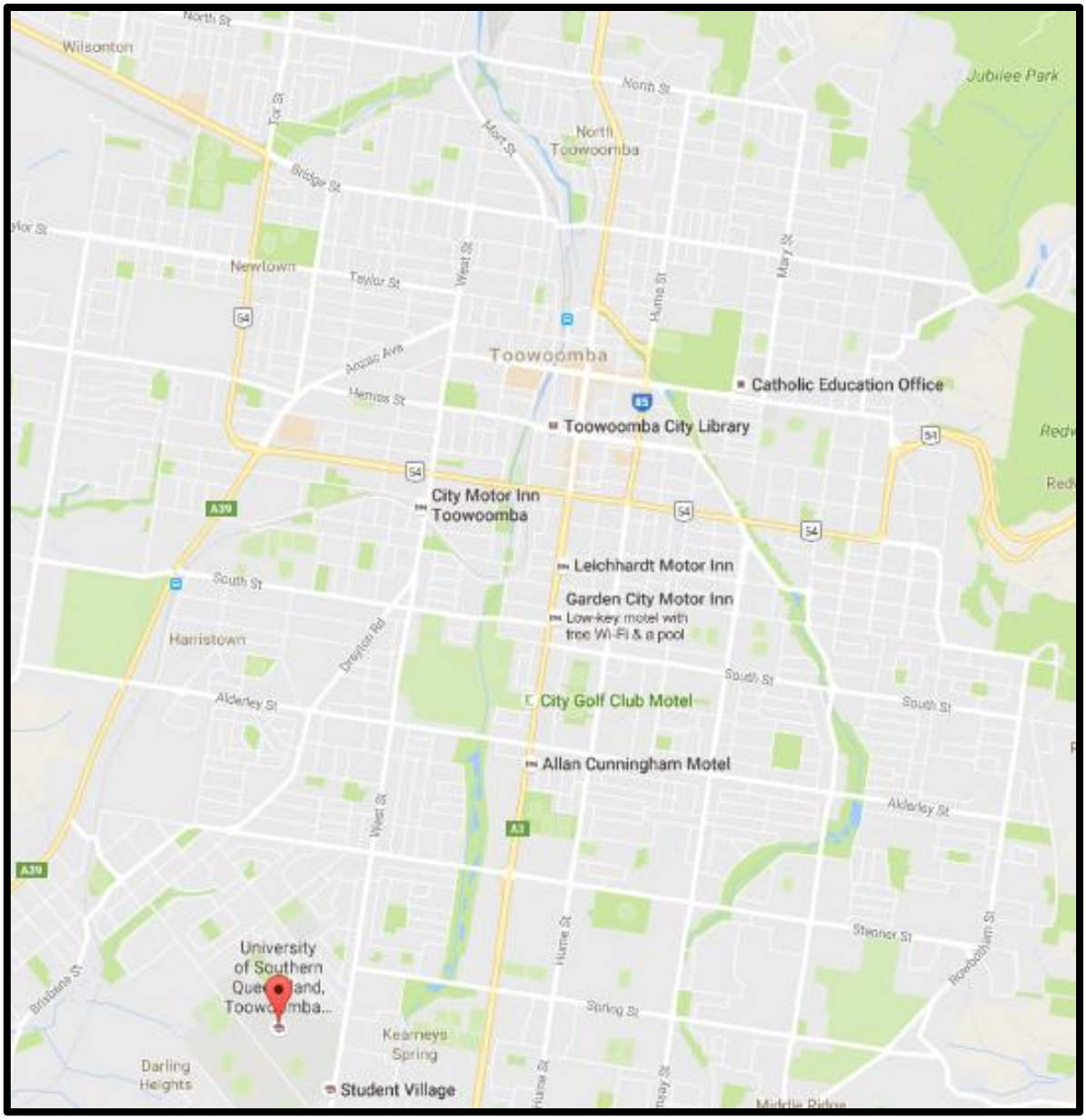

Figure 46: USQ in Toowoomba (Google Maps, 2016)

As seen in Figure 46, the university is on the outskirts of Toowoomba and there are only four bus routes in the area surrounding the university. Until public transport in Toowoomba improves and provides more frequent and convenient routes servicing the university, this strategy would not be effective as the services that are provided would not benefit the students in allowing them to take advantage of public transport. Providing students that live more than 5kilometres away from the university with free public transport would not be practical at this stage either as the services are too infrequent and unreliable to support this proposition. Both these strategy's may be introduced as a long term strategy when there is a convenient and efficient public transport network that efficiently services the university and the suburbs that the students may reside in. Implementing these strategies will encourage the younger generations to utilise public transport. By allowing free public transport for students those students using public transport will become familiar with public transport and are therefore more likely to continue using the services when they are older as they will know how to use it and value its convenience.

Allowing disabled and senior residents of Toowoomba to utilise the public transport system in non-peak hours allows those individuals to increase the patronage within the common lower passenger times. This also allows those residents that may struggle to drive or not have a drivers licence to increase their mobility throughout the day rather than being dependant on family members or taxis. This strategy currently would not be feasible. This strategy could be introduced in the future when there is a higher public transport usage and better services to accommodate the needs of those residents.

5.3.6 CBD shuttle

Toowoomba has recently introduced a CBD shuttle in Toowoomba and it was discontinued due to low patronage. As the service stopped operating on the 19th August 2016, it is evident that currently there is not high enough demand to support this type of service. In the future, when Toowoomba is larger and more highly populated, this strategy should be reintroduced and can contribute to lowering the amount of congestion within the CBD. To begin with, this service can operate on weekends, following the trends of the other cities analysed, and if there is a need and patronage to support it, the service can be extended to include services during the week. This will increase the ease of mobility within the Toowoomba CBD.

5.3.7 Frequency

Providing users with higher frequencies of services is critical especially in peak times. During those common or peak travel times, Qconnect needs to ensure that there are enough services operating to meet the user's demands. All cities have the highest frequencies at peak hours during the week. The hours that the services are running more frequently vary between 7:00am and 9:00am for the before work user's and then between 4:00pm and 6:00pm for the user's return trip. Commonly, amongst the cities that were analysed, it was found that services every 10-30 minutes were effective depending on the destinations. To start with, Toowoomba would need to incorporate services that ran every 30 minutes in peak hours, to ensure that those residents' needs are met and can provide a reliable travel method.

A strategy that was implemented in Hobart, the 'turn up and go' wouldn't operate as efficiently in Toowoomba as it doesn't have a similar layout to Hobart's CBD which is able to support this system. Until Toowoomba is more populated with a higher number of residents using the public transport network (which would require more services and more frequent routes) this system would not be viable. In the long term, this type of service could have the potential to run frequently throughout the CBD along two major streets, Margaret Street and Ruthven Street.

5.3.8 Routes

Ensuring that Toowoomba's routes pass through the key locations is important to ensure that no matter where the user's designation is, public transport can be used. The most common designations are residential neighbourhoods, education facilities, shopping centres, the city centre, sports fields and other city specific key locations. The bus run starts in the city centre at the bus terminal and that bypasses the Technical and Further Education (TAFE) facility, Mary Street village, Mackenzie road shops, Northlands Shopping Centre while additionally servicing the surrounding residential suburbs. Providing a link from the Mt Lofty suburb to the CBD is essential as it is allowing those residents that work in the city to be able to use public transport. A revision of the routes is required to incorporate a higher coverage area within the suburb to ensure that services can be utilized by more users. Revising the current route to include a stop at North Point shopping centre will encourage more residents to use the service as it is a major shopping centre that provides goods and services for the surrounding suburbs. Since the survey data stated that the majority of residents use public transport to get to shopping centres, incorporating the major shopping centre into the route, residents in Mt Lofty will be

able to easily and quickly get down to a shopping centre, with multiple variations of shops, and then catch public transport home.

5.3.9 Cost

Comparing the cost to park in Toowoomba's CBD compared to other cities analysed, it is evident why residents in Toowoomba choose to park in the CBD rather than catch the currently unreliable public transport.

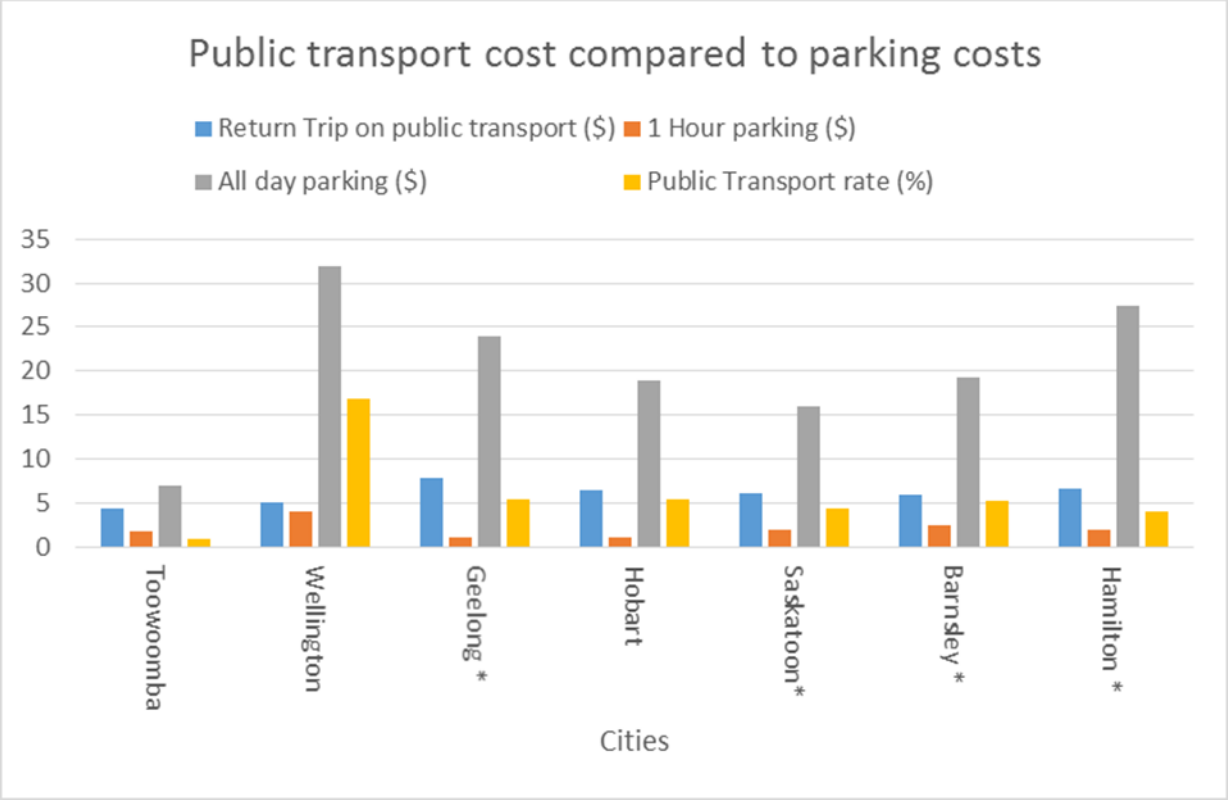

Figure 47: Public transport cost compared to parking costs

Figure 47, shows a direct link between why Toowoomba residents don't use public transport and the cost of parking in the CBD. In Toowoomba, a return ticket on the bus costs $4.40. Alternatively, the cost of parking all day in the CBD, is $7.00. Using public transport is only 63% cheaper than parking. The larger the gap between the price of using public transport compared to parking, in conjunction with the availability of carparks, is directly linked to increased public transport usage. Until using public transport is more cost effective than parking within the city, the Toowoomba residents will be reluctant to look for an alternative

way to travel into the CBD. The price to obtain a 1 hour car park within the CBD is displayed to demonstrate that if residents only needed to be in the CBD for a short time, the use public transport becomes even less effective. Despite the fact that parking is more expensive, the price is not much more than that of using public transport. Looking at the comparison between Toowoomba and the other cities, there is a much larger gap between how much it costs to park in the city and the price of paying for public transport. Increasing the cost of parking in the CBD, however, is not the solution. Toowoomba's has an increasing population and it is going to become harder to find car parks within the CBD which in turn will increase public transport usage, as residents will have to look for alternative travel methods.

5.3.10 Translink Proposal for Toowoomba's public transport

On the 23rd of September 2016, Translink released their plans for Toowoomba's new bus network. Translink is proposing longer operating hours, Sunday services and extended coverage. This further supports the recommendations of the identified strategies that have been provided in this dissertation. The proposed routes are currently up for debate and there is community consultation currently occurring including, online surveys and feedback boxes in regards to the route revisions and the strategies users want to see in their new public transport system (Translink, 2016). Whilst Translink is currently in the investigation process and no precise recommendations have been made, it appears that the conclusions of their analysis will produce the changes to Toowoomba bus services that are in line with the recommendations of this dissertation.

6.0 Conclusion

6.1 General conclusions

Effective public transport is essential in Toowoomba as the population is increasing at a rapid pace. In twenty years' time, the expected population of the Toowoomba Region will be 200,000 residents (Queensland Treasury and Trade, 2012). Currently, only 0.7% of Toowoomba's North-East suburb, Mt Lofty residents travel to work by public transport (Census Data: Toowoomba, 2011). With limited carparks in the city centre, increased driving times and limited roadways, congestion within city centre is being created. There is a strain on the current public transport networks to meet the needs of the ever growing population and, therefore, the advancement of the public transport network needs to occur in order to decrease of public cars in the city centre.

This dissutation has identifed the major factors controlling the current development and use of public transport within the Toowoomba area and has identified strategies and technologies which would be appropriate for development within the next 20 years.

6.1.1 Short term strategies

The aforementioned strategies are to be implemented by Qconnect as a short term plan.

Increased hours of operation

The key strategy to be implemented is increasing the hours of operation so residents are able to use the bus to travel to work. By increasing the hours of operations to service the normal business hours, it would allow them to have an alternative travel method other than by private transport. If users are able to use a service that is convenient, reliable and efficient than usage rate will increase. Without this key strategy being implemented the additional strategies will not be as efficient.

Route revision

An important strategy that needs to occur to increase the public transport usage is the revision of currently provided routes to ensure that a larger suburban coverage area is achieved along with servicing the essential locations within Mt Lofty. A higher coverage area within the suburbs will ensure that more residents can access the services and incorporating a stop at

North Point shopping centre will encourage more residents to use the service due to the amount of people that access the centre on a daily basis. This strategy is essential to ensure that an increasing amount of residents will use the service.

Sunday services

Providing public transport services on Sundays will allow the service be more convenient for the users. With Toowoomba business's operating on a 7 day trading cycle, users that work on Sunday are able to still use public transport to travel to work. Weekend services are essential in reducing the amount of congestion within the city centre; however, these services do not need to be as frequent as weekday services.

Electronic tickets

Residents in Mt Lofty identified not having electronic tickets to use on public transport in Toowoomba was a common reason why they were not using the service. The introduction of electronic tickets is a vital strategy to increase patronage as the technology makes it more user friendly and allows information about the service to be easily accessible.

'Dial and go' service

A 'dial and go' service implemented in Mt Lofty where there is minimal residents and public transport users is essential to ensure that if residents needed to use the bus services, services are provided. The bus that currently services Mt Lofty can collect those residents and if there is no dial and go residents at that time, the bus can continue as normal.

6.1.2 Long term strategies

The aforementioned strategies are to be implemented by Qconnect as a long term plan as growth occurs.

Higher frequencies

This strategy is essential in ensuring that the residents' needs are met as Toowoomba continues to expand. Increasing the frequency of the services provided initially in peak hours from currently times of 60 minutes to 30 minutes intervals. There is the potential for increasing additional services at other times in busy locations as public transport usage rates increase. Providing the users with higher frequencies of services is critical especially at peak times and, therefore, will increase usage rates within Toowoomba.

Night services available.

Incorporating the public transport services to include night services in Toowoomba is a strategy to be implemented once the public transport services are producing higher usage rates and hence more viable. Services running into the night will allow residents to participate in after hour activities and still be able to catch the public transport home, thus creating the opportunity for increasing usage rates.

CBD shuttle

Once Toowoomba's population has grown, the re-introduction of the CBD shuttle service that the Toowoomba Regional Council has previously provided is viable. Having a higher population will ensure that adequate numbers will be achieved to make it worthwhile and feasible to run. Initially operating on weekends, and then expanding to include services during the week, as the demand develops.

Free transport for students and/or seniors.

Providing free or reduced costs for students on the public transport network will only be an effective strategy once there are frequent and convenient routes that service the university. This long term strategy is to be introduced once the University is a major destination within Toowoomba's public transport system. Introducing the strategy of allowing disabled and senior residents of Toowoomba to utilise the public transport system in non-peak hours will allow those individuals to increase the patronage within the common lower passenger times. Once there is a higher usage rate and, therefore; is more feasible to provide free transport, this strategy can be implemented.

Employing these strategies will increase the public transport usage within Toowoomba by providing the residents with an effective, reliable, usable and convenient public transport network. With these recommended strategies in place, as Toowoomba's population continues to increase, the public transport network will be able to withstand the demand and in turn increase mobility in conjunction with decreasing the congestion and use of private cars within the city centre. This dissertation has provided a recommendation to the Queensland Government that will improve the usage of the public transport service provided by Qconnect in Toowoomba.

6.2 Recommendations

The recommendations for this investigation are determined from the analysis of the cities. The majority of recommendations can be applied to Toowoomba's public transport system and can be further validated in future research.

Recommendations from this dissertation include:

- 'Dial and go service'
- Longer hours of operations
- Services available on Sunday
- The introduction of electronic tickets
- Revision of routes
- Higher frequency's services
- Night services available
- CDB shuttle on Saturdays
- Free public transport for students and/or seniors.

These recommendations can be implemented into Toowoomba's public transport system within the next twenty years to increase patronage by creating a more convenient and user friendly service for the Toowoomba residents.

6.3 Further research

There are many topics that future researches could investigate in regards to the topic of Future Public Transport Options for Toowoomba in Twenty Years. Further research in this area, may include:

- Investigating how implementing the individual strategies and technologies that have been identified into Toowoomba.
- Future routes and service times for Toowoomba buses. Provide specific route paths for the Toowoomba city and surrounding suburbs, as well as providing the hours of operation and frequencies for the services.
- Timelines and costing for implementation. Determine a timeline that these strategies and technology are that have been identified and determine the costing of providing these additional services.
- Location of the potential park and ride facilities in Toowoomba. Determining the key locations in Toowoomba that would ensure the highest amount of residents to use the park and ride facilities.
- Determining why cities of Toowoomba's size, struggle to provide an efficient public transport network. An analysis of cities with a population of 100,000 residents and determine why public transport in these cities are hard to increase patronages and have effective services running for the residents.

These further research recommendations are required to provide a greater understanding of how these identified technologies and strategies all integrate together and provide an increase in public transport usage. Further information will allow Qconnect to make more informed decisions regarding the future of public transport within Toowoomba and ultimately increase patronage.

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8.0 Appendix

Appendix A – Project Specification

ENG4111/4112 Research Project

Project Specification

For: Belinda Freeman

Title: Future Public Transport Options for Toowoomba.

Major: Civil Engineering

Supervisor: Ron Ayers

Enrolment: ENG4111- Oncampus S1, 2016: ENG4112 – Oncampus S2, 2016

Project Aim: To identify the major factors controlling the current development and use of public transport within the Toowoomba area and to identify strategies and technologies which would be appropriate for development within the next twenty years.

Programme: Issue A 1st of March 2016

1. Undertake background research relevant to the Project Aim and focussing on
    a. Current and planned public transport in Australian cities;
    b. Overseas public transport systems which may be applicable to regional Australian cities and towns;
    c. Planning and design procedures for public transport systems, particularly bus systems;
    d. The development and use of public transport in Toowoomba.
2. Identify the major factors controlling development and use of public transport.
3. Select and define a suitable study area in Toowoomba (taking account of the existing road network, existing public transport system routes, and census boundaries). Gather data on the selected study area in regard to demographics, car ownership, public transport services, public transport usage, perceived transport needs, etc.
4. Identify about ten (10) cities, from within Australia and developed overseas countries, which have a similar or slightly higher population to Toowoomba.
5. For each city, carry out an analysis of their public transport systems and identify possible strategies or technologies which could potentially be implemented in Toowoomba.
6. Consider how each identify strategy or technology might be implemented in Toowoomba or in the selected study area.
7. Devise and implement a survey to test public reaction to the strategies/technologies proposed.
8. Compile recommendations on how Toowoomba's public transport systems should be developed over the next twenty years.
9. Report findings in required oral and written formats.

If time and resources permit:

10. Carry out an economic analysis of the proposed strategies/technologies .

All project resources will be sourced by the Toowoomba Regional Council, University of Southern Queensland Library and Translink.

Student: Belinda Freeman 7/3/16 Supervisor: R. Ayers 7/3/16

Appendix B- Survey Results

Below are the individual results that were collected in the survey.

Person	1	2	3	4	5	6	7
1. Age Group							
Under 17							
17-25	1	1	1	1		1	1
26-39							
40-64					1		
65+							
2. Gender							
Male		1	1	1	1	1	1
Female	1						
3. How many trips out of the house per weekday							
0							
1			1		1		
2	1						
3		1		1			
4+						1	1
4. Have you ever used public transport							
Yes	1	1			1	1	
No			1	1			1
5. How frequenty do you use public transport?							
less than 1/month		1			1	1	
less than 1/week							
Less than 1/day							
1/day							
2+/day	1						
6. Where do you travel to?							
work						1	
Sport						1	
Social		1				1	
Shopping	1				1	1	
Other	1						
8. if there was adequate services would you use Public Transport							
Yes			1	1			
No							1
9. Would you park and ride							
Yes	1		1	1			
No		1			1	1	1
10. Do you think the current transport routes in Toowoomba are sufficient?							
Yes		1	1		1	1	
No	1			1			1
11. Do you feel safe							
Yes		1	1	1	1	1	
No	1						1
12 Please rate the Toowoomba public transport Network							
Unsatisfactory	1						1
Average		1	1	1	1		
Good						1	
Excellent							

Person	8	9	10	11	12	13	14
1. Age Group							
Under 17			1				
17-25	1	1				1	1
26-39							
40-64				1	1		
65+							
2. Gender							
Male					1		
Female	1	1	1	1		1	1
3. How many trips out of the house per weekday							
0							
1							
2	1		1		1		
3							1
4+		1		1		1	
4. Have you ever used public transport							
Yes	1			1	1		1
No		1	1			1	
5. How frequenty do you use public transport?							
less than 1/month	1			1	1		1
less than 1/week							
Less than 1/day							
1/day							
2+/day							
6. Where do you travel to?							
work				1			
Sport							
Social	1						
Shopping							1
Other							1
8. if there was adequate services would you use Public Transport							
Yes			1			1	
No		1					
9. Would you park and ride							
Yes	1		1	1	1		1
No		1				1	
10. Do you think the current transport routes in Toowoomba are sufficient?							
Yes		1				1	1
No	1		1	1	1		
11. Do you feel safe							
Yes		1		1	1	1	
No	1		1				1
12 Please rate the Toowoomba public transport Network							
Unsatisfactory	1		1	1			
Average		1			1	1	1
Good							
Excellent							

Person	15	16	17	18	19	20	21
1. Age Group							
Under 17		1		1			
17-25	1		1		1	1	1
26-39							
40-64							
65+							
2. Gender							
Male							
Female	1	1	1	1	1	1	1
3. How many trips out of the house per weekday							
0							
1							
2	1						1
3					1	1	
4+		1	1	1			
4. Have you ever used public transport							
Yes	1	1	1	1		1	1
No					1		
5. How frequenty do you use public transport?							
less than 1/month	1	1	1	1		1	
less than 1/week							
Less than 1/day							
1/day							
2+/day							1
6. Where do you travel to?							
work	1			1			1
Sport							1
Social			1				
Shopping			1	1			1
Other		1	1	1			
8. if there was adequate services would you use Public Transport							
Yes					1		
No						1	
9. Would you park and ride							
Yes	1	1	1	1		1	
No					1		1
10. Do you think the current transport routes in Toowoomba are sufficient?							
Yes	1				1		
No		1	1	1		1	1
11. Do you feel safe							
Yes		1		1	1		
No	1		1			1	1
12 Please rate the Toowoomba public transport Network							
Unsatisfactory			1			1	
Average	1	1		1			1
Good					1		
Excellent							

Person	22	23	24	25	26	27	28
1. Age Group							
Under 17							
17-25	1	1	1	1		1	1
26-39							
40-64					1		
65+							
2. Gender							
Male					1	1	1
Female	1	1	1	1			
3. How many trips out of the house per weekday							
0							
1							
2	1	1	1	1			
3							
4+					1	1	1
4. Have you ever used public transport							
Yes		1	1	1		1	
No	1				1		1
5. How frequenty do you use public transport?							
less than 1/month		1	1	1			
less than 1/week							
Less than 1/day						1	
1/day							
2+/day							
6. Where do you travel to?							
work		1		1			
Sport							
Social				1			
Shopping							
Other			1			1	
8. if there was adequate services would you use Public Transport							
Yes			1				
No	1	1			1		1
9. Would you park and ride							
Yes						1	
No	1	1	1	1	1		1
10. Do you think the current transport routes in Toowoomba are sufficient?							
Yes		1				1	
No	1		1	1	1		1
11. Do you feel safe							
Yes	1	1		1	1	1	1
No			1				
12 Please rate the Toowoomba public transport Network							
Unsatisfactory					1		1
Average	1	1	1	1			
Good						1	
Excellent							

Person	29	30	31	32	33	34	35
1. Age Group							
Under 17		1					
17-25							
26-39							
40-64	1		1	1		1	1
65+					1		
2. Gender							
Male	1	1			1		
Female			1	1		1	1
3. How many trips out of the house per weekday							
0							
1						1	1
2	1			1			
3					1		
4+		1	1				
4. Have you ever used public transport							
Yes	1						1
No		1	1	1	1	1	
5. How frequenty do you use public transport?							
less than 1/month	1						1
less than 1/week							
Less than 1/day							
1/day							
2+/day							
6. Where do you travel to?							
work							
Sport							
Social	1						
Shopping	1						
Other							1
8. if there was adequate services would you use Public Transport							
Yes		1		1		1	
No			1		1		
9. Would you park and ride							
Yes	1	1		1			
No			1		1	1	1
10. Do you think the current transport routes in Toowoomba are sufficient?							
Yes			1				
No	1	1		1	1	1	1
11. Do you feel safe							
Yes	1	1	1	1	1	1	1
No							
12 Please rate the Toowoomba public transport Network							
Unsatisfactory			1	1		1	1
Average	1	1					
Good					1		
Excellent							

Person	36	37	38	39	40	41	42
1. Age Group							
Under 17							
17-25							
26-39					1		
40-64	1	1	1	1		1	1
65+							
2. Gender							
Male		1					1
Female	1		1	1	1	1	
3. How many trips out of the house per weekday							
0							
1			1				
2				1		1	
3							1
4+	1	1			1		
4. Have you ever used public transport							
Yes				1			
No	1	1	1		1	1	1
5. How frequenty do you use public transport?							
less than 1/month							
less than 1/week							
Less than 1/day				1			
1/day							
2+/day							
6. Where do you travel to?							
work							
Sport							
Social							
Shopping							
Other							
8. if there was adequate services would you use Public Transport							
Yes	1	1					
No			1	1	1	1	1
9. Would you park and ride							
Yes	1					1	
No		1	1	1	1		1
10. Do you think the current transport routes in Toowoomba are sufficient?							
Yes							1
No	1	1	1	1	1	1	
11. Do you feel safe							
Yes	1	1		1	1	1	1
No			1				
12 Please rate the Toowoomba public transport Network							
Unsatisfactory	1	1	1	1			
Average					1	1	1
Good							
Excellent							

Person	43	44	45	46	47	48	49	50
1. Age Group								
Under 17								
17-25		1					1	
26-39	1					1		
40-64				1	1			1
65+			1					
2. Gender								
Male	1	1			1	1	1	
Female			1	1				1
3. How many trips out of the house per weekday								
0								
1			1					
2	1							
3								
4+		1		1	1	1	1	1
4. Have you ever used public transport								
Yes	1		1	1	1		1	1
No		1				1		
5. How frequenty do you use public transport?								
less than 1/month	1		1	1	1		1	
less than 1/week								
Less than 1/day								1
1/day								
2+/day								
6. Where do you travel to?								
work								
Sport								
Social							1	1
Shopping			1	1	1			1
Other								1
8. if there was adequate services would you use Public Transport								
Yes		1	1			1		
No	1							
9. Would you park and ride								
Yes		1			1			1
No	1		1	1		1	1	
10. Do you think the current transport routes in Toowoomba are sufficient?								
Yes	1		1					
No		1		1	1	1	1	1
11. Do you feel safe								
Yes	1	1	1		1		1	1
No				1		1		
12 Please rate the Toowoomba public transport Network								
Unsatisfactory		1		1	1	1	1	
Average	1							
Good								1
Excellent			1					

Person	51	52	53	54	55	56	57	58
1. Age Group								
Under 17								
17-25								
26-39							1	
40-64			1					
65+	1	1		1	1	1		1
2. Gender								
Male			1	1		1		1
Female	1	1			1		1	
3. How many trips out of the house per weekday								
0								
1	1							
2			1	1	1			
3						1	1	1
4+		1						
4. Have you ever used public transport								
Yes	1	1					1	
No			1	1	1	1		1
5. How frequenty do you use public transport?								
less than 1/month		1					1	
less than 1/week	1							
Less than 1/day								
1/day								
2+/day								
6. Where do you travel to?								
work								
Sport								
Social							1	
Shopping	1	1						
Other	1							
8. if there was adequate services would you use Public Transport								
Yes						1	1	
No			1	1	1			1
9. Would you park and ride								
Yes	1						1	1
No		1	1	1	1	1		
10. Do you think the current transport routes in Toowoomba are sufficient?								
Yes			1					
No	1	1		1	1	1	1	1
11. Do you feel safe								
Yes	1	1	1	1	1	1		1
No							1	
12 Please rate the Toowoomba public transport Network								
Unsatisfactory						1	1	1
Average	1	1		1	1			
Good			1					
Excellent								