Mitigating Traffic Growth in St Albans

"How can we improve and sustain accessibility and cohesion within the St Albans community with the implementation of the Northern Corridor Development?"

Final Research Report

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1. Executive Summary

"How can we improve and sustain accessibility and cohesion within the St Albans community with the implementation of the Northern Corridor Development?"

The Northern Arterial Corridor development will connect the Northern Motorway to Christchurch City by passing through QEII Drive and a four-laned Cranford Street. An estimated 27,300 vehicles will travel through the new motorway daily once opened, with the number expected to rise to 42,000 by 2026. The St. Albans Residents' Association (SARA) is concerned that this will affect the safety and accessibility of residents within the community as Cranford Street passes through the centre of St. Albans.

The methods used to investigate our research question were literature reviews, a survey, interviews, field analyses, spatial analyses and visualisation; a subsequent analysis of our data was completed on Excel.

Our key findings were:

- Refuge Island crossings were the least preferred crossing type among all respondents; signalised traffic crossings were the most preferred.
- The main areas highlighted as unsafe for pedestrians and cyclists are Westminster, Innes Road and Berwick intersections, as well as Edgeware Road.
- Pedestrians must walk faster than 3.2km/h - 3.6km/h to cross before lights change, at most intersections.
- We propose two crossing points, based on findings from the Maptionnaire survey, on the Malvern Street intersection and Springfield/Edgeware Rd intersections.

Cycleways along Cranford Street have been commented by survey respondents as being too narrow and close to traffic. Based on field observations, the cycleway is seemingly below the minimum NZTA requirement of 1.5 meters. Studies have found that people will avoid a route if the infrastructure of cycleways are poor or not distanced enough from traffic.

Pedestrian safety was another frequent complaint, particularly pertaining to children, the elderly and the disabled. Signalised crossings and refuge islands with zebra markings are the most practical and popular solutions, as other options, such as overpasses and underpasses, are infeasible.

Limiting factors in our research include issues such as COVID19 restrictions, survey bias and technological issues with the maptionnaire program. Nevertheless, we have been able to conclude that accessibility and cohesion in St Albans can be improved and sustained if modifications are implemented over the CCC's 10-year response phase. These modifications include the conversion of some refuge islands to include pedestrian crossings, extending the time allocated to cross unsafe intersections, as well as the widening of cycling lanes.

2. Introduction

This report investigates how a motorway development in Christchurch, New Zealand will affect the residents of St Albans, located north of the city centre, with Cranford Street acting as a primary pathway through St Albans. The project is known as the Northern Arterial Corridor and will provide a route for commuters travelling south down the northern motorway to exit into the city, flowing through Cranford Street in the process. This project is managed by the New Zealand Transport Agency (NZTA) and the Christchurch City Council (CCC). Alterations were made to St Albans' to handle the increase of traffic that is predicted following the completion of the Northern Corridor. 2017 council traffic data recorded 21,000 vehicles on a day to day basis, further increasing by approximately 30% to 27,300 vehicles once completed. The NZTA also predicts that 42,000 vehicles will be using the northern corridor by 2026.

The CCC developed a document named the Downstream Effects Management Plan (DEMP) to investigate what changes were needed for St Albans to function while allowing the movement of more vehicles. This was originally performed by a third-party company hired to find the minimum amount of changes needed to the area. The CCC took this baseline and developed it further to become more accommodating for pedestrians and cyclists. The current timeline of these plans are divided into three main phases (Appendix A); stage one is set to finish with the opening of the Northern Corridor, with stage two's completion three years later and stage three by 2031. This involves the widening of Cranford Street from two lanes up to four allowing for a higher flow of traffic to and from Christchurch, as well as the addition of multiple traffic lights with timed light crossings for pedestrians, refuge islands, cycle lanes and speed reductions to list a selection throughout St Albans.

There are concerns within the community of St Albans surrounding safety and accessibility when travelling, as well as community severance between east and west St Albans. This concern extended specifically to children, the elderly and people with physical disabilities. The area has several schools as well as an aged population that may struggle to move through the area. Additionally, there was an interest in how the Māori community would be affected. Research showed that as of 2018 there were 2,154 Māori living within the St Albans area with 627 on the west and 1,527 on the east side of Cranford Street (Stats NZ, 2018). The Rehua Marae is located

in the West and is a focal point for Iwi in the area. As a result, they could feel distanced from their spiritual, physical and cultural heritage associated with the Marae. The land and Marae are of significant value to Mana Whenua as they are places of social stability, tribal identity and where relationships can be built and sustained.

These led to the St Albans Residents Association (SARA) creating this project to try to mitigate effects on the community and seek assurance that residents will not be restricted as a result. The research question developed to investigate this task was, *"how can we improve and sustain accessibility and cohesion within the St Albans' community with the implementation of the Northern Corridor Development?"* The remainder of this report will detail the methods used throughout the project, followed by the results achieved by the investigation and a discussion examining relationships between the project's results and existing literature, finished off with final recommendations and conclusions.

3. Literature Review

3.1 Universal Design Principles

As with any research, it is important to read, analyse and evaluate previous literature to understand a certain topic and its intricacies. In our research topic, *mitigating traffic in St Albans*, we emphasised the issues of safety and accessibility, particularly for children and elderly; community cohesion and severance; built environment and quality of infrastructure; and social equity and transport. To understand these, we must first understand the seven *universal design principles*. In a broad definition, *universal design* is "design for all people" and "seeks to create environments and products that are usable by children, young adults and the elderly" regardless of their physical and mental capabilities (Null, 2014). These principles are *equitable use*; *flexibility in use*; *simple and intuitive*; *perceptible information*; *tolerance for error*; *low physical effort*; *and size and space for approach and use* (Akinci, 2014). These seven principles are important to our research, as we often overlook our privilege and fail to produce environments, infrastructure and institutions that are favourable to people outside of our own demographics.

3.2 Safety and accessibility

Firstly, safety and accessibility are a large concern for our research because, contradictory to universal design principles, an increase in vehicle use can correlate with a decrease in active transport. This may result from more residents preferring to drive for its convenience, or, residents feeling unsafe cycling or walking due to increased traffic (Stoker et al., 2015). What has been found in literature concerning safety and accessibility for active transport is the efficacy of education in improving safety, particularly for school students, in a community with growing vehicle use (Raftery & Wundersitz, 2011). Although visual aids almost improve safety for cyclists and pedestrians, overtime this effect wears off as active transporters become used to the prompts and begin to neglect them (Retting et al., 1996). Further research however, is needed for middle-aged individuals as much of the literature focuses on school-aged or elderly active transporters (Anstey et al., 2016).

3.3 Community Cohesion and Severance

Secondly, the expected influx of traffic travelling down Cranford Street is likely to convert the industrious thoroughfare into an intra-suburb border that separates the affluent west side of St

Albans from the relatively impoverished eastern side. This necessitates research concerning community cohesion and severance. The concept of cohesion in communities, however, is a recent development with few concrete studies. These studies have found that as the quality of the environment decreased due to poor maintenance and obstructions, movement within a community also decreased (Anciaes, 2013; Cervero et al., 2017; Mindell & Karlsen, 2012). This lack of cohesion is more likely to affect those with less mobility, such as youth and the elderly, who are more restricted from travel, therefore resulting in a sense of solitude and anxiety (Anciaes, 2013; Mindell & Karlsen, 2012).

3.4 Quality of built environment and infrastructure

Thirdly, the built environment and quality of infrastructure can be detrimental to the safety and wellbeing of residents. On average, a pedestrian injury and fatality occurs in the United States every six and 107 minutes respectively (Schneider et al., 2004). Civil built environments can be altered, such as traffic calming features and detaching road loans, to mitigate dangers in an urban setting for adults (Lassarre et al., 2007). However, a child does not have the same perception of danger and risk as an adult, therefore, the built environment must be optimised to promote active and safe transport for residents – particularly children (Noland & Quddus, 2005).

3.5 Social equity

Finally, communities, both virtual and physical, have evolved to become more cooperative to achieve their goals. When sections of a community are separated, however, disparities and inequity may eventuate (Brunsdon, Fotheringham & Charlton, 1996). In the literature it was found that a lack in public transport may lead to social inequity as groups outside of the public transport sphere could not access resources which would have been accessible had they been encompassed in a public transport plan (Appleyard, 1980; Boisjoly & Yengoh, 2017; Allen & Farber, 2020). It is possible that if a disconnection between East and West St Albans does eventuate, residents living in the relatively impoverished eastern half of the suburb may feel isolated, as well as discouraged and/or disabled from accessing essential services. If perpetuation of this cycle is to be prevented, it is critical for alternative methods of interaction to be established between East and West St Albans.

4. Methodology

The methods used to investigate our research question included; literature reviews, a survey, interviews, field analysis and spatial analysis and visualisation.

4.1 Literature Review

Literature review was our main method for gaining a greater insight into topics relating to our research question. Topics that were investigated were in relation to the effects of traffic growth with community cohesion and severance, built environment and quality of infrastructure, social equity and transport, safety and accessibility for children and elderly and physical and mental health. These topics were critically analysed and reflected upon to enhance our understanding of the research problem.

4.2 Maptionnaire survey

The questionnaire was our main method for gathering primary data. The purpose of this questionnaire was to gather information on resident's perceptions on safety and cohesion within St Albans, primarily focusing on active transport. Maptionnaire was used to create our questionnaire which was distributed through multiple online platforms. These included the St Albans Facebook group, community email and the monthly St Albans newsletter. Posters with a QR code linking to the survey were distributed throughout key locations around St Albans, such as the supermarket and St Albans medical centre. Through the distribution methods we were able to get 222 respondents.

4.3 Interviews

An interview with the CCC was organised to discuss the DEMP of the Northern Arterial Corridor. This meeting enabled us to gather up to date information on the DEMP. Detailed maps of the updated plans were provided which included locations and types of pedestrian crossings, as well as the placement of cycle lanes.

An interview with a rehabilitation instructor at the Blind Low Vision NZ foundation (BLV) was set-up to discuss clients' perceptions on moving around St Albans.

4.4 Field Analysis

Field observations were done in the initial stages of research. Before determining our research question we met with our community partner, SARA, in which we were shown around St Albans. Later in the research process, we measured the timing of traffic lights to investigate safety at main intersections.

4.5 Spatial analysis and visualisation

ArcMap was used for spatial analysis and visualisation. Participants' routes were downloaded from Maptionnaire and added to ArcMap. The proposed crossing points from the Christchurch City Council were manually added. This allowed us to see if the proposed crossing points from the council aligned with the main routes people were moving through. From this, we were able to add new crossing points.

4.6 Data Analysis

Analysis of the data was done through Excel, where the results from Maptionnaire were all collated into one spreadsheet of ‘response data’. Tables and graphs were produced in Excel and maps were produced in Maptionnaire. The geospatial data could be analysed in different ways, such as heat maps, density squares or as separate features. Cross-tabulations were done for those of different age groups and for the East and West side of Cranford Street in regard to opinions on movement, safety, transport modes and crossing types.

4.7 Sample statistics

There is an even spread of respondents on both the East and West side of Cranford Street (*Figure 1*).

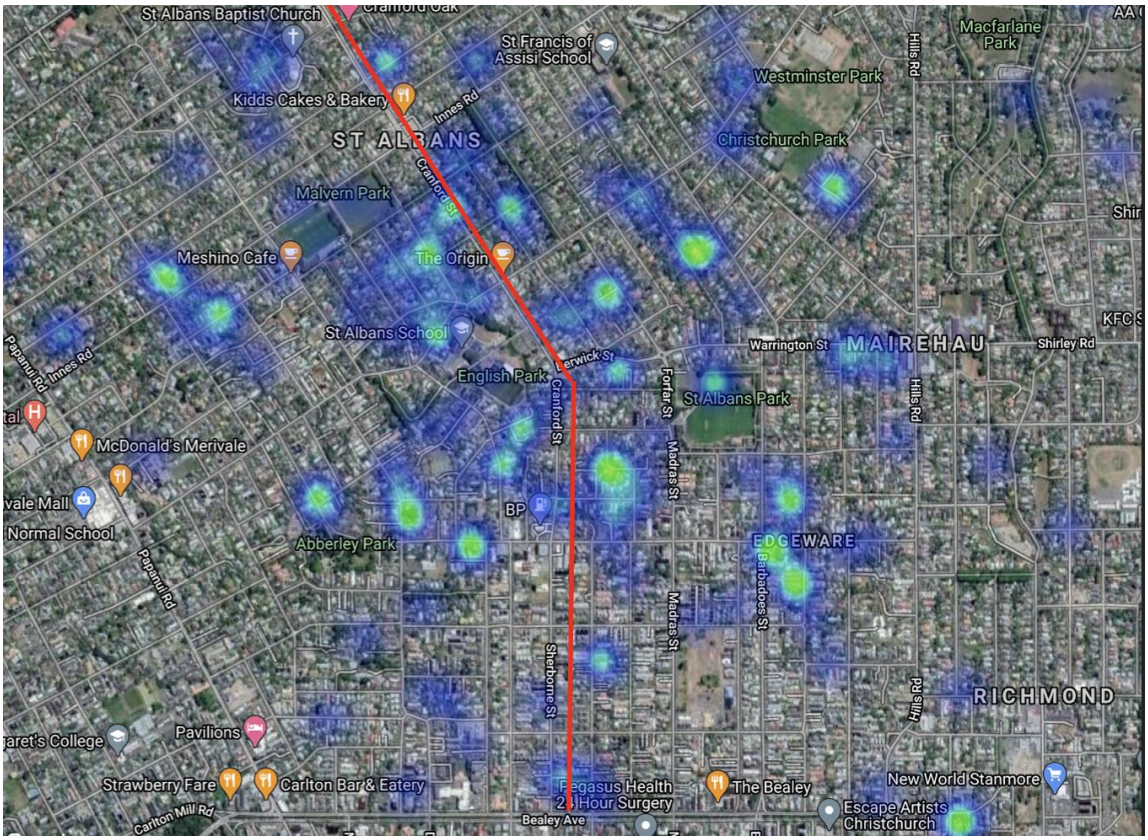


Figure 1: Heatmap showing approximately where respondents live.

4.7.1 Ethnicity

People who partook in the survey were mainly of Pakeha NZ European descent. The 2018 Census found that 2.3% of the total population in St Albans were Maori. Maori participation rate in this survey was 4.5%. There were very low numbers of other ethnic groups. As a result, we were unable to infer any relationships between different ethnic groups.

5. Results

5.1 Cross-tabulations

5.1.1 Age

The most common age bracket in the survey was 26 to 55 years. This accounted for 45.6% of the total number of respondents (*Figure 2).* The most common age bracket in the 2018 Census was 30-64 years (StatsNZ, 2018).

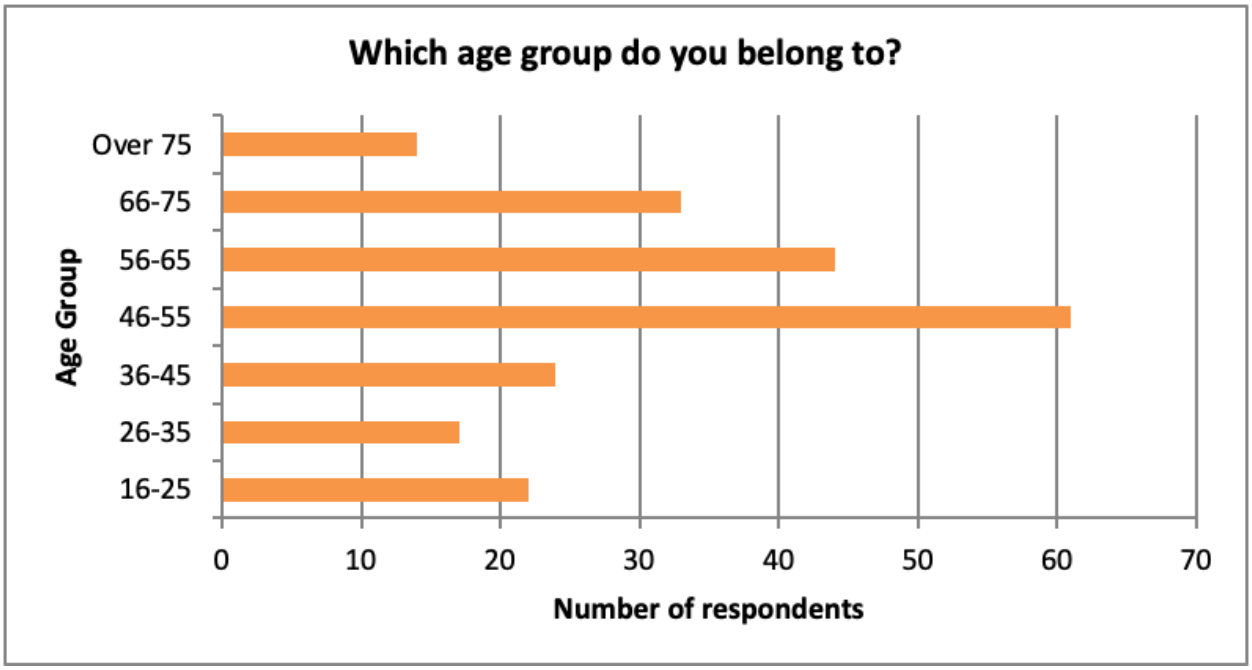


Figure 2: Bar graph showing the number of respondents for each age group.

5.1.2 Transport mode

The most common transport mode for 16 to 25 years was driving a car, truck or van, as well as biking. For the age group 26 to 55 years and 56 to 65, the most frequent mode of transportation was driving a car, truck or van, followed by walking. Biking was the second most common mode. For those aged 66 and over, driving a car, truck or van was the most common mode of transport. Walking was the next frequent choice.

These results reveal that driving a car, truck or van to travel is the most common mode of transportation for all age groups that partook in this survey.

5.1.3 Preferred types of pedestrian crossings

The most preferred crossing type for the age group 16 to 25 years was timed traffic lights and pedestrian crossing with an island. Those aged 26 to 55 preferred a pedestrian crossing with an island. Timed traffic lights were the most favoured for those aged between 56 to 65 and 66 years and over. Overall, island crossings were the least preferred option for all age groups.

The survey showed residents of St Albans prefer timed traffic lights (*Figure 3)*. The plan for the Northern Arterial Corridor is that there will be a mix of refuge islands and signalised pedestrian crossings. Interest in barnes dance crossings is significant, especially at major intersections such as Innes Road/Cranford Street and Westminster/Cranford Street.

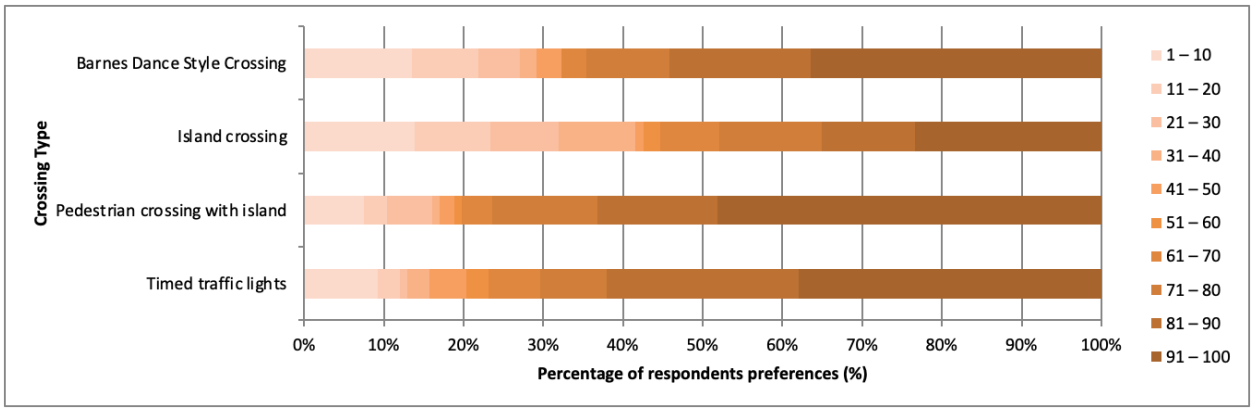


Figure 3: Bar graph showing the percentage of respondents from all age groups that prefer certain pedestrian crossing types

5.2 Comparison of East of Cranford Street and the West of Cranford Street

5.2.1 Restrictions on movement

From random sampling, 75% of respondents located on the East of Cranford Street felt their movement would be restricted once the Northern Arterial Corridor is completed. In comparison, 80% of respondents on the West of Cranford Street felt their movement would be restricted.

5.2.2 Cranford street is easy to cross as cyclist

From random sampling, it was found that 13.3% of respondents living on the East of Cranford Street agree that it is easy to cross Cranford Street as a cyclist, whilst 14.3% of respondents living on the West agree that Cranford Street is easy to cross as a cyclist.

5.2.3 Cranford street is easy to cross as pedestrian

From randomly selecting points on the map, it was found that 17% of respondents living on the East of Cranford Street agree that it is easy to cross as a pedestrian. 12.5% of respondents living West of Cranford Street also agree.

Overall, respondents living on both the East and West of Cranford Street find it difficult to cross as a pedestrian and cyclist (*Figure 4)*.

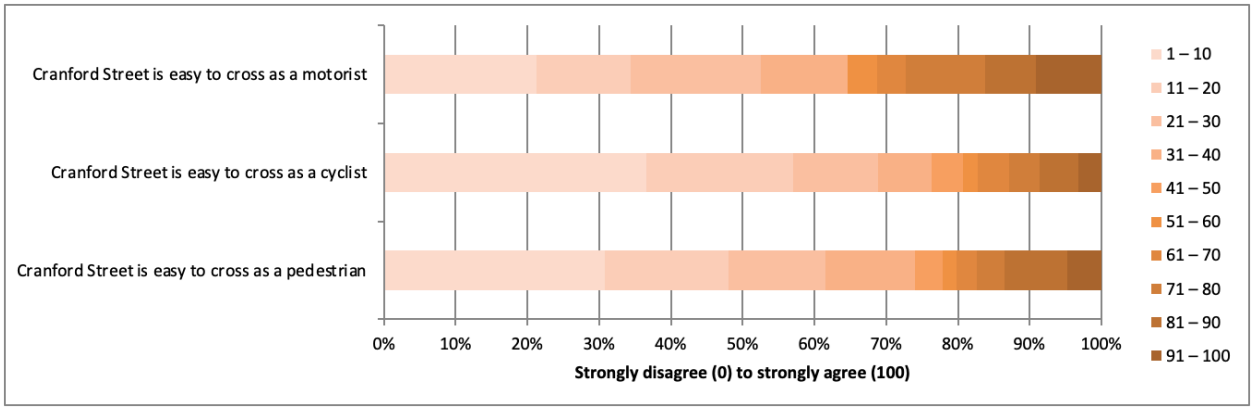


Figure 4: Bar graph showing percentage of respondents from St Albans that agree with the corresponding statements about whether Cranford Street is easy to cross.

5.3 Gender

Our survey respondents were mainly female, which is to be expected. As data indicates, women tend to be more cautious and aware of their environment and community (Garrard et al., 2008; Rankavat & Tiwari, 2016).

5.4 Main routes

An important aspect to our survey was understanding the main routes people take in St Albans to determine where key infrastructure could be needed. *Figure 5* highlights the streets that are used most in dark blue; streets that are also frequently used but not as much are in light blue. Some of

the suburban roads e.g. Trafalgar Street *(Figure 6)*, has shared cycleways with vehicles, which has been mentioned as one of the safety concerns in the area as cyclists are having to contend with high traffic volumes on suburban streets.

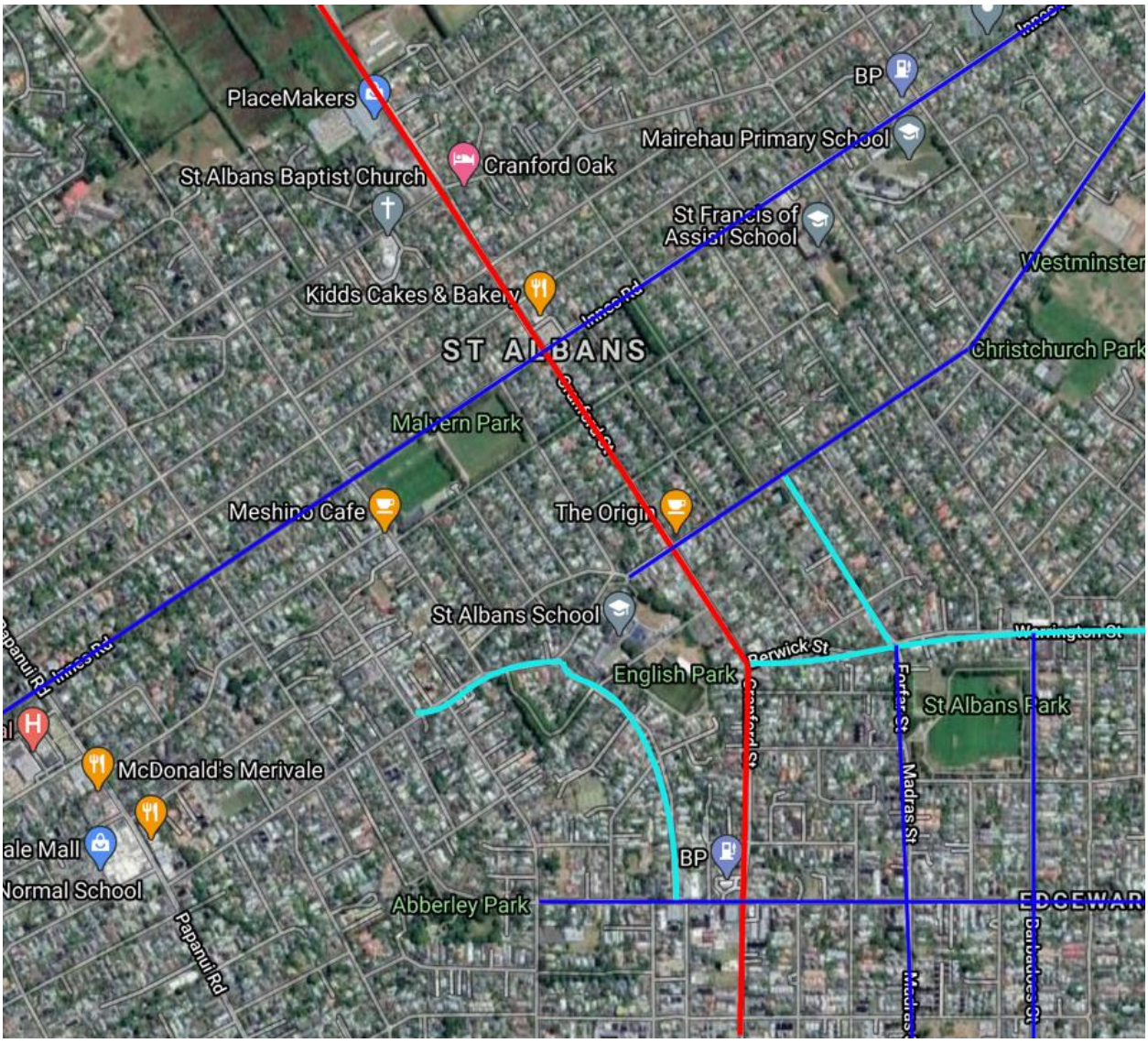


Figure 5: Map of St Albans highlighting main routes that are used in the suburb. Dark blue routes are heavily used by all traffic types, while light blue routes are also used frequently but not to the same extent. The red route is Cranford Street/Future Northern Arterial Corridor.

Figure 6: Image of Trafalgar Street, St Albans. An example of a shared cycleway in the suburb.

5.5 Unsafe areas for pedestrians and cyclists

Figure 7 is a hotspot map showing where residents have indicated areas unsafe for pedestrians in St Albans. The main areas highlighted as unsafe are Westminster, Innes Road and Berwick intersections, as well as Edgeware Road. Another key hotspot is Springfield Road near Abberley Park. This has been recommended to include a crossing for pedestrians to increase pedestrian safety (as shown in *Figure 10).* For cyclists, hotspots are around similar intersections to the pedestrian map (*Figure 8).* A new hotspot is on Innes Road near two schools. This could be because there are no cycle lanes on this road, forcing cyclists to weave around parked cars causing potentially dangerous situations (*Figure 9).*

Figure 7: Hotspot map showing areas that St Albans residents feel are unsafe for pedestrians.

Figure 8: Hotspot map showing areas that St Albans residents feel are unsafe for cyclists

Figure 9: Image of Innes Road near Kensington Avenue Intersection (Google Maps, 2020)

5.6 Timed Pedestrian Crossings

The speed of timed pedestrian crossings at key intersections in St Albans were measured. Overall, pedestrians must walk faster than 3.2km/h - 3.6km/h in order to cross before the lights change at most intersections in St Albans *(Figure 10)*. Our recommendation is to make all crossings the same time to improve safety and allow for enough time to cross.

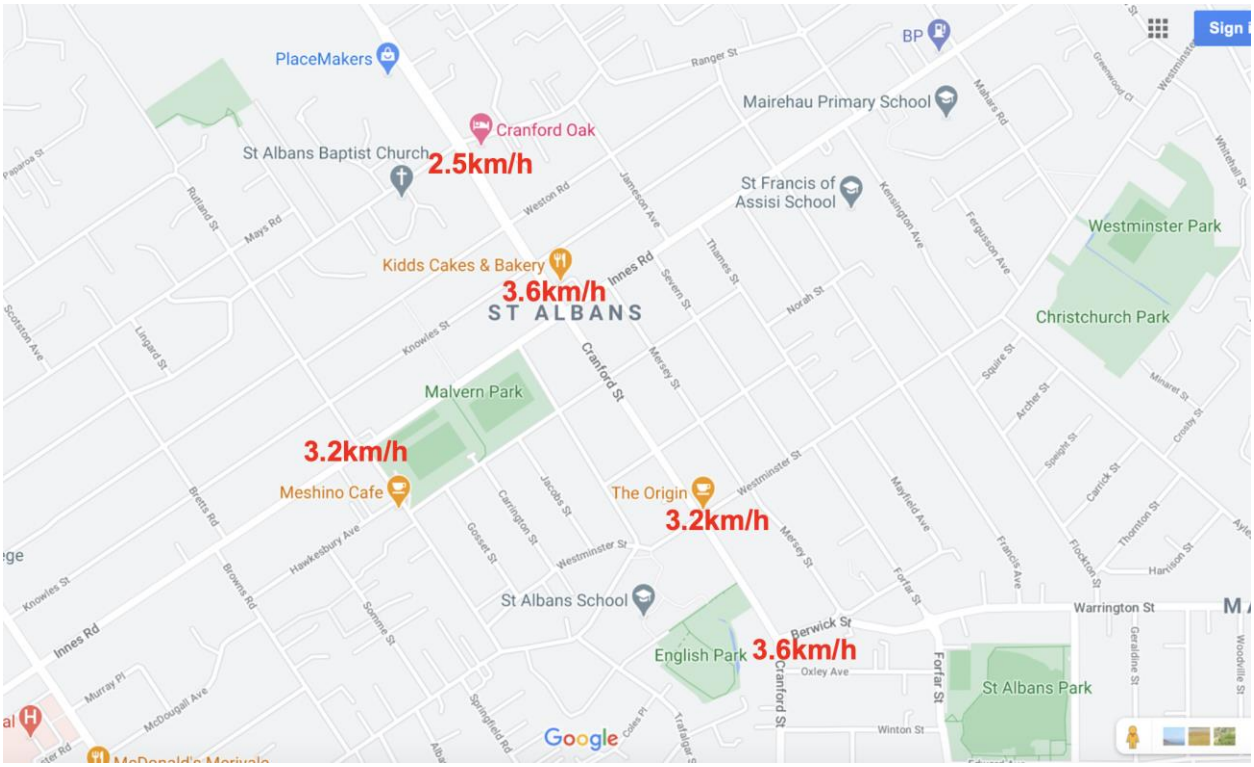


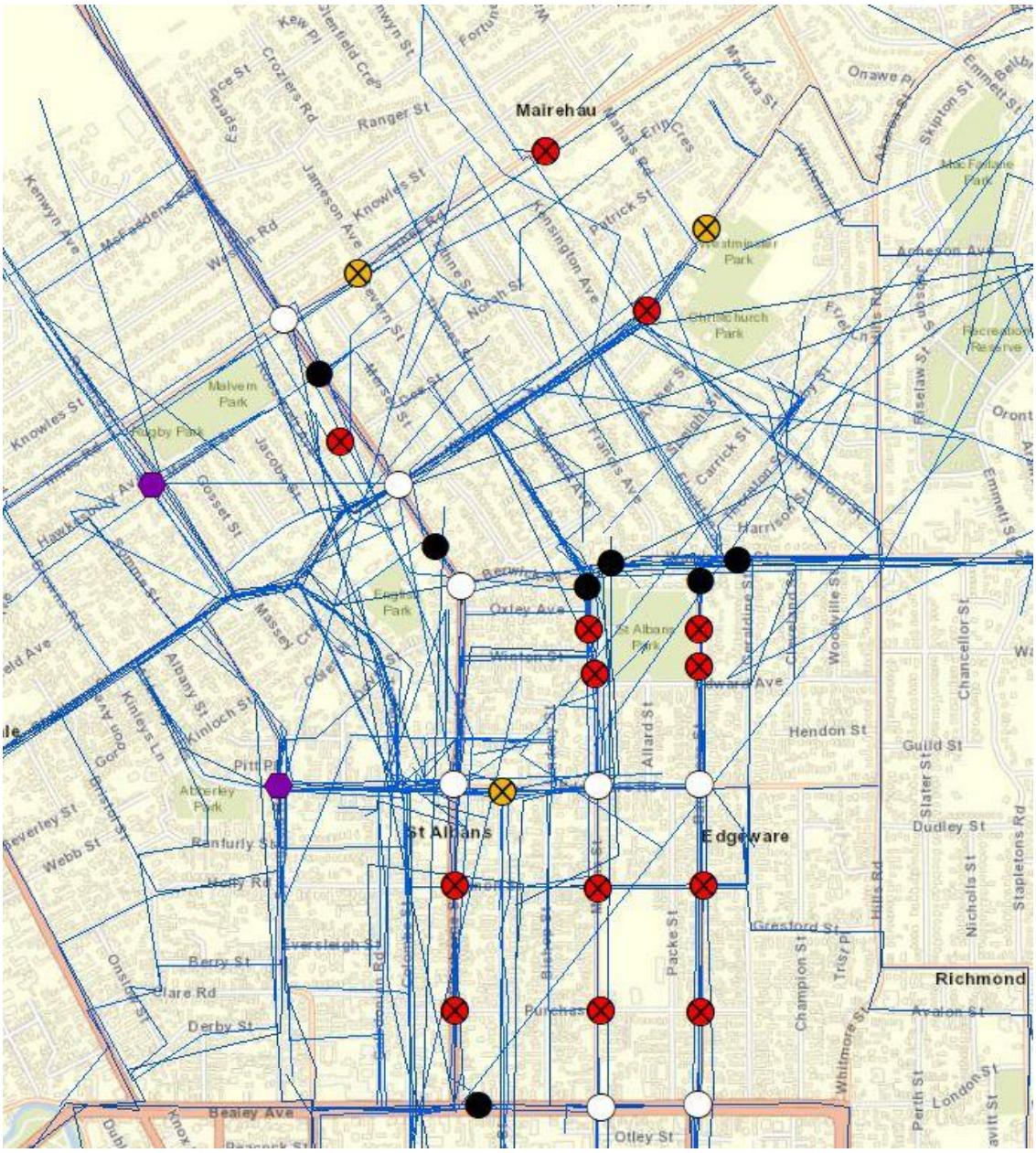
Figure 10: Map showing the minimum speed that pedestrians need to walk in order to get across the crossing before the traffic lights turn red.

On average, most able-bodied people walk at 4.1km/h (Fitzpatrick et al., 2006), which gives them adequate time to cross the intersections on Cranford Street that were measured. However, elderly on average walk at approximately 3.3km/h (Fitzpatrick et al., 2006), meaning they won't have enough time to cross some intersections in St Albans.

5.7 Spatial Analysis and Visualisation

Spatial analysis was conducted to determine main routes St Albans residents use, and compare the current crossing points and future crossing points as indicated by the CCC. Two proposed crossing points were added to the analysis, based on findings from the Maptionnaire survey, on the Malvern

Street intersection and Springfield/Edgeware Rd intersections. From the council's outline of the DEMP current and planned crossing points, it is evident there are a large number of refuge islands that are planned for the future. However, it was found in our survey that residents do not like refuge islands. This should be reviewed based on these results.



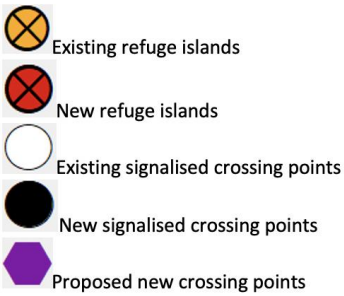


Figure 11: Spatial analysis of current, future and proposed crossing points in St Albans

6. Discussion

While it is not possible to reverse the Northern Arterial Corridor, by analysing resident routes and behaviours along the major roads of St. Albans, suggestions can be made in order to improve community cohesion.

6.1 Cyclists

As the hotspot map (*Figure 8)* has indicated, the areas deemed most unsafe for cyclists have been at intersections such as Innes Road/Cranford Street, Westminster/Cranford Street, and Cranford/ Berwick Street. Issues such as fast cars and narrow cycling lanes are cyclists' primary concerns especially in and around the intersections.

Figure 12: Cranford Street cycleway approaching the Innes Road intersection.

The minimum required width for cycling lanes in New Zealand is 1.5 meters (NZTA, n.d.). Based on field observations, the cycling lanes appear to be below the minimum width requirement (at approximately 50cm- 1m) excluding the gutter. The width may be adequate with the gutter; however, the infrastructure quality poses safety concerns. The lack of seamless transition from tarmac to the concrete makes the surface uneven and puts cyclists at risk. The cycle lane is also very close to traffic. Studies have found that cyclists are more likely to avoid routes with high

traffic volumes if cycle lanes are not well designed or distanced enough from traffic (Garrard et al., 2008).

It should be noted that on the hotspot map there was an area marked along Innes Road by the St. Francis School. While not by any major intersections, the road by the school lacks cycle lanes and it sees a high volume of motorists particularly during pick up and drop off times.

6.2 Pedestrians

Another frequent complaint was a lack of pedestrian safety. Areas of high risk are Cranford and Innes Road, but Springfield Road is of particular concern as well.

St. Albans School sits adjacent to Cranford Street (on the western side) and many children must cross the road to reach their school. The CCC have collaborated with the principal and have created several solutions and compromises:

1. A refuge island is being moved to sit across English Park as it is a direct route children most often use.
2. Pedestrian crossings at signalised intersections will be on for longer periods during school pick-up and drop-offs.
3. Temporary speed limits will be put in place during these same hours to slow local traffic.

While these implementations are beneficial, there are also some considerations that need to be made. For example, children have poor hazard and risk perception which leads to dangerous behaviour around roads given their inability to correctly assess when it is suitable for them to cross. Thus, children are subsequently at higher risk of traffic accidents than adults (Pitcairn & Edlmann, 2000; Poudel-Tandukar et al., 2007). Therefore, refuge islands are not as much of a suitable choice as signalised crossings, which is further suggested by our own results.

Additionally, the BLV have indicated that their clients also prefer signalised crossings and that refuge islands are deemed a risk. Signalised crossings have cues that are easier to follow as opposed to refuge islands where blind pedestrians rely solely on hearing. Electric cars, for example, are dangerous for the elderly and poor of sight given the lack of noise they produce (Verheijen & Jabben, 2010; Brand et al., 2013).

The BLV also commented on the inability to easily cross for wheelchair bound users. This is supported by research that found wheelchair users are disproportionately involved in accidents as pedestrians at crossings (Kraemer & Benton 2015). For both the blind and wheelchair users, where mobility is an issue, there was also the comment that refuge islands, if to be used, should be straight approaching as opposed to side on. This will minimise the manoeuvring required to get onto the island itself.

Other options such as pedestrian overpasses and underpasses were considered, but ultimately their implementation will not be practical. These structures, while alleviating direct pedestrian and vehicle interaction, tend to be very expensive and can result in higher incidences of illegal crossings (Tanaboriboon and Jing, 1994; Räsänen, Lajunen et al., 2007; Rankavat and Tiwari, 2016).

Therefore, our suggestions to improve pedestrian safety and perception of safety would be to implement more signalised crossings and set them to be on for longer periods of time. This should encourage residents to interact with both halves of the community and thus increase cohesion as a whole. Ideally, refuge islands should be minimised, or they should be designed with a zebra crossing. However, they should still be used to a minimum given the risk they still pose for some.

Future studies should place more focus on ethnicities and their relationship to the road and the community. While the results showed ethnicity was not statistically significant, it may be possible that foreigners have different perceptions and methods of crossing roads as opposed to the majority NZ European that responded in our survey. This may mean they are less affected by the implementation of the Northern Arterial Development and thus may view the cohesion of the community differently to others.

6.3 Limitations

Covid19 restrictions meant that physical surveying could not be conducted in rest homes. This means that a certain demographic may have been missed.

Responses on the survey could have been entered multiple times due to technological difficulties. Piloted responses were also included in the final respondent data.

Survey bias should also be noted. Respondents may have felt more inclined to comment on the topic if they are passionate, regardless of the prize incentive.

7. Conclusions

In conclusion, the Christchurch Northern Corridor is a massive project that exemplifies the connections we still have with our surroundings, despite living in an ever technologically advancing and dependent society. In order to maintain community cohesion and interaction, the CCC has, in response to public concerns, implemented a series of speed restrictions and additional crossing points. These include 30km/h and 40km/h speed restrictions and an increase in refuge island crossings – both of which are situated in sections of St Albans, particularly around St Albans School, English Park and adjacent streets to Cranford Street that are commonly used by elderly, children and active transport enthusiasts. Critically, the CCC has also developed a three and ten-year phase for this plan, allowing further changes to their response to the Northern Corridor. Although this phase focuses on additional safe routes for cyclists and pedestrians, from our research we have concluded that alternative solutions should be implemented to improve safety and accessibility in St Albans, as well as appealing to its residents.

As previously mentioned, 81% of our respondents stated that their preferred crossing method was a pedestrian crossing with a refuge island. Conversely, the CCC has implemented a series ofstandard refuge islands, which were unfavourable amongst our respondents. Additionally, many of our respondents expressed concerns over a short period of time that is allowed to cross at a timed-light intersection. Often the respondents claimed they felt "anxious when cars begin to move-out into an intersection when the pedestrian light changes from green to flashing red". We have also been informed by the CCC that they would only be willing to alter the time permitted to cross at a light-intersection if this alteration would not affect vehicles.

To answer our research question, "*how can we improve and sustain accessibility and cohesion within the St Albans community with the implementation of the Northern Corridor Development?*" we suggest that over the project's ten-year response phase, some, but not all refuge islands are converted to pedestrian crossings with refuge islands; crossing times are extended at light-intersections around schools and intersections deemed unsafe by our respondents; and the widening of cycle lanes to the New Zealand Transport Agency's guidelines of 1.5-2 metres. The reason to convert some, but not all refuge islands is because there is not unanimity on this crossing method as preferable, as well as the logistics of converting every crossing. Instead, as with the

extension of crossing times at lights, this conversion should take place at previously mentioned areas that are seen as unsafe by our respondents.

8. Acknowledgements

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10. Appendices

Appendix 1 Downstream Management Plan Stages 1-3

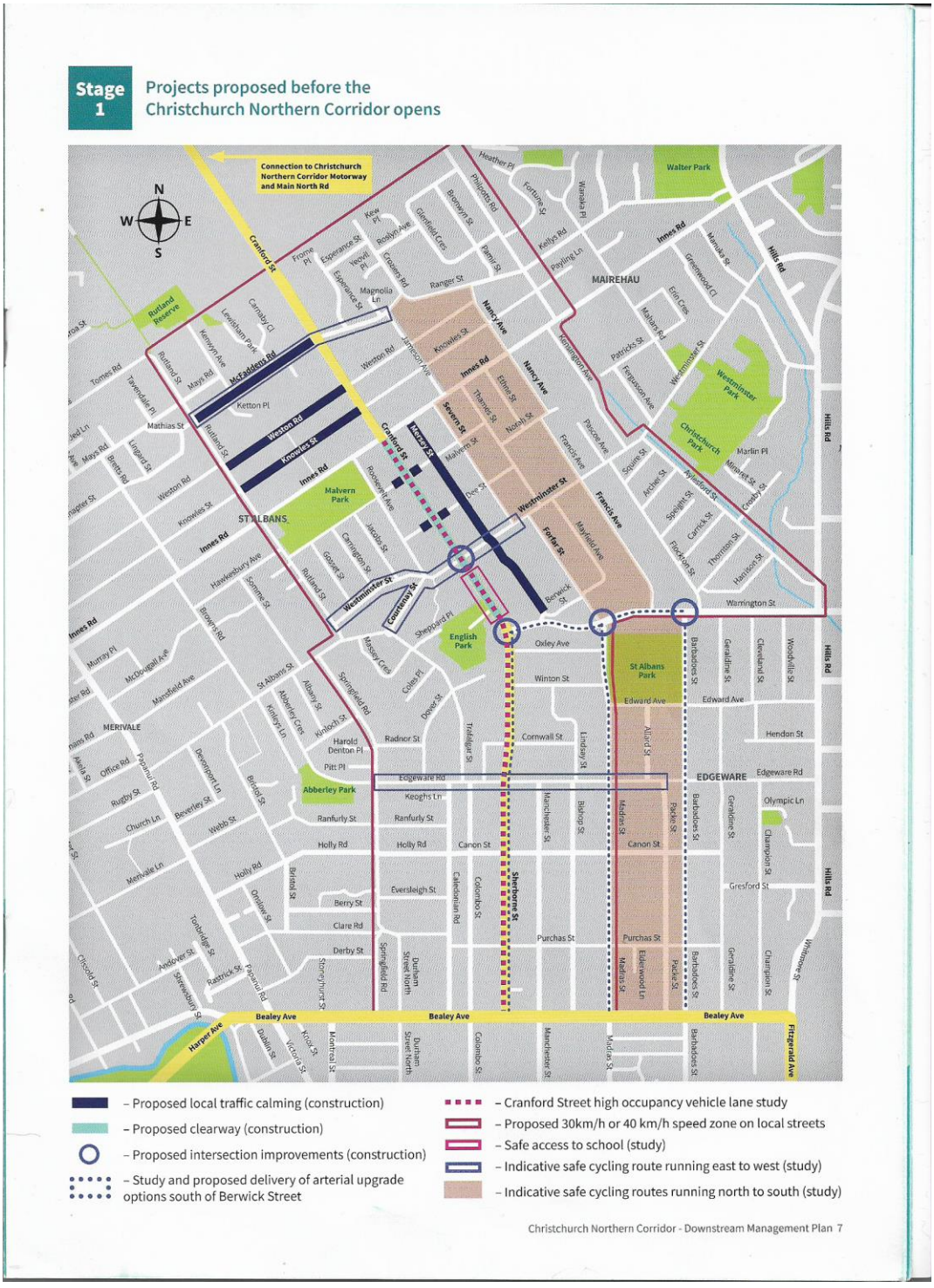

Figure A.1: Downstream Management Plan Stages 1.

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Figure A.2: Downstream Management Plan Stages 2.

Figure A.3: Downstream Management Plan Stages 3.